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MANUAL PART # **MU-2B-60-MR-0273-1-MR-0338-1**

MANUAL TITLE: **AIRPLANE FLIGHT & PILOTS OPERATION MANUAL**

(Most current Revision to this Manual from Master Status List)

AFM Revision #:	**14**	POM Revision #:	**7**
Dated:	**7/11/2005**	Dated:	**7/15/2004**
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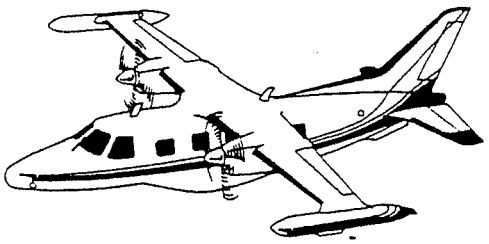

MU-2B-60 AIRPLANE FLIGHT MANUAL

DOCUMENT NUMBER MR-0273-1

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MITSUBISHI
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FAA APPROVED MARCH 2, 1978
REISSUE DATE: 9-24-85
Don P. Watson

Don P. Watson - Manager
Aircraft Certification Division
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Ft. Worth, Texas 76101

APPLICABLE TO AIRPLANE SERIAL NUMBERS 700SA,
731SA THROUGH 799SA, AND 1501SA THROUGH 1569SA.

MU-2B-60
AIRPLANE
FLIGHT
MANUAL

EFFECTIVE PAGES

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REVISION LOG

The Log of Revisions identifies and provides a listing of all revisions to this manual. When new information becomes necessary, revisions will be issued for all applicable airplanes. Additions, deletions, or changes will be identified on each page by the letter R opposite that portion being affected. The revision number and date will be added to each page revised.

REV. NO.	PAGES AFFECTED	REASON FOR CHANGE	*FAA APPROVED	DATE
	All Airplane Flight Manual pages.	Reissue of MU-2B-60 AFM MR-0273 (3-2-78) through Revision FMR 60-11 (12-19-83) and revised Performance as MR-0273-1.	Don P. Watson	09-24-85
1	EFFECTIVE PAGES 1, 2, REVISION LOG 1, 2-4, 6-13, 6-14	Change Fuel System anti-icing inhibitor requirement and add NOTE to Balked Landing Best Rate of Climb charts.	C L Stone	3-25-86

REV. NO.	PAGES AFFECTED	REASON FOR CHANGE	*FAA APPROVED	DATE
2	Cover page, EFFECTIVE PAGES 1, 2, REVISION LOG 1, 1-1	Change Logo and add ending effectivity on cover page. Change Name of Holder of Type Certificate.	for Manager Wichita Aircraft Certification Office Federal Aviation Administration Central Region Wichita, Kansas	9/24/86

* For Manager
Aircraft Certification Division
Federal Aviation Administration
Department of Transportation
Southwest Region, Ft. Worth
Texas

REVISION LOG

REV. NO.	PAGES AFFECTED	REASON FOR CHANGE	*FAA APPROVED	DATE
3	Cover page, EFFECTIVE PAGES 1, 2, REVISION LOG 2, 5-i, 5-ii, 5-15, 5-16, 5-17, 5-18, 5-18-1/5-18-2, 5-28, 5-29, 5-30, 5-30-1/5-30-2	Introduction of Engine Continuous Ignition System	D M Baker Manager Wichita Aircraft Certification Office Federal Aviation Administration Central Region Wichita, Kansas	10-9-91
4	EFFECTIVE PAGES 1, 2, REVISION LOG 2, 2-4, 4-i, 4-6, 4-7, 5-i, 5-17, 5-18, 5-18-1/5-18-2, 5-19	Introduction of Engine Oil brand per Vendor SIL and procedure in Icing Conditions	D M Baker Manager Wichita Aircraft Certification Office Federal Aviation Administration Central Region Wichita, Kansas	3-5-93
5	EFFECTIVE PAGES 1, 2, REVISION LOG 2, 1-5, 2-9, 5-10, 5-13, 5-14, 5-24	Change of Under Speed Governor Minimum Stop Setting	D M Baker Manager Wichita Aircraft Certification Office Federal Aviation Administration Central Region Wichita, Kansas	4-6-94
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8	EFFECTIVE PAGES 1, 2, REVISION LOG 3, 5-ii, 5-8, 5-21, 5-22, 5-22-1/5-22-2	Addition of Feather Valve Check	for Manager Wichita Aircraft Certification Office Federal Aviation Administration Central Region Wichita, Kansas	1/14/97
9	EFFECTIVE PAGES 1, 2, REVISION LOG 3, 2-i, 2-8, 2-8-1, 2-8-2, 4-i, 4-7, 4-8	Addition of Icing Limitation	for Manager Wichita Aircraft Certification Office Federal Aviation Administration Central Region Wichita, Kansas	1/15/97
10	EFFECTIVE PAGES 1, 2, REVISION LOG 3, 2-3, 2-6, 2-8-2	• Addition of Propeller NTS & Feather Valve SYS Limitation, and Power Lever Positioning Limitation in Flight. • Addition of Pilot Training Requirements in Limitation Section.	for Manager Wichita Aircraft Certification Office Federal Aviation Administration Central Region Wichita, Kansas	1/14/98

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REV. NO.	PAGES AFFECTED	REASON FOR CHANGE	*FAA APPROVED	DATE
11	EFFECTIVE PAGES 1, 2, 3, REVISION LOG 4, 2-i, 2-8, 2-8-1, 4-7, 5-i, 5-18-3/5-18-4, 5-19, 5-35, 5-36	Incorporate Deicing Procedures per FAA AD 2000-02-25 Rev.11 to this AFM is approved by the Manager, Airplane Certification Office, ASW-150, by letter dated 12/4/00, as an AMOC to AD 2000-02-25, paragraph (d).	Manager Airplane Certification Office Federal Aviation Administration Southwest Region Fort Worth, Texas	12/4/00
12	EFFECTIVE PAGES 1, 2,3, REVISION LOG 4, 5-ii, 5-26, 5-26-1/5-26-2	Addition of Supplemental NTS Check (First Flight of Day)	Manager Airplane Certification office Federal Aviation Administration Southwest Region Fort Worth, Texas	12.6.02
13	EFFECTIVE PAGES 1, 2, 3 REVISION LOG 4, 2-8-2, 5-9, 5-10, 5-13, 5-14, 5-26-1/5-26-2, 5-28, 5-30, 5-34	• Change the OAT for the Anti-ice system operation. • Change the Engine Anti-ice Caution. • Change the preflight check procedures for Auto-Ignition System. • Correct error.	for MMO. Manager Airplane Certification Office Federal Aviation Administration Southwest Region Fort Worth, TX	7-6-04

REVISION LOG

REV. NO.	PAGES AFFECTED	REASON FOR CHANGE	*FAA APPROVED	DATE
14	EFFECTIVE PAGES 1, 2, REVISION LOG 5(Added), 1-1, 2-2, 2-6	· Change Holder's address of Type Certificate. · Incorporate FAA AD No.2003-22-07. . Change of Propeller Blade Parts Number.	for Manager Airplane Certification Office Federal Aviation Administration Southwest Region Fort Worth, Texas	7/11/05

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INTRODUCTION

This Airplane Flight Manual must be carried in the airplane at all times. It contains the information required by CAR 3 for safe operation of the MU-2B-60. It is the pilot's responsibility to ensure the Airplane Flight Manual is current and that all issued, applicable revisions and supplements are incorporated.

CERTIFICATION BASIS

CAR 3, effective May 15, 1965, including Amendments 3-1 through 3-8, plus Special Conditions defined in FAA letters of May 14, 1965; January 25, 1968; May 13, 1971; and Exemption No. 1951, Equivalent Safety Finding CAR 3.86, and FAR 36.

HOLDER OF TYPE CERTIFICATE

Mitsubishi Heavy Industries, Ltd.

R 16-5, Konan 2-Chome, Minato-ku, Tokyo, Japan

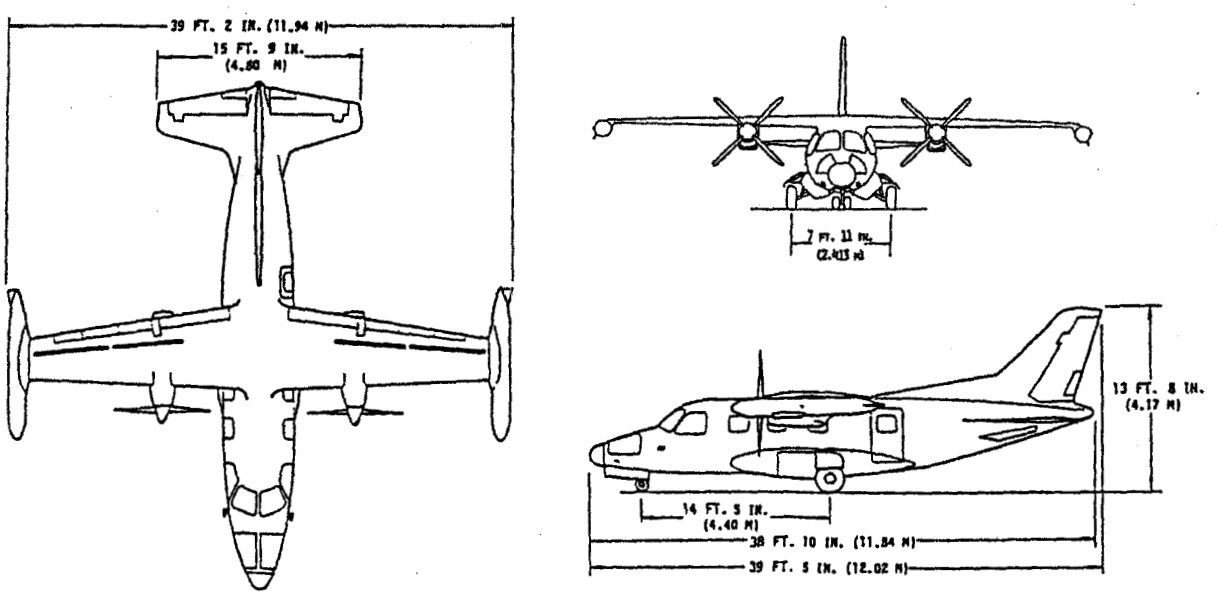
CLASSIFICATION, CLASS, AND MODEL

Classification	Airplane
Class	Multi-Engine Land
Model	Mitsubishi MU-2B-60

CATEGORY

Normal

GENERAL DIMENSIONS



NOTATIONS

WARNING **OPERATING PROCEDURES OR TECHNIQUES WHICH MAY RESULT IN PERSONAL INJURY OR LOSS OF LIFE IF NOT CAREFULLY FOLLOWED.**

CAUTION OPERATING PROCEDURES OR TECHNIQUES WHICH MAY RESULT IN DAMAGE TO EQUIPMENT IF NOT CAREFULLY FOLLOWED.

NOTE Supplemental Information or highlights considered of sufficient significance to require emphasizing.

SECTION 2 - OPERATING LIMITATIONS

FAA approved and contains only those limitations necessary for safe operation as specified by CAR 3.

SECTION 3 - EMERGENCY PROCEDURES

FAA approved and contains procedures that require the use of special systems or the alternate use of the regular systems in order to protect the occupants and the airplane from serious or critical harm. Brackets ([ ]) indicate steps of a procedure requiring immediate action by the flight crew.

SECTION 4 - ABNORMAL PROCEDURES

FAA approved and contains procedures that require the use of special systems or the alternate use of the regular systems to maintain an acceptable level of airworthiness or reduce operational risk resulting from a failure condition. Usually these procedures do not require immediate action and are not intended for use when the airplane is intentionally operated from takeoff to landing with a known inoperative system.

SECTION 5 - NORMAL PROCEDURES

FAA approved operating procedures which have been evaluated and found to adequately provide guidance for the routine operation of the airplane.

SECTION 6 - PERFORMANCE

FAA approved and contains only that performance information required to meet the certification requirements of CAR 3 and FAR 36.

SECTION 7 - WEIGHT & BALANCE (Manufacturer Approved Only)

Information includes the applicable empty weight and center of gravity location with installed equipment, along with the necessary loading instructions.

NOTATIONS (CONT)

SECTION 8 - SUPPLEMENTS (Must be attached to the Airplane Flight Manual)

FAA approved supplemental information, procedures, and limitations concerning operations of equipment or installations necessary for the safe operation of the airplane.

DEFINITIONS

The following definitions, abbreviations and terminologies have been listed for your convenience and ready interpretation where used within this Airplane Flight Manual. Whenever possible, they have been categorized for ready reference.

AIRSPEED TERMINOLOGY

IAS — Indicated Airspeed - The speed of the airplane as shown on the airspeed indicator when corrected for instrument error. IAS values published in this Airplane Flight Manual assume zero instrument error.

CAS — Calibrated Airspeed - The indicated airspeed of an airplane, corrected for position and instrument error. Calibrated airspeed is equal to true airspeed in standard atmosphere at sea level.

TAS — True Airspeed - The airspeed of an airplane relative to undisturbed air which is the calibrated airspeed corrected for altitude, temperature and compressibility.

M — Mach number - The ratio of true airspeed to the speed of sound. Limiting above 21,300 feet pressure altitude.

V_{MC} — Minimum Control Speed - The minimum control speed in the takeoff flap configuration with the critical engine made suddenly inoperative in the NTS mode and the remaining engine operating at takeoff power, landing gear retracted, and a 5° bank angle into the operating engine. The value presented represents the most critical combination of horsepower, weight, and center of gravity. All takeoff and landing speeds shall be above published V_{MC}.

V_A — Design Maneuvering Speed - The maximum speed at which application of full available aerodynamic control will not overstress the airplane.

AIRSPEED TERMINOLOGY (CONT)

V_{MO}/M_{MO}	Maximum Operating Limit Speed or Mach Number - The speed limit that may not be deliberately exceeded in normal flight operations. Velocity is expressed in KCAS and Mach in M Number.
V_{FO}	Maximum Flap Operating Speed - The highest speed for operation of the wing flaps.
V_{FE}	Maximum Flap Extended Speed - The highest speed permissible with wing flaps in a prescribed extended position.
V_{LO}	Maximum Landing Gear Operating Speed - The maximum speed at which the landing gear can be safely extended or retracted.
V_{LE}	Maximum Landing Gear Extended Speed - The maximum speed at which an airplane can be safely flown with the landing gear extended.
V_{LLO}	Maximum Speed for operating the landing lights.
V_{WW}	Maximum Speed for operating the windshield wipers.
V_{S_1}	Stalling Speed or the minimum steady flight speed at which the airplane is controllable in pitch, roll, and yaw with both engines operating, power set at zero thrust, condition levers at Takeoff Land, and the airplane configured in a specific flap setting.
V_{SO}	Stalling Speed or the minimum steady flight speed in the landing configuration. (Flaps 40°)
V_X	Best angle of climb speed.
V_{XSE}	Best angle of climb speed single engine.
V_Y	Best rate of climb speed.
V_{YSE}	Best rate of climb speed single engine.
V_R	Rotation Speed for takeoff to obtain proper airspeed at 50 feet agl. V_R varies with flap setting and gross weight. Rotation attitude is 13° nose up maximum.

POWER TERMINOLOGY

Takeoff Power	The maximum power rating when at torque limit or EGT limit. This is equivalent to maximum continuous power.
Maximum Continous Power	The highest power rating when at torque limit or EGT limit.

POWER TERMINOLOGY (CONT)

Cruise Climb Power	The maximum power recommended for normal climb. The power is torque and/or temperature limited.
Flight Idle Power (Cruise)	The minimum power available for flight obtained when the power levers are in the Flight Idle position and the condition levers are in other than the Takeoff Land position. NOT TO BE USED FOR LANDING.
Flight Idle Power (Landing)	The minimum power available for landing obtained when the power levers are in the Flight Idle position and the condition levers are in Takeoff Land position.
Taxi (Ground Idle)	RPM is obtained by placing the condition lever in the Taxi position with the power lever in Ground Idle position. This limits the RPM operation to a minimum of about 76.5% RPM. NOT TO BE USED IN FLIGHT.
Reverse Thrust	The thrust produced when the propeller blades are rotated past flat pitch into the reverse range. NOT TO BE USED IN FLIGHT.
Negative Torque Sensing System	A system in the turboprop engine that prevents excessive propeller drag on a failed engine by controlling the pitch of the propeller blades.
Windmilling	The rotation of an airplane propeller by air flowing over it without the engine operating.

CONTROL AND INSTRUMENT TERMINOLOGY

Power Lever	This lever controls engine power from full Reverse to Takeoff. The Flight Idle position represents the lowest level of power for flight operation.
Condition Lever	This lever controls RPM of the engine at a selected value and in the Emergency position closes the manual fuel shutoff valve, dumps the feather valve, and causes the propeller to feather.
EGT	Exhaust Gas Temperature - The temperature of the exhaust as it leaves the turbine section of the engine.
Tachometer	The tachometer registers the RPM of the turbine with 100% representing a speed of 41,730 RPM.

POWER TERMINOLOGY (CONT)

Torquemeter — The torquemeter indicates the shaft output torque that is proportional to the power output of the engine. Instrument read out is in percent of torque. 100% of torque equals 715 shaft horsepower.

Beta Range — Engine ground operational mode in which propeller blade pitch is hydromechanically controlled by the cockpit power lever. **BETA RANGE** annunciator will be illuminated. **NOT TO BE USED IN FLIGHT.**

METEOROLOGICAL TERMINOLOGY

Indicated Pressure Altitude — The altimeter reading when the barometric scale has been set to 29.92 inches of mercury (1013.2 millibars).

Pressure Altitude — Indicated Pressure Altitude corrected for instrument error.

Barometric Altitude — The altimeter reading when the barometric scale has been set to the reported barometric pressure corrected to sea level.

NOTE

For correct values of altitude, the reading must be adjusted for instrument error and, as appropriate, for primary or alternate static source errors.

OAT — Outside Air Temperature - The free air static temperature, obtained either from ground meteorological sources or from inflight temperature indications adjusted for instrument error and compressibility effects.

IOAT — OAT as indicated on the aircraft instrument.

Wind — Winds for which graphical corrections are presented are to be taken as the tower wind.

ISA — International Standard Atmosphere which assumes:

(1) The air is a dry perfect gas;
(2) The temperature at sea level is 15° C;
(3) The pressure at sea level is 29.92 inches Hg. (1013.2 millibars);
(4) The temperature lapse rate with altitude is 2°C per 1,000 feet up to the altitude at which the air temperature reaches -56.5°C and is considered constant above that altitude.

CHART AND GRAPH TERMINOLOGY

Best Rate of Climb Speed (V_Y)	The airspeed which delivers the greatest gain in altitude in a given time interval for a specified configuration.
Best Angle of Climb Speed (V_X)	The airspeed which delivers the greatest gain in altitude in respect to the shortest ground distance with zero wind for a specified configuration.
Demonstrated Crosswind	The maximum wind velocity of the 90° crosswind component for which adequate control of the airplane during takeoff and landing was actually demonstrated in certification testing. Takeoffs and landings in crosswind components greater than those demonstrated are not recommended.
Maximum Ramp Weight	The maximum weight of the airplane allowed at engine start. Included is the takeoff weight plus fuel for start, taxi, and run up, up to brake release for takeoff.
Maximum Takeoff Weight	The maximum weight approved at brake release for the start of the takeoff run.
Maximum Landing Weight	The maximum weight approved for the landing touchdown.
Maximum Zero Fuel Weight (ZFW)	The maximum weight to which the airplane may be loaded exclusive of Usable Fuel. (ZFW includes passengers, baggage, equipment, full oil, and unusable fuel.) Any weight above the value given must be loaded as fuel.
Mean Aerodynamic Chord (MAC)	The chord of an imaginary airfoil which has the same aerodynamic characteristics as the actual airfoil; used in the computation of weight and balance.

METRIC SYMBOLS

Metric values will appear in parentheses ( ) immediately adjacent to the English values throughout the text.

KM/H	Kilometers per hour
L	Liters
Kg	Kilograms
mm	Millimeters
M	Meters
cm	Centimeters
Km	Kilometer
Kg/sq. cm.	Kilograms per Square Centimeter
Kg/sq. m.	Kilograms per Square Meter
mm-Kg	Millimeter-Kilograms
CuM	Cubic Meter

SECTION 2 OPERATING LIMITATIONS
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WEIGHT LIMITS

Maximum Ramp Weight	11,625 lbs.	(5,272 Kg)
Maximum Takeoff Weight	11,575 lbs.	(5,250 Kg)
Maximum Landing Weight	11,025 lbs.	(5,000 Kg)
Maximum Zero Fuel Weight	9,950 lbs.	(4,513 Kg)

BAGGAGE COMPARTMENT

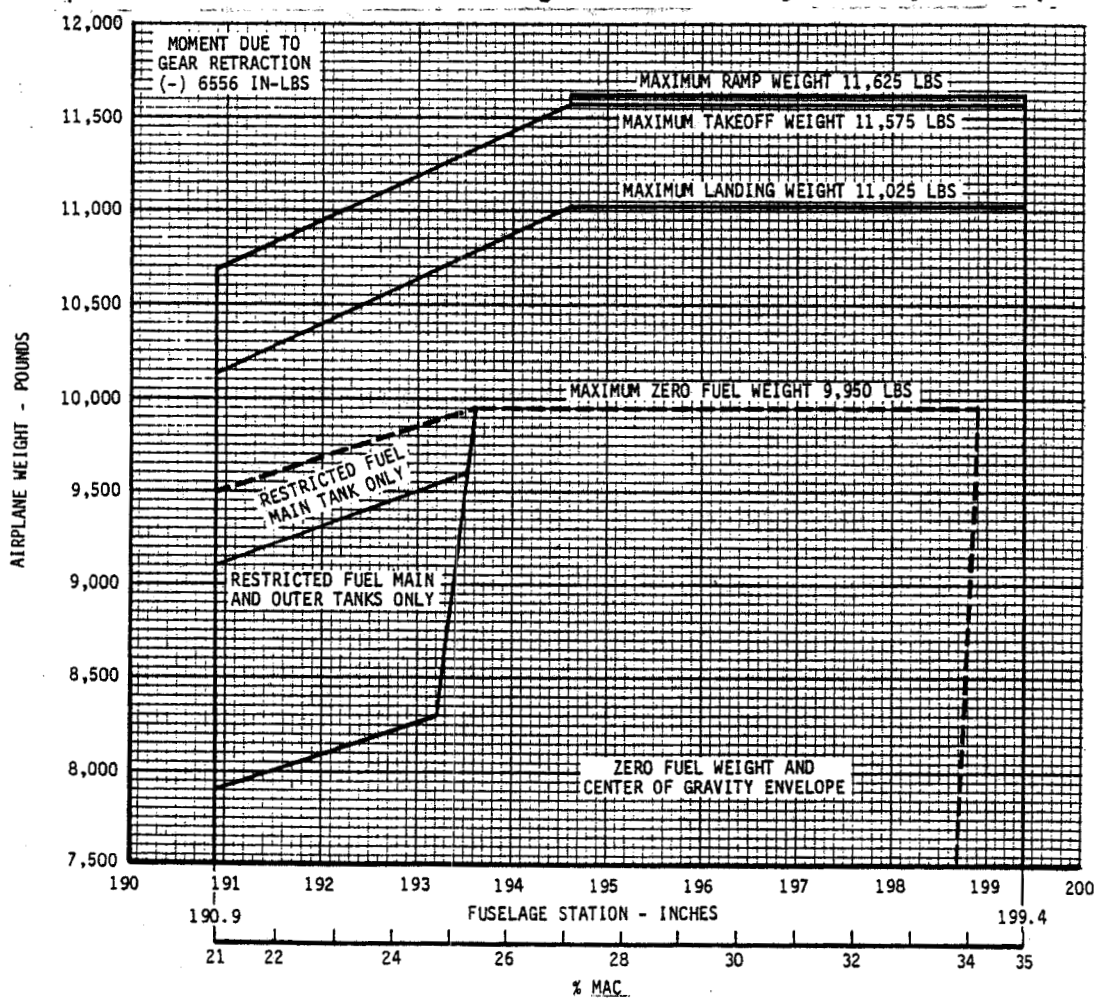
Maximum Loading Weight	600 lbs.	(272 Kg)
Floor Strength	75 lbs/sq. ft.	(366 Kg/sq.m.)

NUMBER OF SEATS

11 seats maximum with one oxygen outlet per seat.

CENTER OF GRAVITY/LOADING LIMITS

Refer to Section 7, Weight & Balance, for detailed procedures to comply with the center of gravity and weight distribution limits. Airplane loading, exclusive of fuel (ZFW), must remain within the Zero Fuel Weight Envelope. **The order of fuel loading must be Mains, Outers, and Tips.**



Datum: 6.69 inches (170 mm) aft of the nose or 220.67 inches (5605 mm) forward from front plane of wing rear spar-fuselage connection frame.

MAC : Length is 60.55 inches (1538 mm)
(Leading edge of MAC is at +178.23 inches [4527 mm])

POWER PLANT LIMITATIONS

Engine ..... 2 AiResearch TPE 331-10-501M (S/N 700SA, 731SA thru 799SA, 1501SA thru 1553SA, 1555SA thru 1562SA not modified by SR038/76-001 and Garrett SB TPE 331-72-0389)

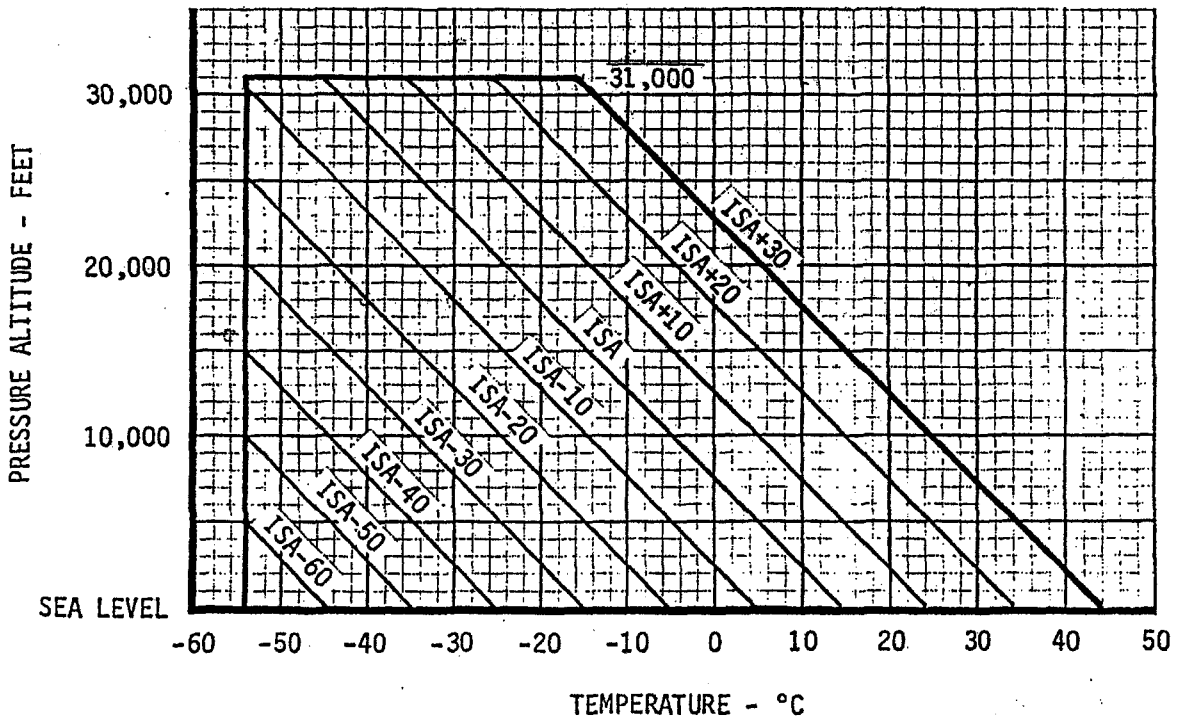
2 AiResearch TPE 331-10-511M (S/N 1554SA, 1563SA and subsequent, and aircraft in compliance with SR038/76-001 and Garrett SB TPE 331-72-0389)

Propeller : 2 Hartzell Propeller Assemblies comprised of the following hub and blade combinations.

R HC-B4TN-5DL/LT10282NSB-5.3R
R HC-B4TN-5DL/LT10282NSK-5.3R
R HC-B4TN-5GL/LT10282NSB-5.3R
R HC-B4TN-5GL/LT10282NSK-5.3R
R HC-B4TN-5JL/LT10282NSB-5.3R
R HC-B4TN-5JL/LT10282NSK-5.3R

4 Blades, 98 inch diameter, constant speed, full feathering, reverse pitch propeller.

POWER PLANT OPERATIONAL ENVELOPE

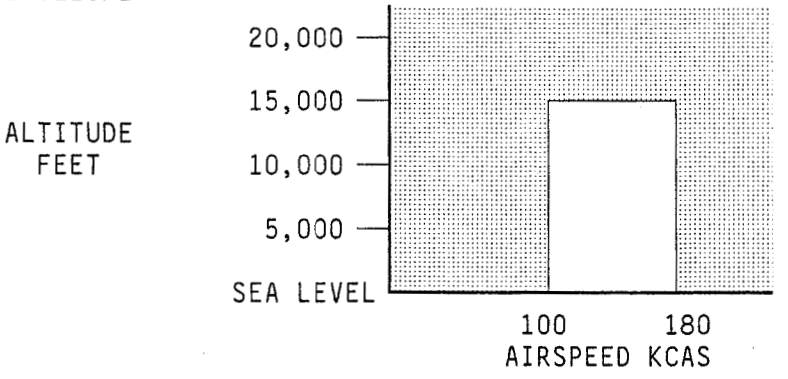


POWER PLANT LIMITATIONS (CONT)

AMBIENT TEMPERATURE LIMITS
Start - Maximum: ISA +30°C
Minimum: -40°C (other approved fuel types except Jet A-1)
Minimum: -28.9°C (Jet A-1)

EXHAUST GAS TEMPERATURE LIMITS (Single Red Line System)
Takeoff Power ..... 650°C
Maximum Continuous Power
(100% RPM) ..... 650°C
Starting ..... 770°C

AIRSTART ENVELOPE



ENGINE SPEED LIMITS (% RPM)
Takeoff Power 100%
Maximum Continuous Power 100%
Cruise Power ..... 96% minimum
ABSOLUTE MAXIMUM ..... 106% (5 seconds)
105.5% (30 seconds)
101% (no limit)

WINDMILLING RPM LIMITS (% RPM)
28% to 100% ..... 1 minute maximum
18% to 28% ..... Do not allow operation in this range.
10% to 18% ..... 5 minutes maximum
5% to 10% ..... 30 minutes maximum
0% to 5% ..... Continuous (no limits)
Do not allow windmilling in a reverse direction.

OUTPUT TORQUE LIMITS (% torque)
Takeoff Power 100%
Maximum Continuous Power 100%
Cruise Power 100%

R Positioning of power levers below the flight idle stop while the airplane
R is in flight is prohibited. Such positioning may lead to loss of airplane
R control or may result in an overspeed condition and consequent loss of
R engine power.

OIL SYSTEM

APPROVED OILS

R Oil brands and trade names conforming to MIL-L-23699 are approved
R lubricants. (See Allied Signal Aerospace Company Service Information Letter SIL P331-2 latest revision.)

CAUTION

DO NOT MIX TYPES OR BRANDS OF OILS.

OIL PRESSURE

Minimum	40 psi
Maximum	120 psi

OIL TEMPERATURE

Minimum	-40°C
Maximum	127°C (5 minutes limit for takeoff, climb, and approach) 127°C (Ground Operation) 110°C (all other operations)

FUEL SYSTEM

TYPES AND ADDITIVES

Engine operation is approved with the following aviation turbine fuels: ASTM Designation D1655-68T, Types Jet A, A-1, and B; military aviation turbine fuel MIL-T-5624G-1, Grades JP-4 and JP-5; MIL-F-5616-1, Grade JP-1; MIL-F-46005A(MR)-1, Types I and II and fuel D.ENG. R.D. 2482 Issue 2, 2486 Issue 2, and 2494 Issue 4.

Aviation gasoline MIL-G-5572D, Grade 80/87, not in excess of 1,000 gallons per 100 hours of operation, may be used for emergency fuel operation.

Fuels not containing anti-icing inhibitors must have MIL-I-27686E Fuel System Icing Inhibitor added in amounts of not less than 0.06% or more than 0.15% by volume. (See Normal Procedures, Section 5, Blending Anti-Ice Additive to Fuel.)

Aviation gasoline, Grade 100/130 low lead, not in excess of 250 gallons per 100 hours of operation, may be used for emergency fuel operation. Total usage must be limited to 7,000 gallons during any overhaul period.

If combinations of the above aviation gasoline are used, the following formula is required for establishing portions of combinations during any overhaul period.

$$\frac{\text{Amount of Grade 100/130 (GAL)}}{\text{7,000 (GAL)}} + \frac{\text{Amount of Grade 80/87 (GAL)}}{\text{30,000 (GAL)}} \leq 1$$

FUEL SYSTEM (CONT)

TYPES AND ADDITIVES (CONT)
If 25% or more Avgas is used at any time, one quart of aviation grade oil (as specified for the engine by latest revision to Garrett SIL P-331-2) must be added to the mixture per 100 gallons of Avgas.

CAUTION

OPERATIONS ABOVE 10,000 FEET PRESSURE ALTITUDE WHEN USING AVIATION GASOLINE ARE PROHIBITED.

Shell ASA-3 anti-static additive, or equivalent, may be added in amounts to bring the fuel up to 300 conductivity units, but in no event shall the additive exceed 1 ppm (parts per million).

CAPACITIES

		Maximum Capacity lbs*	Maximum Capacity US Gal	Usable Capacity lbs*	Usable Capacity US Gal
Center Wing Main Tank		1,065	159.0	1,032	154.0
Outer Wing Tank	L	235	35.0	231	34.5
	R	235	35.0	231	34.5
Tip Tank	L	623	93.0	603	90.0
	R	623	93.0	603	90.0

*Fuel Weight based on 6.7 pounds per U.S. gal.

FUEL PRESSURE LIMITS
Minimum ..... 15 psi
Maximum ..... 90 psi

STARTER/GENERATOR LIMITS

Maximum continuous load for each generator:
SEA LEVEL TO 28,000 feet
pressure altitude ..... 200 AMPS
28,000 TO 31,000 feet
pressure altitude ..... 175 AMPS

Starter Duty Cycle for Battery or APU Start : 30 Seconds ON - 1 minute OFF
: 30 Seconds ON - 1 minute OFF
: 30 Seconds ON - 30 minutes OFF

CABIN PRESSURIZATION SYSTEM

Maximum Differential Pressure ..... 6.10 PSI

AIRSPEED LIMITATIONS (KCAS) (M)

V_{MO} (Maximum operation limit) ..... 250 (Sea level to 21,300 feet pressure altitude)
M_{MO} (Maximum operating Mach number) ..... 0.57 (Above 21,300 feet pressure altitude)
V_A (Maneuvering) 191
V_{FO} (Flap operating)
Up to 5° 175
5° to 20° 155
20° to 40° 120
V_{FE} (Flap extended)
5° 175
20° , 40° 155
V_{LO} (Landing gear operating) 175
V_{LE} (Landing gear extended) 175
V_{LLO} (Landing Light operating) 175
V_{TIRE} ..... 139 (True speed on the ground)
V_{WW} (Windshield Wiper operating) 175
V_{MC} (Minimum control Flaps 5°) 99
(Flaps 20°) 99

MANEUVERING LOAD FACTORS

Maximum Positive : 3.28 (Flaps Up)
2.0 (Flaps Down)
Maximum Negative : -1.31 (Flaps Up)

MINIMUM CREW

1 (Pilot)

For flight into known or forecasted icing conditions, the pilot-in-command must have satisfied the training
R requirements specified in FAA AD No. 2003-22-07 latest revision.

TYPES OF OPERATION/REQUIRED EQUIPMENT LIST

This is a normal category airplane approved for day/night, VFR/IFR and known icing conditions when properly equipped for the intended flight. The operator of the airplane is responsible for ensuring that the proper equipment is installed, approved and operational, for the intended flight, in order to comply with Federal Aviation Regulations (FAR) Part 91.

The following listed equipment is required to be installed, approved, properly maintained, and operable for the indicated type of flight. The listed equipment is not applicable for airplanes which are to be operated under FAR Part 135. Airplanes to be operated under Part 135 should refer to the Master Minimum Equipment List developed by the FAA Flight Operations Evaluation Board.

TYPES OF OPERATION / REQUIRED EQUIPMENT LIST (CONT)

DAY VFR
1. Airspeed indicator
2. Altimeter
3. Magnetic direction indicator
4. Tachometer - each engine
5. Torquemeter - each engine
6. Exhaust gas temperature indicator - each engine
7. Single Red Line System - each engine
8. Oil pressure indicator - each engine
9. Oil temperature indicator - each engine
10. Fuel pressure indicator - each engine
11. Fuel quantity indicators
12. Landing gear position indicator
13. Approved seat belt for each seat
14. Emergency locator transmitter - if required by the operating rules
15. Above 12,500 feet - transponder with automatic altitude reporting capability if required by the operating rules
16. Airplane Flight Manual

NIGHT VFR
1. All equipment required for DAY VFR
2. Position lights
3. Anti-collision lights
4. Instrument lights
5. Landing lights - if operated for hire
6. Adequate source of electrical energy for all installed electrical and radio equipment
7. One spare set of fuses or three spare fuses of each kind required

DAY IFR
1. All equipment required for DAY VFR
2. Two way radio and navigational equipment appropriate to ground facilities to be used
3. Gyroscopic rate of turn indicator
4. Bank indicator
5. Sensitive altimeter - adjustable for barometric pressure
6. Clock with sweep second hand or Digital Clock (Hrs-Mins-Secs)
7. Generator - each engine
8. Gyroscopic bank and pitch indicator
9. Gyroscopic direction indicator
10. Free air temperature indicator

NIGHT IFR
1. All equipment required for NIGHT VFR
2. All equipment required for DAY IFR

CABIN PRESSURE ALTITUDE ABOVE 15,000 FEET PRESSURE ALTITUDE
1. Supplemental oxygen system
2. Oxygen mask available for each crew member and passenger

TYPES OF OPERATION/REQUIRED EQUIPMENT LIST (CONT)

FLIGHT ABOVE 25,000 FEET PRESSURE ALTITUDE

1. Supplemental Oxygen system
2. Oxygen mask available for each crew member and passenger with one crew mask plugged in and readily accessible

ICING CONDITIONS

1. Wing deicing
2. Propeller anti-icing
3. Engine air intake anti-icing
4. Oil cooler air intake anti-icing
5. Static and pitot anti-icing
6. Stall warning anti-icing
7. Heated windshield anti-icing
8. AOA probe (if installed) anti-icing

R **PNEUMATIC DEICING BOOTS OPERATIONS**

R Wing and Tail Leading Edge Pneumatic Deicing Boots System must be activated:

R - At the first sign of ice formation anywhere on the aircraft, or upon annunciation from an ice detector system, whichever occurs first; and
R - The system must either be continued to be operated in the automatic cycling mode, or the system must be manually cycled as needed to minimize the ice accretions on the airframe.

R The wing and tail leading edge pneumatic deicing boots system may be deactivated only after leaving icing conditions and after the airplane is determined to be clear of ice.

ICING LIMITATIONS

Minimum airspeed for sustained level flight in icing conditions ..... 180 KIAS

Sustained flight in icing conditions with flaps extended is prohibited except for approach and landing.

WARNING

SEVERE ICING MAY RESULT FROM ENVIRONMENTAL CONDITIONS OUTSIDE OF THOSE FOR WHICH THE AIRPLANE IS CERTIFICATED. FLIGHT IN FREEZING RAIN, FREEZING DRIZZLE, OR MIXED ICING CONDITIONS (SUPERCOOLED LIQUID WATER AND ICE CRYSTALS) MAY RESULT IN ICE BUILD-UP ON PROTECTED SURFACES EXCEEDING THE CAPABILITY OF THE ICE PROTECTION SYSTEM, OR MAY RESULT IN ICE FORMING AFT OF THE PROTECTED SURFACES.

ICING LIMITATIONS (CONT)

THIS ICE MAY NOT BE SHED USING THE ICE PROTECTION SYSTEMS, AND MAY SERIOUSLY DEGRADE THE PERFORMANCE AND CONTROLLABILITY OF THE AIRPLANE. IN SOME CASES THE ICE MAY APPEAR TO BE OF RELATIVELY SMALL PROPORTIONS. OFTEN THE APPEARANCE OF THE ICE CAUSING THE MOST SEVERE CONSEQUENCES IS GLAZE ICE OR A COMBINATION OF GLAZE ICE AND RIME ICE.

DURING FLIGHT, SEVERE ICING CONDITIONS THAT EXCEED THOSE FOR WHICH THE AIRPLANE IS CERTIFICATED SHALL BE DETERMINED BY THE FOLLOWING VISUAL CUES. IF ONE OR MORE OF THESE VISUAL CUES EXIST, IMMEDIATELY REQUEST PRIORITY HANDLING FROM AIR TRAFFIC CONTROL TO FACILITATE A ROUTE OR AN ALTITUDE CHANGE TO EXIT THE ICING CONDITIONS.

1. **AIRSPEED LOSSES GREATER THAN 20 KIAS THAT ARE NOT REGAINED AFTER A BOOT DEICE CYCLE.**
2. **DECREASE IN RATE OF CLIMB DURING A CONSTANT AIRSPEED CLIMB TO 300FT/MIN.**
3. **UNUSUALLY EXTENSIVE ICE ACCRETED ON THE AIRFRAME IN AREAS NOT NORMALLY OBSERVED TO COLLECT ICE. (E.G., LARGE GRANULAR ICE BUILD-UP ON THE WINDSHIELD AND ICE ACCUMULATING AROUND THE WELD LINE ON THE TIP TANKS.)**
4. **ACCUMULATION OF ICE ON THE LOWER SURFACE OF THE WING AFT OF THE PROTECTED AREA.**
5. **ACCUMULATION OF ICE ON THE PROPELLER SPINNER FARTHER AFT THAN NORMALLY OBSERVED.**
6. **ACCUMULATION OF ICE ON THE UPPER SURFACE OF THE WING AFT OF THE DEICING BOOTS VISIBLE FROM THE PILOT'S POSITION THAT IS NOT REMOVED BY DEICE BOOT OPERATION.**

NOTE

Ice accretion beyond the limit of the boots on the upper surface may be visible from the pilot's position as a solid or partial ridge of ice.

SINCE THE AUTOPILOT MAY MASK TACTILE CUES THAT INDICATE ADVERSE CHANGES IN HANDLING CHARACTERISTICS, USE OF THE AUTOPILOT IS PROHIBITED WHEN ANY OF THE VISUAL CUES SPECIFIED ABOVE EXIST, OR WHEN UNUSUAL LATERAL OR LATERAL/YAW TRIM REQUIREMENTS ARE ENCOUNTERED WHILE THE AIRPLANE IS IN ICING CONDITIONS.

All icing detection lights (tip tank taxi lights, if installed, and wing ice detection light) must be operable prior to flight into known or forecast icing conditions at night.

TAKEOFF AND LANDING OPERATIONS

Ambient Temperatures ..... Maximum ISA +30°C
Minimum -54°C

Airport Elevation ..... 8,000 feet pressure altitude

Windshield HI HEAT operation prohibited during takeoff or landing

ENGINE SYNCHROPHASER - OFF for Takeoff, Approach, Landing, and Single Engine Operation

PROPELLER FEATHER VALVE AND NTS SYSTEM
Prior to the first flight of the day and before every flight during which an intentional engine shutdown is planned, the feather valve and negative torque sensor (NTS) check (detailed in Section 5, Normal Procedures) must be performed. These checks must also be performed before the first flight after the feathering linkage is adjusted and/or after any maintenance of the feathering system is performed.

TAKEOFF
Demonstrated Crosswind Takeoff ..... 22 KTS

R All anti-ice systems must be ON prior to takeoff in visible moisture if OAT is +10°C or colder.

Air Conditioning and Pressurization ..... OFF (Performance Section 6 is predicated on no bleed air losses)

SRL system must be operative.

If **Battery Temp 120°** annunciator illuminates ..... Takeoff Prohibited

LANDING
Demonstrated Crosswind Landing ..... 18 KTS

Maximum Tip Tank fuel quantity each tank ..... 400 pounds

Maximum Demonstrated Fuel Unbalance ..... 150 pounds
(Tip Tank and Outer Tank combined)

ENROUTE OPERATIONS

Maximum Operating Altitude ..... 31,000 feet
Outer fuel tanks must not be used during descent

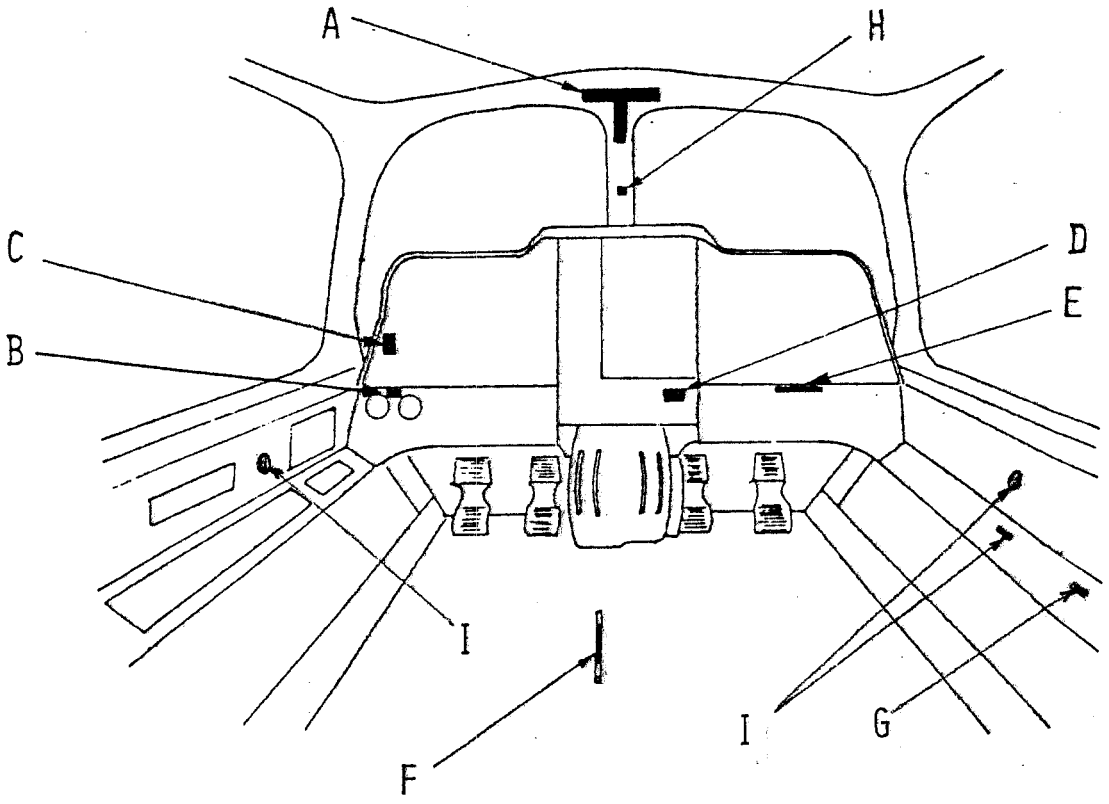
INSTRUMENT MARKINGS

	INSTRUMENT	COLOR & MARKING	RANGE	SIGNIFICANCE
	TORQUEMETER (% Tq)	Green Arc	0 to 100	Normal Operation
		Red Line	100	Maximum Limit
R	TACHOMETER	Red Arc	50 to 76.5	Transient Zone, Start Only
R	(% RPM)	Yellow Arc	76.5 to 96	Caution-BETA RANGE
		Green Arc	96 to 100	Normal Flight Operation
R		White Arc	76.5 to 101	Normal Ground Operation
		Yellow Arc	100 to 101	Caution Zone
		Red Line	101	Maximum Limit
	EXHAUST GAS TEMPERATURE (°C)	Green Arc	0 to 650	Normal Operation
		Red Line	650	Takeoff & Maximum Continuous Limit
		White(▽) Triangle	770	Maximum Starting Limit
	OIL TEMPERATURE (°C)	Red Line	-40	Minimum Limit
		Yellow Arc	-40 to 55	Caution-DO NOT EXCEED 78.5% RPM
R		Green Arc	55 to 110	Normal Operation
		Yellow Arc	110 to 127	Caution Zone, 5 minutes Maximum at 127 for takeoff, climb, and approach
		Red Line	127	Maximum Limit
	OIL PRESSURE (PSI)	Red Line	40	Minimum Limit
		Yellow Arc	40 to 70	Caution-Ground Operation
		Green Arc	70 to 120	Normal Operation
		Red Line	120	Maximum Limit
	FUEL PRESSURE (PSI)	Red Line	15	Minimum Limit
		Yellow Arc	15 to 20	Caution-Ground Operation
		Green Arc	20 to 80	Normal Operation
		Yellow Arc	80 to 90	Caution-MONITOR
		Red Line	90	Maximum Limit

INSTRUMENT MARKINGS (CONT)

INSTRUMENT	COLOR & MARKING	RANGE	SIGNIFICANCE
AMMETER	Green Arc Yellow Arc Red Line	0 to 175 175 to 200 200	Normal Operation Caution-MONITOR Maximum Limit
BATTERY TEMP (°F)	Green Band Yellow Band Red Band	0 to 120 120 to 150 150 to 190	Normal Operation Caution-MONITOR Overtemp-Requires Bench Test
VACUUM GAUGE (IN-HG)	Red Line Green Arc	4.0 4.2 to 5.0	Minimum Limit Normal Operation
CABIN ALTITUDE DIFFERENTIAL PRESSURE (PSI)	Green Arc Red/Black Line	0 to 6.00 6.10	Normal Operation Maximum Limit
AIRSPEED INDICATOR (KTS)	Red Line White Arc Blue Line Green Arc Red Line	99 81 to 120 152 106 to 250 250	Air Minimum Control Speed Full Flap Operating Range Single Engine Best Rate of Climb (Sea Level, Maximum Takeoff Weight) Normal Operation Maximum Limit Operating Speed
MACH NEEDLE	Red/White	.57 Mmo	Maximum Limit Operating Mach

FLIGHT COMPARTMENT PLACARDS & MARKINGS



THIS AIRPLANE MUST BE OPERATED AS A NORMAL CATEGORY AIRPLANE IN COMPLIANCE WITH THE OPERATING LIMITATIONS STATED IN THE FAA APPROVED AIRPLANE FLIGHT MANUAL.

TYPES OF OPERATION

VFR, IFR, DAY, NIGHT, ICING CONDITIONS. NO ACROBATIC MANEUVERS, INCLUDING SPINS ARE APPROVED.

MU-2B-60

SPEED LIMITATIONS

		FLAPS		CROSSWIND	
LDG NORM	175	0° - 5°	175	TAKEOFF	22
LDG EMER	130	5° - 20°	155	LANDING	18
LND LIGHT	175	20° - 40°	120		
MANEUVER	191	EXTD 5°	175		
MIN CONTROL	99	EXTD 20° or 40°	155		

ROTATION
FLAPS 5°...100-109
FLAPS 20°..100-105
BEST RATE OF CLIMB
TWO-ENG
FLAPS 5°...129-134
FLAPS 20°..129-134
ONE ENG
FLAPS 0°...140-152
APPROACH
FLAPS 20°...99-110
FLAPS 40°..105-119

NOTE:
TURN OFF STROBE LIGHTS WHEN TAXIING IN VICINITY OF OTHER AIRCRAFT, OR DURING FLIGHT THROUGH CLOUDS, FOG, OR HAZE.

FOR ALTERNATE STATIC SOURCE DATA SEE AFM

DETAIL "A"

FLIGHT COMPARTMENT PLACARDS & MARKINGS (CONT)

SEA LEVEL TO 28,000 FT - 200 AMPS

28,000 FT TO 31,000 FT - 175 AMPS

MAX CONT LOAD

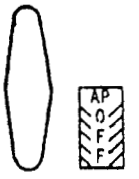
DETAIL B

ALTERNATE
STATIC SOURCE

NORMAL
STATIC SOURCE

S/N 700SA, 731SA - 747SA, 749SA - 757SA, 759SA - 778SA

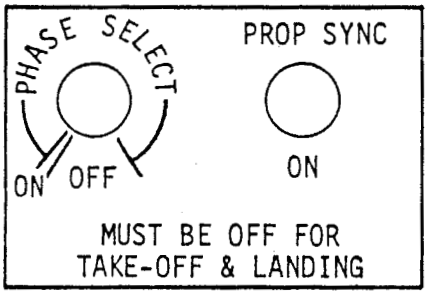
ALTERNATE
STATIC SOURCE



NORMAL
STATIC SOURCE

S/N 748SA, 758SA, 779SA and Subsequent

DETAIL C



DETAIL D

DEPRESSURIZE CABIN BEFORE LANDING

DETAIL E

LDG. GEAR EMER. HANDLE - PULL AND PUMP | MAX. OPER. AIRSPEED - 130 KTS

DETAIL F

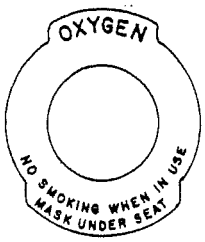
PORTABLE
FIRE EXT

DETAIL G

CAUTION
READ COMPASS WITH
WINDSHIELD HEAT OFF

DETAIL H

FLIGHT COMPARTMENT PLACARDS & MARKINGS (CONT)



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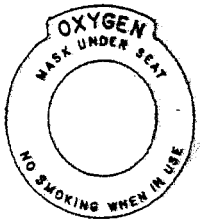


OXYGEN MASK UNDER SEAT
NO SMOKING WHILE IN USE

S/N 700SA, 731SA - 799SA
1501SA - 1553SA, 1555SA -
1561SA

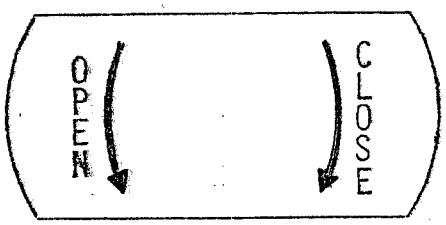
OXYGEN MASK ON SEAT BACK
NO SMOKING WHILE IN USE

S/N 1554SA, 1562SA, and
Subsequent

DETAIL 'I'

MISCELLANEOUS PLACARDS & MARKINGS

ON ENTRANCE DOOR



BAGGAGE AREA

Near Coat Hanger

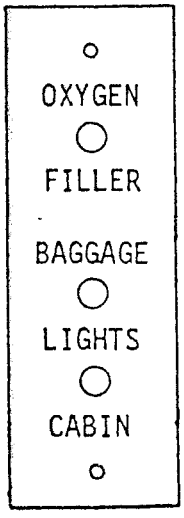
MAX CAPACITY
EACH HANGAR 50 LBS

Baggage Area Cabinet

MAX. CAPACITY BEHIND
NET IS 330 LBS

MAX. CAPACITY
THIS CABINET 25 LBS

FIRST AID KIT
INSIDE



MISCELLANEOUS PLACARDS & MARKINGS (CONT)

PASSENGER COMPARTMENT - VISIBLE FROM SEATS

NOTE

Due to various passenger compartment arrangements and furnishings which may be installed, certain placards and markings that follow may not be applicable or required.

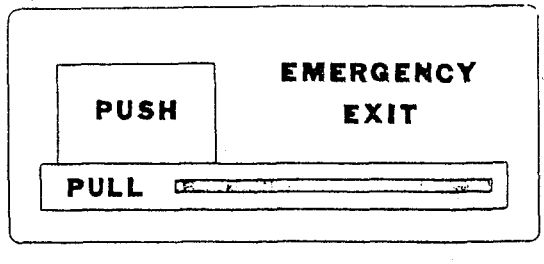
INSTALL HEADRESTS (LARGE HEADREST ON AFT FACING SEATS ONLY) & PLACE SEATS IN UPRIGHT POSITION FOR TAKE-OFF AND LANDING

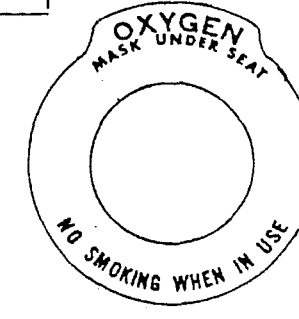
INSTALL HEADREST (LARGE HEADREST ON AFT FACING SEAT ONLY) - PLACE SEAT IN UPRIGHT POSITION & STOW ARMREST FOR TAKE-OFF AND LANDING

SEAT MUST BE IN UPRIGHT POSITION DURING TAKE-OFF & LANDING

OPEN BULKHEAD AND FASTEN STRAP BEFORE TAKE-OFF AND LANDING

INSTALLATION OF TWO-PLACE COUCH IN THIS LOCATION IS NOT APPROVED WHEN DIRECTLY ACROSS FROM EXISTING TWO PLACE COUCH





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STOW LEAF DURING TAKE-OFF AND LANDING

Table Cover

COVER TO BE IN PLACE DURING TAKE-OFF & LANDING

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PASSENGER COMPARTMENT (CONT)

Cabinets

NOTE

The "X" indicates weight limit on the following placards and marking which may vary depending upon the structural limitation of the cabinet design.

MAX. CAPACITY "X" LBS

MAX. CAPACITY THIS CABINET "X" LBS

MAX. CAPACITY
THIS CABINET "X" LBS

"X" LBS MAX.

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ENGINE FAILURE

ENGINE FAILURE DURING TAKEOFF PRIOR TO LIFTOFF

1. Power Levers ..... GROUND IDLE (REVERSE AS REQUIRED)
2. Brakes..... AS NECESSARY
3. Reverse Thrust ..... AS REQUIRED TO MAINTAIN DIRECTIONAL CONTROL

CAUTION

ON OTHER THAN DRY, HARD SURFACE RUNWAYS, IT IS POSSIBLE TO APPLY MORE REVERSE THRUST THAN CAN BE COUNTERACTED BY RUDDER, BRAKES, AND NOSEWHEEL STEERING.

ENGINE FAILURE AFTER LIFTOFF - GEAR DOWN OR IN TRANSIT TO UP

If the engine failure occurs after liftoff but before the landing gear cycle is fully complete (gear UP, doors CLOSED) and continued flight is not possible

1. Landing Gear ..... DOWN
2. Operating Engine ..... POWER AS REQUIRED
3. Flaps ..... LEAVE IN SELECTED TAKEOFF POSITION
4. Land straight ahead using airspeed appropriate for the airplane weight, but not less than 105 KCAS

WARNING

IF FLAPS 20° TAKEOFF IS SELECTED AND ENGINE FAILURE OCCURS AFTER LIFTOFF, CONTINUED CLIMB PERFORMANCE IS NOT ASSURED UNLESS THE LANDING GEAR HAS COMPLETELY RETRACTED, THE GEAR DOORS ARE CLOSED, AND THE FLAPS ARE AT 5° OR LESS.

ENGINE FAILURE IN TAKEOFF CLIMB - GEAR FULLY RETRACTED

1. Airspeed ..... 140 KCAS MINIMUM
2. Flaps ..... 5°
3. Failed Engine Condition Lever. EMERGENCY STOP
4. Failed Engine Power Lever .... TAKEOFF

WARNING

IDENTIFY FAILED ENGINE BY POWER ASYMMETRY AND ENGINE INSTRUMENTS. DO NOT RETARD FAILED ENGINE POWER LEVER. PLACE FAILED ENGINE POWER LEVER TO TAKEOFF POSITION DURING FEATHERING OF PROPELLER AND LEAVE THERE FOR THE REMAINDER OF THE FLIGHT.

CAUTION

RUN-CRANK-STOP SWITCH MUST REMAIN IN RUN POSITION.

ENGINE FAILURE (CONT)

ENGINE FAILURE IN TAKEOFF CLIMB - GEAR FULLY RETRACTED (CONT)

5. Flaps ..... UP
6. Airspeed ..... 150 KCAS
7. Operating Engine Power ..... AS REQUIRED

WARNING

AIR CONDITIONING AND PRESSURIZATION SYSTEM MUST REMAIN OFF TO ATTAIN FULL CLIMB CAPABILITY.

8. Engine Shutdown Procedure .... COMPLETE

NOTE

Single engine climb rates are best attained with wings level by use of rudder to correct for yawing tendency and using the minimum amount of spoiler necessary to maintain lateral control.

FLAP SETTING	V_{XSE}(KCAS)	V_{YSE}(KCAS)
0° (Up)	140	150 *
5°	130	140
20°	125	135

*V_{YSE}, Maximum Takeoff Gross Weight, Sea Level Standard day, Flaps 0° is 152 KCAS. 150 KCAS is recommended for all weights.

LH OR RH **BETA RANGE** ANNUNCIATOR ILLUMINATED IN FLIGHT

Should either **BETA RANGE** annunciator illuminate in flight in other than a full stall condition and no control problem is present in rpm or yaw:

1. Affected Engine ..... SECURE PRIOR TO LANDING (USE ENGINE SHUTDOWN PROCEDURE)

or

If airplane control or rpm problem exists:

1. Affected Engine ..... SECURE IMMEDIATELY (USE ENGINE SHUTDOWN PROCEDURE)
2. Land ..... USE SINGLE ENGINE LANDING PROCEDURES

CAUTION

ILLUMINATION OF EITHER **BETA RANGE** ANNUNCIATOR IN FLIGHT MAY BE AN INDICATION OF A PROPELLER CONTROL MALFUNCTION. IT MAY BE IMPOSSIBLE TO REDUCE THRUST ON THE AFFECTED ENGINE DURING LANDING OR AFTER TOUCHDOWN.

ENGINE FAILURE (CONT)

AUTO-IGNITION RELIGHT FAILURE (Applicable to airplanes equipped with Auto-Ignition System)

R Ignition Annunciator Light illuminates with Auto-Ignition selected, engine fails to accelerate properly:

R
R
1. Failed Engine ITT and RPM ..... CHECK
(If ITT increases toward red line and RPM is not increasing normally)
2. Failed Engine Condition Lever ... EMERGENCY STOP
3. Failed Engine Power Lever ..... TAKEOFF

4. Engine Shutdown Procedure ..... COMPLETE

R
R
R
R
R
R

CAUTION

IF ACTUATION OF THE AUTO-IGNITION WAS DUE TO ICE INGESTION, ENSURE THAT APPROPRIATE PROCEDURES ARE EXECUTED FOR FLIGHT IN ICING CONDITIONS.

ENGINE SHUTDOWN PROCEDURE

If engine failure occurs, or if a sudden loss or significant fluctuation (± 7.5%) of indicated torque pressure occurs, as indicated by airplane yaw, promptly shutdown the affected engine and determine the cause prior to further operation.

1. Failed Engine Condition Lever ... EMERGENCY STOP
2. Failed Engine Power Lever ..... TAKEOFF

WARNING

IDENTIFY FAILED ENGINE BY POWER ASYMMETRY AND ENGINE INSTRUMENTS. DO NOT RETARD FAILED ENGINE POWER LEVER. PLACE FAILED ENGINE POWER LEVER TO TAKEOFF POSITION DURING THE FEATHERING OF PROPELLER AND LEAVE THERE FOR THE REMAINDER OF THE FLIGHT.

CAUTION

RUN-CRANK-STOP SWITCH MUST REMAIN IN RUN POSITION.

3. Trim ..... SET
4. Power ..... AS REQUIRED
5. Failed Engine DC Generator Switch ..... OFF

ENGINE FAILURE (CONT)

R ENGINE SHUTDOWN PROCEDURE (CONT)

6. Ignition Switch ..... OFF (Affected engine)
7. Air Conditioning and Pressurization System ..... SELECT OPERATING ENGINE BLEED AIR OR RAM AIR (IF THRUST CRITICAL)

NOTE

Ram Air Position will depressurize Cabin. Oxygen may be required.

8. Operating Engine Power Lever .... SET AS REQUIRED
9. Operating Engine DC Generator Load ..... REDUCE TO ESSENTIAL ITEMS
10. Synchrophaser ..... OFF

DRIFTDOWN PROCEDURE

Following an engine failure at altitudes above 25,000 feet pressure altitude:

1. Failed Engine ..... SECURE (USE ENGINE SHUTDOWN PROCEDURE)
2. Operating Engine Power Setting .. AS REQUIRED
3. Pressurization System ..... SELECT OPERATING ENGINE BLEED AIR

NOTE

For prolonged descent above 25,000 feet pressure altitude, it may be necessary to utilize oxygen. Observe cabin altitude warning light. Recommended airspeed for prolonged descent is 135 KCAS with operating engine at maximum continuous power setting.

SINGLE ENGINE LANDING

CAUTION

THE USE OF 40° FLAPS WITH AN ENGINE INOPERATIVE IS NOT RECOMMENDED. ALWAYS MAINTAIN AIRSPEED ABOVE V_{XSE} FOR FLAP SETTING BEING USED UNTIL LANDING IS ASSURED.

Before Landing Checklist - Use normal procedures except as follows:

1. Inoperative Engine ..... SECURED (USE ENGINE SHUTDOWN PROCEDURE)
2. Fuel Quantity and Balance ..... CHECK WITHIN LIMITATIONS
3. Cabin Air Selector Switch ..... OFF OR RAM
4. Condition Lever (Operating Engine) ..... TAKEOFF LAND

SINGLE ENGINE LANDING (CONT)

5.	Power Lever (Operating Engine) ..	SET AS REQUIRED TO MAINTAIN AIRSPEED AND DESIRED FLIGHT PATH
6.	Landing Gear	UP
7.	Flaps	UP (V_{XSE} = 140 KCAS)
8.	Airspeed	150 KCAS

Beginning final approach descent or base leg: (approximately 1,000 feet agl)

9.	Flaps	5° (V_{XSE} = 130 KCAS)
10.	Airspeed	140 KCAS
11.	Landing Gear	DOWN
12.	Power Lever (Operating Engine) ..	AS REQUIRED TO MAINTAIN AIRSPEED AND DESIRED FLIGHT PATH

When Landing is assured:

13.	Flaps	20° (V_{XSE} = 125 KCAS)
14.	Airspeed	110 KCAS WHEN OVER RUNWAY

WARNING

DO NOT ATTEMPT A GO AROUND BELOW 400 FEET AGL OR AFTER 20° OF FLAPS ARE SELECTED.

CAUTION

UP TO 10% ADDITIONAL RUNWAY MAY BE REQUIRED USING THIS PROCEDURE WHEN COMPARED TO THE NORMAL TWO ENGINE LANDING DISTANCE.

After touchdown:

15.	Reverse Thrust	AS REQUIRED TO MAINTAIN DIRECTIONAL CONTROL

CAUTION

ON OTHER THAN DRY, HARD SURFACE RUNWAYS, IT IS POSSIBLE TO APPLY MORE REVERSE THRUST THAN CAN BE COUNTERACTED BY RUDDER, BRAKES, AND NOSEWHEEL STEERING.

SINGLE ENGINE GO AROUND

WARNING

UNDER CERTAIN COMBINATIONS OF WEIGHT, TEMPERATURE, AND PRESSURE ALTITUDES, WITH LANDING GEAR DOWN AND FLAPS 20° , SINGLE ENGINE GO AROUND MAY NOT BE POSSIBLE AT ALTITUDES OF LESS THAN 400 FEET AGL. DURING TRANSITION FROM STEADY APPROACH (GEAR DOWN AND FLAPS 20°) TO ESTABLISHMENT OF POSITIVE CLIMB (GEAR UP, FLAPS UP) AN ALTITUDE LOSS WILL RESULT. A GO AROUND AFTER FLAPS ARE EXTENDED TO 20° SHOULD NOT BE ATTEMPTED. DO NOT SELECT 40° FLAPS UNTIL LANDING IS ASSURED. ALWAYS MAINTAIN AIRSPEED ABOVE V_{XSE} FOR FLAP SETTING BEING USED UNTIL LANDING IS ASSURED.

1. Condition Lever (Operating Engine) ..... TAKEOFF LAND
2. Power Lever (Operating Engine) .. SMOOTHLY APPLY POWER TOWARD TAKEOFF POWER WHILE MAINTAINING AIRPLANE CONTROL
3. Landing Gear ..... UP
4. Flaps ..... SET 5°
5. Airspeed ..... 140 KCAS
6. Flaps ..... UP (WHEN POSITIVE CLIMB ESTABLISHED)
7. Cabin Air Selector Switch ..... RAM OR OFF
8. Airspeed ..... 150 KCAS
9. Engine Anti-Ice Switch ..... AS REQUIRED

ENGINE FIRE

If LH or RH ENGINE Annunciator Illuminates:

Affected Engine

1. Condition Lever ..... EMERGENCY STOP
2. Power Lever ..... TAKEOFF

WARNING

IDENTIFY FAILED ENGINE BY POWER ASYMMETRY AND ENGINE INSTRUMENTS. DO NOT RETARD FAILED ENGINE POWER LEVER. PLACE FAILED ENGINE POWER LEVER TO TAKEOFF POSITION DURING THE FEATHERING OF PROPELLER AND LEAVE THERE FOR THE REMAINDER OF THE FLIGHT.

R ENGINE FIRE (CONT)

CAUTION

RUN-CRANK-STOP SWITCH MUST REMAIN IN RUN POSITION. DO NOT MOVE AFFECTED ENGINE POWER LEVER UNTIL PROPELLER IS FEATHERED.

3. Fire Handle ..... PULL
4. Main Fuel Valve Switch ..... CLOSED

5. DC Generator Switch ..... OFF (Affected engine)
6. Ignition Switch ..... OFF (Affected engine)
7. Air Conditioning and Pressurization System ..... SELECT OPERATING ENGINE BLEED AIR OR RAM AIR (IF THRUST IS CRITICAL)

NOTE

Ram air position will depressurize cabin. Oxygen may be required.

8. Land As Soon As Possible Utilizing Single Engine Landing Procedures. (EMERGENCY PROCEDURES)

AIRSTART

CAUTION

ENSURE ENGINE STOPPAGE WAS NOT THE RESULT OF MALFUNCTION WHICH MIGHT MAKE IT DANGEROUS TO ATTEMPT A RESTART.

1. Airspeed ..... 100 TO 180 KCAS (150 KCAS Recommended)
2. Altitude ..... BELOW 20,000 FEET PRESSURE ALTITUDE
3. SRL System ..... ON
4. Synchrophaser ..... OFF

NOTE

Engine will not airstart unless SRL is on and operable.

5. Exhaust Gas Temperature ..... BELOW 200°C (if feasible)
6. Condition Lever ..... MINIMUM CRUISE DETENT
7. Power Lever ..... ONE HALF INCH FORWARD OF FLIGHT IDLE
8. Start Selector Switch ..... AIR START AND SAFE
9. Ignition Switch ..... OFF
10. Run-Crank-Stop Switch ..... RUN

AIRSTART (CONT)

11. Unfeather Switch ..... PRESS AND HOLD TO 30% RPM MINIMUM
    a. At 10% RPM Engine Start
       Indicator Light ..... ILLUMINATES
    b. Exhaust Gas Temperature ..... MONITOR (Maximum 770°C)
    c. Within 15 seconds past 10% rpm
       or by 25% rpm ..... INDICATED COMBUSTION OR ABORT START (Place Condition Lever to EMERGENCY STOP)
    d. Above 25% rpm with Slow
       Acceleration ..... USE FUEL ENRICHMENT SWITCH
    e. If Acceleration stagnates and EGT continues to rise
       Condition Lever ..... EMERGENCY STOP

NOTE

If ABORT was caused by high EGT, reduce altitude and increase airspeed, if possible, before attempting a restart.

If ABORT was caused by no combustion, reduce altitude and reduce airspeed, if possible, before attempting a restart.

CAUTION

DO NOT ALLOW ENGINE TO WINDMILL IN THE 18% to 28% RPM RANGE.

12. Condition Lever ..... AS REQUIRED
13. Power Lever ..... AS REQUIRED
14. DC Generator Switch ..... ON/RESET IF NECESSARY
15. Ignition Switch ..... AUTO (Ignition Annunciator Light extinguished if Auto-Ignition System installed)
16. Air Conditioning and Pressurization System ..... BOTH

R R R

FUEL BOOST PUMP FAILURE

L or **R BOOST PUMP FAIL** Annunciator Illuminated:

1. FUEL BOOST PUMP Circuit Breaker (faulty side) ..... DISENGAGE
2. Land As Soon As Possible

NOTE

Main wing tank unusable fuel is 60 pounds with one boost pump failed.

SMOKE AND FUME ELIMINATION

CABIN OR COCKPIT SMOKE OR ODOR, KNOWN OR UNKNOWN SOURCE

1. Oxygen Outlet Valve ..... OPEN
2. Oxygen Masks ..... DON AND USE

KNOWN SOURCE

Faulty Circuit or System ..... SWITCH OFF AND DISENGAGE ASSOCIATED CIRCUIT BREAKERS

UNKNOWN SOURCE

1. Cockpit and Cabin Room Light Switches ..... ON
2. Master Switch ..... EMERGENCY

WARNING

CABIN WILL DEPRESSUREIZE. AT A MINIMUM ALL INSTURMENTS EXCEPT ENGINE TACHOMETERS, COPILOT ALTIMETER, COPILOT AIRSPEED, COPILOT TURN AND BANK, COPILOT ATTITUDE INDICATOR AND MAGNETIC COMPASS WILL BE INOPERATIVE. ALL LIGHTS EXCEPT COCKPIT AND CABIN ROOM LIGHTS, COPILOTS TURN AND BANK LIGHTS (S/N 1518SA AND SUBSEQUENT) AND ENGINE FIRE WARNING LIGHTS WILL BE INOPERATIVE. ALL RADIOS WILL BE INOPERATIVE. PARTIAL PANEL FLIGHT AND LET DOWN WITH NO COMMUNICATIONS TO A VFR LANDING WILL BE REQUIRED UNLESS NECESSARY SYSTEMS CAN BE RESTORED. IF ELECTRICAL POWER CANNOT BE RESTORED, A NO FLAP LANDING WITH EMERGENCY GEAR EXTENSION WILL BE NECESSARY.

3. Battery Switches ..... BOTH ISOLATE
4. DC Generator Switches ..... BOTH OFF
5. Inverter Switch ..... OFF
6. All Switches and Circuit Breakers ..... OFF or DISENGAGE
7. Master Switch ..... NORMAL
8. Battery, DC Generator Switches and Inverter Switch ..... ON

IF SMOKE OR ODOR STOPS

9. Switches and Circuits Breakers for Equipment Essential to the Particular Phase of Flight .... ON OR ENGAGE ONE AT A TIME (attempt to isolate circuit)

CAUTION

GIVE EACH CIRCUIT OR SYSTEM TIME TO SMOKE OR MALFUNCTION AGAIN BEFORE GOING TO NEXT CIRCUIT OR SYSTEM. IF FIRE/SMOKE STARTS AGAIN, DISABLE THE CIRCUIT IMMEDIATELY, THEN CONTINUE TO ISOLATE ANY OTHER CIRCUITS OR SYSTEMS.

SMOKE AND FUME ELIMINATION (CONT)

IF SMOKE OR ODOR STOPS (Cont)

WARNING

ENSURE THE OXYGEN OUTLET VALVE IS CLOSED WHEN USE OF OXYGEN MASKS IS NO LONGER REQUIRED.

IF SMOKE OR ODOR INCREASES

10. Cabin Air Selector Switch ..... RAM
11. Battery, DC Generator, and Inverter Switches ..... OFF
12. Manual Pressure Control Valve .... FULL DECREASE
13. Execute HIGH SPEED Descent To Low Altitude If Necessary
14. Pilot's Communication Door ..... OPEN
15. Emergency Exit ..... OPEN (IF FEASIBLE)

IF SMOKE OR ODOR PERSISTS

16. Land As Soon As Possible

LANDING GEAR EMERGENCY OPERATIONS

RECYCLING OF LANDING GEAR SYSTEM

If UNSAFE light does not extinguish within approximately 17 seconds after placing the Landing Gear Switch to UP, or if the light illuminates during flight, recycle the system in accordance with the following procedures:

1. Airspeed ..... 130 KCAS MAXIMUM
2. Flaps ..... 5°
3. Landing Gear Switch ..... DOWN
   a. Three Gear Position Indictor lights (Green) ..... ILLUMINATED
   b. UNSAFE Light (Red) ..... EXTINGUISHED

NOTE

If Gear Position Indicator lights are illuminated and UNSAFE light is illuminated observe airspeed limitation and land as soon as practicable at the nearest suitable airport. Do not perform Step 4.

If any one of the Gear Position Indicator lights is extinguished and the UNSAFE light is illuminated, complete the gear extension cycle according to LANDING GEAR EMERGENCY EXTENSION procedure and land as soon as practicable at the nearest suitable airport. Do not perform Step 4.

4. Landing Gear Switch ..... UP
   a. Three Gear Position Indicator lights ..... EXTINGUISHED
   b. UNSAFE Light ..... EXTINGUISHED

LANDING GEAR EMERGENCY OPERATIONS (CONT)

RECYCLING OF LANDING GEAR SYSTEM (Cont)

NOTE

If the UNSAFE light is illuminated, place Landing Gear Switch DOWN and proceed according to light indications as stated in Step 3.

LANDING GEAR EMERGENCY EXTENSION

1.	Airspeed	130 KCAS MAXIMUM
2.	Flaps	5°
3.	Landing Gear Circuit Breakers: CONT, LG MOTOR, DOOR MOTOR	DISENGAGE
4.	LDG POS Circuit Breaker	ENGAGED
5.	Landing Gear Switch	DOWN
6.	Landing Gear Emergency Handle	PULL AND PUMP THROUGH FULL STROKES UNTIL LANDING GEAR LIGHTS INDICATE DOWN AND HANDLE CANNOT BE MOVED
7.	If Indicator Lights are Inoperative	CONTINUE TO PUMP UNTIL PUMP HANDLE CANNOT BE MOVED

NOTE

After pulling Landing Gear Emergency Handle, main landing gear doors unlatch and cannot be closed again in the air. If indicator lights are operational, the RED UNSAFE light will illuminate and will remain illuminated because the gear doors are open.

Do not attempt to electrically retract landing gear after Emergency Extension.

After landing, the main landing gear lock lever mechanism and the clutch for the main landing gear forward door actuating mechanism must be reset prior to flight.

AIR CONDITIONING AND PRESSURIZATION SYSTEM FAILURE

CABIN PRESS LOW ANNUNCIATOR ILLUMINATES

1.	Oxygen	USE IF NECESSARY
2.	Cabin Pressurization Control	CHECK AND RESET CABIN ALTITUDE
3.	Manual Pressure Control Valve	CHECK - FULL INCREASE (clockwise)
4.	Cabin Air Selector Switch	BOTH ENGINES OR OPERATING ENGINE SIDE
5.	If Pressure Remains Low	DESCEND TO ALTITUDE NOT REQUIRING OXYGEN

AIR CONDITIONING AND PRESSURIZATION SYSTEM FAILURE (CONT)

AIR COND SYS FAIL ANNUNCIATOR ILLUMINATES

1. Cabin Pressurization ..... CHECK
2. Oxygen ..... USE IF NECESSARY
3. Descend to Altitude where Oxygen is not required ..... HIGH OR LOW SPEED DESCENT
4. Cabin Air Selector Switch ..... RAM

DEFOG OVER TEMP ANNUNCIATOR ILLUMINATES

1. Defogging Selector Valve ..... FULL DEC FROM DEFOG
2. As Soon as Possible ..... HIGH OR LOW SPEED DESCENT
3. Manual Pressure Control Valve .... FULL DEC
4. Cabin Air Selector Switch ..... RAM

EMERGENCY DESCENT

For Maximum Rate of Descent:

HIGH SPEED DESCENT

a. Power Levers ..... FLIGHT IDLE
b. Condition Levers ..... TAKEOFF LAND
c. Airspeed ..... V_{MO}/M_{MO} (250 KCAS/0.57 M MAXIMUM

LOW SPEED DESCENT

a. Power Levers ..... FLIGHT IDLE
b. Condition Levers ..... TAKEOFF LAND
c. Landing Gear ..... DOWN (Below 175 KCAS)
d. Flaps ..... 40° (Below 120 KCAS)
e. Airspeed ..... V_{FE} (155 KCAS MAXIMUM)

BATTERY OVERHEAT

BAT TEMP 120° Annunciator Illuminates:
If on Ground, MONITOR ..... DO NOT TAKEOFF

1. AMBER 120°F Light Illuminates .... MONITOR TEMPERATURE
2. Temperature Continues to Rise. Disconnect the Battery at 140°F, Battery Isolate Switch ..... ISOLATE

BATTERY OVERTEMP Annunciator Illuminates:
If on Ground ..... ABORT
If in Flight:

3. RED 150°F Light Light Illuminates. Disconnect Battery Immediately, Battery Isolate Switch ..... ISOLATE

BATTERY OVERHEAT (CONT)

BATTERY OVERTEMP Annunciator Illuminates: (Cont)

NOTE

If both batteries have overtemped and are both disconnected, operate on generators only.

4. Temperature Continues to Rise after Isolating and Goes Full Scale .. LAND AS SOON AS POSSIBLE
5. Running on Generators Only and Approaching Terminal Area
   a. If Battery has Cooled Below 120°F, Battery Isolate Switch ..... ON FOR LANDING TO PREVENT POWER LOSS AT LOW RPM
   b. If **BAT TEMP 120°** Annunciator Reilluminates, Exercise Caution. Notify Tower of Problem Prior to Landing, Battery Isolate Switch ..... ISOLATE

CAUTION

IF BATTERY TEMPERATURE REACHED 150°F, EITHER DURING START OR IN FLIGHT, BATTERY MUST BE REMOVED FOR BENCH TEST AND INSPECTION PRIOR TO NEXT FLIGHT.

ELECTRICAL FAILURE

Indicated by the following Annunciator Panel Lights

L OR **R DC GEN OUT** ANNUNCIATOR ILLUMINATES

1. GEN CONT and GEN FIELD Circuit Breakers (affected side) ..... CHECK. IF OUT, RESET

Light remains illuminated,

2. DC Generator Switch (affected side) ..... RESET, THEN ON

Light does not extinguish,

3. DC Generator Switch (affected side) ..... OFF

NOTE

Maximum allowable load on the remaining generator is less than 200 amperes or less than 175 amperes if above 28,000 feet pressure altitude.

ELECTRICAL FAILURE (CONT)

L OR **R DC GEN OUT** ANNUNCIATOR ILLUMINATES (CONT)

4. Operating Engine DC Generator
   Load ..... REDUCE TO ESSENTIAL ITEMS (If Necessary)
5. Voltammeters ..... CHECK

CAUTION

IF EITHER VOLTAMMETER INDICATES BATTERY VOLTAGE (22 - 24 VOLTS) INSTEAD OF GENERATOR VOLTAGE (27 - 29.5 VOLTS) THE 200 AMP BUS TIE CIRCUIT BREAKER IS OPEN AND THE FOLLOWING EQUIPMENT IS POWERED BY BATTERY ONLY. REDUCE LOADS ON THE AFFECTED BUS TO SAVE BATTERY FOR LANDING.

LEFT DC GENERATOR INOPERATIVE, 200 AMP BUS TIE CIRCUIT BREAKER OPEN, NO. 1 BATTERY POWERS

a. MAIN INVERTER
b. LH WINDSHIELD HEAT
c. LH RADIO MASTER (AUTOPILOT, COMM 1, PHONE AUDIO, RNAV, ATC 1, ADF 1, VOR 1, DME 2)

RIGHT DC GENERATOR INOPERATIVE, 200 AMP BUS TIE CIRCUIT BREAKER OPEN, NO. 2 BATTERY POWERS

a. STANDBY INVERTER
b. RH WINDSHIELD HEAT
c. LANDING GEAR (EXCEPT INDICATOR LIGHTS)
d. RH RADIO MASTER (COMM 2, SPEAKER AUDIO, RADAR, ATC 2, ADF 2, DME 1, VOR 2)

ELECTRICAL FAILURE (CONT)

S/N 700SA, 731SA Through 798SA

INVERTER FAIL ANNUNCIATOR CYCLES ON AND OFF

WARNING

IF INVT FAIL ANNUNICATOR CYCLES ON AND OFF, IMMEDIATELY PLACE INVERTER SWITCH TO THE OFF POSITION.

CAUTION

POWER WILL BE LOST TO THE FOLLOWING EQUIPMENT:
a. MAIN FUEL QUANTITY INDICATOR
b. LH AND RH ENGINE FUEL PRESSURE INDICATORS
c. TRIM POSITION INDICATOR AND INTEGRAL INSTRUMENT LIGHTING (5 VOLT LIGHTING)
d. AC POWER TO VARIOUS FLIGHT INSTRUMENTS (i.e. PILOT'S ADI AND HSI, NAVS, RADAR, AUTOPILOT)
e. LH AND RH ENGINE OIL PRESSURE INDICATORS

THE FOLLOWING ITEMS WILL REMAIN OPERATIVE:
a. BOTH VHF COMMUNICATION RADIOS
b. NAV AUDIO
c. ADF AUDIO
d. ALL DC ONLY SYSTEMS

1. Fuel Quantity ..... CALCULATE APPROXIMATE FUEL QUANTITY REMAINING FOR FLIGHT AND PLAN ACCORDINGLY
2. Operative Engine Instruments ..... MONITOR INDICATIONS FOR POSSIBLE MALFUNCTION
3. Remainder Of Flight ..... USE ALTERNATE FLIGHT INSTRUMENTS

NOTE

The following equipment list gives the primary instrument and its alternate:

	PRIMARY	ALTERNATE
a.	F/D ADI	Copilot Vacuum Attitude Gyro
b.	HSI's	Magnetic Compass (Center Windshield Post)
c.	Pilot Altimeter	Copilot Barometric Altimeter
d.	RMI's	None

4. Land As Soon As Possible

ELECTRICAL FAILURE (CONT)

S/N 700SA, 731SA Through 798SA

INVERTER FAIL ANNUNCIATOR ILLUMINATES

1. Inverter Switch ..... STANDBY
2. Main Inverter POWER and CONT
   Circuit Breakers ..... DISENGAGE

INVERTER FAIL ANNUNCIATOR ILLUMINATES AFTER SELECTING STANDBY

1. Inverter Switch ..... OFF
2. Standby Inverter POWER and CONT
   Circuit Breakers ..... DISENGAGE

CAUTION

POWER WILL BE LOST TO THE FOLLOWING EQUIPMENT:

a. MAIN FUEL QUANTITY INDICATOR
b. LH AND RH ENGINE FUEL PRESSURE INDICATORS
c. TRIM POSITION INDICATOR AND INTEGRAL INSTRUMENT LIGHTING (5 VOLT LIGHTING)
d. AC POWER TO VARIOUS FLIGHT INSTRUMENTS (i.e. PILOT'S ADI AND HSI, NAVS, RADAR, AUTOPILOT)
e. LH AND RH ENGINE OIL PRESSURE INDICATORS

THE FOLLOWING ITEMS WILL REMAIN OPERATIVE:

a. BOTH VHF COMMUNICATION RADIOS
b. NAV AUDIO
c. ADF AUDIO
d. ALL DC ONLY SYSTEMS

3. Fuel Quantity ..... CALCULATE APPROXIMATE FUEL QUANTITY REMAINING FOR FLIGHT AND PLAN ACCORDINGLY
4. Operative Engine Instruments ..... MONITOR INDICATIONS FOR POSSIBLE MALFUNCTION
5. Remainder Of Flight ..... USE ALTERNATE FLIGHT INSTRUMENTS

NOTE

The following equipment list gives the primary instrument and its alternate:

	PRIMARY	ALTERNATE
a.	F/D ADI	Copilot Vacuum Attitude Gyro
b.	HSI's	Magnetic Compass (Center Windshield Post)
c.	Pilot Altimeter	Copilot Barometric Altimeter
d.	RMI's	None

6. Land As Soon As Possible

ELECTRICAL FAILURE (CONT)

S/N 799SA, 1501SA And Subsequent

INVERTER FAIL ANNUNCIATOR ILLUMINATES

1. Inverter Switch ..... STANDBY
2. Main Inverter POWER and CONT Circuit Breakers ..... DISENGAGE
3. 115VAC LH POWER Circuit Breaker .. DISENGAGE
4. 26VAC LH POWER Circuit Breaker ... DISENGAGE

INVERTER FAIL ANNUNCIATOR ILLUMINATES AFTER SELECTING STANDBY

1. Inverter Switch ..... OFF
2. Standby Inverter POWER and CONT Circuit Breakers ..... DISENGAGE

CAUTION

POWER WILL BE LOST TO THE FOLLOWING EQUIPMENT:

a. MAIN FUEL QUANTITY INDICATOR
b. LH AND RH ENGINE FUEL PRESSURE INDICATORS
c. TRIM POSITION INDICATOR AND INTEGRAL INSTRUMENT LIGHTING (5 VOLT LIGHTING)
d. AC POWER TO VARIOUS FLIGHT INSTRUMENTS (i.e. PILOT'S ADI AND HSI, NAVS, RADAR, AUTOPILOT)
e. LH AND RH ENGINE OIL PRESSURE INDICATORS

THE FOLLOWING ITEMS WILL REMAIN OPERATIVE:

a. BOTH VHF COMMUNICATION RADIOS
b. NAV AUDIO
c. ADF AUDIO
d. ALL DC ONLY SYSTEMS

3. Fuel Quantity ..... CALCULATE APPROXIMATE FUEL REMAINING FOR FLIGHT AND PLAN ACCORDINGLY
4. Operative Engine Instruments ..... MONITOR INDICATIONS FOR POSSIBLE MALFUNCTION
5. Remainder Of Flight ..... USE ALTERNATE FLIGHT INSTRUMENTS

NOTE

The following equipment list gives the primary instrument and its alternate.

	PRIMARY	ALTERNATE
a.	F/D ADI	Copilot Vacuum Attitude Gyro
b.	HSI's	Magnetic Compass (Center Windshield Post)
c.	Pilot Altimeter	Copilot Barometric Altimeter
d.	RMI's	None

6. Land As Soon As Possible

ELECTRICAL FAILURE (CONT)

L FEEDER OUT ANNUNCIATOR ILLUMINATES

1. Inverter Switch ..... STANDBY
2. LH FEEDER CONT Circuit Breaker ..... CHECK, RESET

CAUTION

IF RESET IS UNSUCCESSFUL, POWER WILL BE LOST TO THE FOLLOWING EQUIPMENT:

a. MAIN INVERTER
b. LH WINDSHIELD HEAT
c. LH RADIO MASTER (AUTOPILOT, COMM 1, AUDIO PHONE, RNAV, ATC 1, ADF 1, VOR 1, DME 2)

3. BUS TIE Circuit Breaker ..... CHECK, RESET
   a. If reset is unsuccessful .... REDUCE LOAD ON LH BUS AND RESET CIRCUIT BREAKER

NOTE

The landing gear will operate normally if the BUS TIE circuit breaker remains engaged.

4. Electrical Load ..... MONITOR, REDUCE TO ESSENTIAL ITEMS AS REQUIRED AND LIMIT EQUIPMENT OPERATION TO REMAIN WITHIN 50 AMP CAPACITY OF BUS TIE CIRCUIT BREAKER

CAUTION

IF BOTH THE BUS TIE AND LH FEED CONT CIRCUIT BREAKERS REMAIN OPEN:

a. LANDING GEAR MUST BE EXTENDED MANUALLY USING LANDING GEAR EMERGENCY EXTENSION PROCEDURE.
b. LANDING GEAR POSITION INDICATOR LIGHTS WILL BE INOPERATIVE.

ELECTRICAL FAILURE (CONT)

R FEEDER OUT ANNUNCIATOR ILLUMINATES

1. Inverter Switch ..... MAIN
2. RH FEEDER CONT Circuit Breaker ..... CHECK, RESET

CAUTION

IF RESET IS UNSUCESSFUL, THE LANDING GEAR MUST BE EXTENDED MANUALLY USING LANDING GEAR EMERGENCY EXTENSION PROCEDURE AND POWER WILL BE LOST TO THE FOLLOWING EQUIPMENT:

a. STANDBY INVERTER
b. RH WINDSHIELD HEAT
c. LANDING GEAR (EXCEPT INDICATOR LIGHTS)
d. RH RADIO MASTER (COMM 2, AUDIO SPEAKER, RADAR, ATC 2, ADF 2, DME 1, VOR 2)

3. BUS TIE Circuit Breaker ..... CHECK, RESET
   a. If reset is unsuccessful .... REDUCE LOAD ON RH BUS AND RESET BREAKER

NOTE

The cabin will remain pressurized and the flaps will operate normally if the BUS TIE circuit breaker remains engaged.

4. Electrical Load ..... MONITOR, REDUCE TO ESSENTIAL ITEMS AS REQUIRED AND LIMIT EQUIPMENT OPERATION TO REMAIN WITHIN 50 AMP CAPACITY OF BUS TIE CIRCUIT BREAKER

WARNING

THE CABIN WILL DEPRESSURIZE IF BOTH THE BUS TIE AND THE RH FEEDER CONT CIRCUIT BREAKERS REMAIN OPEN.

CAUTION

IF BOTH THE BUS TIE AND RH FEEDER CONT CIRCUIT BREAKERS REMAIN OPEN, FLAPS WILL BE INOPERATIVE AND FIXED IN THEIR POSITION AT TIME OF POWER FAILURE.

SECTION 4 ABNORMAL PROCEDURES
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AUTO FUEL TRANSFER FAILURE 4- 2

OUTER FUEL TANK TRANSFER PUMP FAILURE 4- 4

HEATED WINDSHIELD ANTI-ICE SYSTEM FAILURE 4- 4

TRIM AILERON TAB FAILURE 4- 4

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R SEVERE ICING ENCOUNTER 4- 7

SINGLE RED LINE (SRL) SYSTEM FAILURE

FAILURE INDICATION

A failure of the SRL System may be indicated by one or more of the following:

1. A **SRL FAIL** annunciator illumination indicates loss of power to the system, loss of signal to the computer, loss of computer output signal, or the difference between compensated EGT and SRL value is less than 15°C.
2. A sudden change in EGT of 20°C or more with no corresponding change in other engine parameters.
3. An erratic or fluctuating EGT indication.

SYSTEM FAILURE PROCEDURES

In event of SRL failure, DO NOT reposition power levers until engine affected by the failure is positively identified.

CAUTION

DO NOT ADVANCE THE POWER LEVER ON AN ENGINE SUSPECTED OF SRL FAILURE BEYOND THE LAST KNOWN POSITION OF SAFE OPERATION.

1. Verify the SRL switches and circuit breakers are engaged or reset as necessary and observe EGT indication.
2. If condition cannot be corrected:
   a. SRL Switch ..... OFF
   b. Power Lever ..... If engines are reasonably matched in torque, fuel flow, and EGT, the unaffected engine may be used as a reference for setting power on affected engine.
   c. If uncertain about power setting retard power lever and follow EGT schedule shown below.

IOAT (°C)	EGT (°C)	IOAT(°C)	EGT(°C)
-54	482	0	510
-50	483	10	519
-40	486	20	530
-30	490	30	544
-20	496	40	556
-10	503	45	562

NOTE

These figures are shown on the decal attached to the OAT gauge.

3. Land as soon as practical.

FUEL PRESSURE DROP

If Engine Fuel Pressure Drops and Engine Malfunction Occurs:

1. Condition Lever (affected engine) ..... EMERGENCY STOP

WARNING

DO NOT RETARD AFFECTED ENGINE POWER LEVER. PLACE AFFECTED ENGINE POWER LEVER TO TAKEOFF POSITION DURING FEATHERING OPERATION AND LEAVE THERE FOR THE REMAINDER OF THE FLIGHT.

CAUTION

RUN-CRANK-STOP SWITCH MUST REMAIN IN RUN POSITION. DO NOT MOVE AFFECTED ENGINE POWER LEVER UNTIL PROPELLER IS FEATHERED.

2. Main Fuel Valve Switch (affected side) ..... CLOSED
3. DC Generator Switch (affected side) ..... OFF
4. Air Conditioning and Pressurization System ..... SELECT OPERATING ENGINE BLEED AIR OR RAM AIR (IF THRUST IS CRITICAL)

NOTE

Ram Air position will depressurize cabin. Oxygen may be required.

5. Engine Fuel Pressure (operating engine) ..... CHECK

AUTO FUEL TRANSFER FAILURE

TIP TANK MANUAL FUEL TRANSFER

Fuel is not transferring from a tip tank to the main tank with the Transfer Switch in AUTO positon:

1. Fuel Transfer Switch ..... TIP MANUAL (for tank not transferring)
2. Fuel Quantity Indicators ..... MONITOR

AUTO FUEL TRANSFER FAILURE (CONT)

TIP TANK MANUAL FUEL TRANSFER (CONT)

3. Fuel Usage ..... MAINTAIN BALANCE BETWEEN TIP TANKS AND/OR OUTER TANKS
   (Tip tank maximum quantity at Landing: 400 pounds each)
   (Maximum fuel unbalance at Landing: 150 pounds)

NOTE

When the Fuel Transfer Switch is in the TIP MANUAL position, only the fuel in the tip tank will transfer to the main tank.

Fuel cannot be transferred from either the left or right outer tank with the Fuel Transfer Switch in the AUTO position unless both tips can be emptied.

OUTER TANK MANUAL FUEL TRANSFER

1. Fuel Transfer Switches ..... OFF
2. Outer Pump Manual Switch ..... MAN

NOTE

Failure to position the Fuel Transfer Switch to OFF will result in fuel not being pumped from the outer tanks.

3. Fuel Quantity Indicators ..... MONITOR
4. LH and RH OUTER FUEL EMP Lights .. ILLUMINATE
5. Outer Pump Switch ..... OFF

NOTE

If sufficient usable fuel remains in one of the outer tanks, it may be used by disengaging the FUEL TRANSFER CONT circuit breaker for the empty tank and placing the Outer Pump Switch to MAN.

CAUTION

FAILURE TO DISENGAGE THE FUEL TRANSFER CONT CIRCUIT BREAKER FOR THE EMPTY TANK MAY RESULT IN DAMAGE TO THE TRANSFER PUMP.

OUTER FUEL TANK TRANSFER PUMP FAILURE

LH or **RH OUTER FUEL EMP** Annunciator Illuminates with Fuel Quantity Indicator showing fuel remaining in tank:

AUTO FUEL TRANSFER MODE

1. Fuel Transfer Switch ..... OFF (Defective Side)
2. If annunciator remains illuminated
   FUEL TRANSFER CONT Circuit Breaker ..... DISENGAGE (Defective Side)

MANUAL FUEL TRANSFER MODE

1. Outer Pump Switch ..... OFF
2. FUEL TRANSFER CONT Circuit Breaker ..... DISENGAGE (Defective Side)
3. Outer Pump Switch ..... MAN

CAUTION

MAXIMUM FUEL UNBALANCE (TIP TANK AND OUTER TANK COMBINED) IS 150 POUNDS.

HEATED WINDSHIELD ANTI-ICE SYSTEM FAILURE

L or **R H/W OVER TEMP** Annunciator Light Illuminates:

1. Windshield Heat Low Switch (faulty side) ..... OFF

TRIM AILERON TAB FAILURE

Selecting LH or RH on the Trim Aileron Select switch disconnects the electrical interconnection between the left and right trim aileron tabs. The surface selected can be operated independently by the control switch.

NOTE

The indicator will only register to the halfway mark either L or R when the operative trim aileron tab reaches maximum deflection.

FAILURE OF ONE OF THE TRIM AILERON TAB ACTUATORS:

1. Trim Aileron Select Switch ..... LH or RH (Determine Operating Side)
2. Operate the selected surface by the trim aileron control switch and retrim

TRIM AILERON TAB RUNAWAY

1. Maintain lateral control with spoiler and rudder.
2. Trim Aileron Select Switch ..... LH or RH

If runaway continues

3. Trim Aileron Select Switch ..... SELECT OTHER POSITION
4. Operate the selected surface by the trim aileron control switch and retrim

NORMAL STATIC SOURCE FAILURE

Loss of or erratic indications from the Altimeter, Airspeed, or Rate of Climb Indicators:

1. Static Source Select Valve ..... ALTERNATE

CAUTION

USE APPLICABLE ALTERNATE STATIC CORRECTION CHARTS IN SECTION 6.

NOTE

The differential indicating portion of the Cabin Altitude Differential Pressure Indicator may not function.

ELECTRIC TURN & BANK INDICATOR FAILURE

Applicable to S/N 1518SA And Subsequent

PILOT TURN AND BANK INDICATOR POWER FAILURE

1. Indicator Warning Flag ..... VISIBLE
2. **P T/B PWR FAIL** Annunciator ..... ILLUMINATES
3. Turn and Bank Circuit Breaker .... DISENGAGE
4. Remainder of Flight ..... USE ALTERNATE TURN AND BANK INDICATING SYSTEM

COPILOT TURN AND BANK INDICATOR POWER FAILURE

1. **CP T/B PWR FAIL** Annunciator ..... ILLUMINATES
2. Indicator Warning Flag ..... VISIBLE

NOTE

The warning flag will not become visible until the voltage to the system decreases to approximately 12 VDC or less. The system will remain reliable until the warning flag becomes visible.

3. Turn and Bank Circuit Breaker .... DISENGAGE

NOTE

If a system failure occurs which causes a steadily decreasing voltage in the LH and RH DC load buses simultaneously:

1. The pilot's turn and bank indicator will flag somewhere in the range of 23.4V to 22.0V.
2. The **MASTER CAUTION** light and the panel annunciator will illuminate somewhere in the range of 20V to 17V. This means that the **CP T/B PWR FAIL** annunciator will be illuminated also; however, the decreasing voltage has not yet reached a value at which the copilot's turn and bank indicator becomes unreliable. This will occur in the range of 12V to 10V at which time the indicator will flag.

NO FLAP APPROACH AND LANDING

ON DOWNWIND LEG

1. Before Landing Checklist ..... COMPLETE
2. Airspeed ..... 150 KCAS MINIMUM
3. Landing Gear ..... DOWN - OPPOSITE OF LANDING POINT

ON BASE LEG

4. Airspeed ..... 140 KCAS MINIMUM
5. Landing Gear ..... CHECK DOWN

ON FINAL APPROACH

6. Airspeed ..... 1.25 V_{S_1} BUT NOT BELOW 115 KCAS

NOTE

Landing distance will increase approximately 30%.

EMERGENCY EXIT DOOR OPERATION

1. Manual Pressure Control Valve .... FULL DECREASE

When cabin is depressurized:

2. Handle Access Cover ..... PUSH IN
3. Emergency Exit Door Handle ..... PULL, THEN LIFT DOOR UP AND INWARD

R ## INADVERTENT ICING ENCOUNTER

NOTE

Conditions exist for icing when the outside air temperature (OAT) on the ground is +10°C or below or the indicated OAT (RAT) in flight is +10°C or below and visible moisture in any form is present.

WARNING

IN THE EVENT OF AN INADVERTENT ICING ENCOUNTER, IMMEDIATE ACTION MUST BE TAKEN BY THE PILOT WHEN THE SITUATION IS DISCOVERED:

1. **MAINTAIN AIRPLANE CONTROL.**
2. **CHECK ENGINE INLETS AND WING LEADING EDGES AND TAKE APPROPRIATE ACTION AS DESCRIBED IN THE FOLLOWING PROCEDURE. (PG 4-7)**
3. **EXIT ICING CONDITIONS, IF REQUIRED.**

INADVERTENT ICING ENCOUNTER(CONT)

IN ORDER TO MINIMIZE ICE ACCUMULATIONS ON UNPROTECTED LOWER SURFACES, MAINTAIN A MINIMUM SPEED OF 180 KIAS DURING OPERATIONS IN SUSTAINED CRUISE IN ICING CONDITIONS. THIS WILL PROVIDE AN ANGLE OF ATTACK THAT REDUCES EXPOSURE (FRONTAL AREA) OF THE LOWER SURFACES TO ICE ACCUMULATION. IF UNABLE TO MAINTAIN 180 KIAS AT MAXIMUM CONTINUOUS POWER, A CHANGE IN ALTITUDE AND/OR COURSE MAY BE NECESSARY TO MAINTAIN MINIMUM AIRSPEED AND/OR EXIT THE ICING CONDITIONS.

IF ICE HAS BEEN ALLOWED TO BUILD UP ON THE ENGINE AIR INLET, IT MUST BE REMOVED AS SOON AS POSSIBLE. HOWEVER, BEFORE ACTIVATING THE ENGINE AIR INTAKE ANTI-ICE, THE PILOT SHOULD BE AWARE THAT AS THE ICE IS REMOVED, IT COULD DISRUPT THE AIRFLOW TO THE ENGINE AND RESULT IN FLAMEOUT OF THAT ENGINE. THE PILOT SHOULD BE PREPARED FOR THE POSSIBILITY OF SINGLE ENGINE OPERATION.

1. Anti-Ice Systems ..... ON, (Except engine air intake anti-ice)
R 2. De-Ice ..... ON
3. Continuous Ignitions ..... BOTH ON
4. LH Engine Air Intake Anti-Ice ... ON

When proper operation of the LH engine is assured

5. RH Engine Air Intake Anti-Ice ... ON

When proper operation of both engines is assured

6. Continuous Ignitions ..... AS REQUIRED

SEVERE ICING ENCOUNTER

THE FOLLOWING DESCRIBES SOME OF THE WEATHER CONDITIONS THAT MAY BE CONDUCIVE TO SEVERE IN-FLIGHT ICING :

1. Visible rain at temperatures below 0 degrees Celsius ambient air temperature.
2. Droplets that splash or splatter on impact at temperatures below 0 degrees Celsius ambient air temperature.

PROCEDURES FOR EXITING SEVERE ICING ENVIRONMENT :

Procedures for exiting severe icing environment are applicable to all flight phases from takeoff to landing. Monitor the ambient air temperature. While severe icing may form at temperatures as cold as -18 degrees Celsius, increased vigilance is warranted at temperatures around freezing with visible moisture present. If the visual cues specified in the Operating Limitations Section of the AFM for identifying severe icing conditions are observed, accomplish the following :

R SEVERE ICING ENCOUNTER (CONT)
R
R PROCEDURES FOR EXITING SEVERE ICING ENVIRONMENT : (CONT)
R
R 1. Immediately request priority handling from Air Traffic Control to
R facilitate a route or an altitude change to exit the severe icing
R conditions to avoid extended exposure to flight conditions more severe
R than those for which the airplane has been certificated.
R 2. Avoid abrupt and excessive maneuvering that may contribute to
R control difficulties.
R 3. Do not engage the autopilot.
R 4. If the autopilot is engaged, hold the control wheel firmly and dis-
R engage the autopilot.
R 5. If an unusual roll response, an uncommanded roll, or an unusual trim
R is observed, lower the nose (reduce the angle of attack) and allow
R the airspeed to increase before any reduction in engine power.
R 6. Do not extend flaps during extended operation in icing conditions.
R Operation with flaps extended can result in a reduced wing angle-of-
R attack, with the possibility of ice forming on the upper surface
R further aft on the wing than normal, possibly aft of the protected
R area.
R 7. If the flaps are extended, do not retract them until the airframe is
R clear of ice.
R 8. Report these weather conditions to Air Traffic Control.

SECTION 5 NORMAL PROCEDURES
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PREFLIGHT CHECK

The extent of exterior inspections will be influenced by the type of operation, weather, and parking facilities. Additionally, recent maintenance, airplane storage, or operation from unusual airfields will dictate a more extensive inspection.

Check for

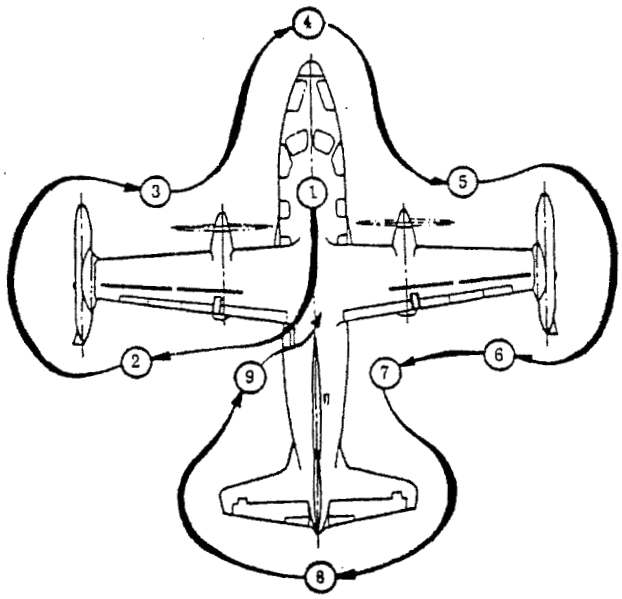
After Maintenance:

1. Flight Controls ..... SMOOTH/PROPER MOVEMENT
2. Trim Tabs ..... SMOOTH/PROPER MOVEMENT
3. Pitot-Static Ports ..... CLEAR AND UNOBSTRUCTED

After Airplane Storage:

1. Wings ..... DENTS AND SCRATCHES
2. Tip Tanks ..... DENTS AND SCRATCHES
3. Fuselage ..... DENTS AND SCRATCHES
4. Empennage ..... DENTS AND SCRATCHES
5. Navigation/Landing Lights ..... DAMAGE AND OPERATION
6. Deicing Boots ..... DAMAGE
7. Radio Antennas ..... DAMAGE
8. Pitot-Static System Lines ..... CLEAR AND UNOBSTRUCTED
9. Fuel System and Vents ..... CLEAR AND UNOBSTRUCTED

PREFLIGHT CHECK (CONT)



Determine the zero fuel weight, fuel loading required and compute the airplane weight and balance. Insure all necessary documents, maps, charts, and equipment necessary for the particular flight are on board and available, then proceed as follows:

COCKPIT (1)

a. Gear Handle ..... DOWN
b. Emergency Gear Extension Handle .. DOWN AND SAFETIED
c. Control Lock ..... REMOVE AND STOWED
d. Parking Brake ..... SET
e. Battery Key Switch ..... ON
f. Battery Isolate Switches ..... BOTH NORMAL
   1) Battery 1 Isolate Switch ..... ISOLATE. BOTH VOLTAMMETERS MUST INDICATE 22 TO 24 VOLTS AND NO FEEDER OUT ANNUNCIATOR WILL BE ILLUMINATED
   2) Battery 2 Isolate Switch ..... ISOLATE. BOTH BATTERIES WILL BE ISOLATED
   3) Battery 1 Isolate Switch ..... NORMAL. BOTH VOLTAMMETERS MUST INDICATE 22 TO 24 VOLTS AND NO FEEDER OUT ANNUNCIATOR WILL BE ILLUMINATED
   4) Battery 2 Isolate Switch ..... NORMAL

CAUTION

IF EITHER VOLTAMMETER READS ZERO, THE 200 AMP BUS TIE CIRCUIT BREAKER IS OPEN AND THE CORRESPONDING FEEDER OUT ANNUNCIATOR WILL BE ILLUMINATED. MALFUNCTION MUST BE CORRECTED PRIOR TO FLIGHT.

PREFLIGHT CHECK (CONT)

COCKPIT (1) (CONT)

g.	Inverter Switch	MAIN
h.	Trim	ZERO
i.	Flaps	5°
j.	Fuel	CHECK
k.	Inverter Switch	OFF
l.	Battery Key Switch	OFF

CAUTION

IF AIRPLANE HAS SET IN OR FLOWN THROUGH MOISTURE, OR HAS BEEN WASHED, PERFORM PITOT STATIC SYSTEM DRAIN PROCEDURES (SEE PILOTS OPERATING MANUAL, SECTION 3).

LEFT WING TRAILING EDGE (2)

a.	General Condition	CHECK
b.	Flap, Spoiler and Trim Aileron	CHECK
c.	Tailpipe, EGT Probes, and Turbine	CHECK
d.	Static Discharger	CHECK

LEFT WING TIP TANK, LEADING EDGE, AND NACELLE (3)

a.	General Condition	CHECK
b.	Tip Tank Filler Cap	CHECK FOR SECURITY
c.	Wing Tip & Taxi Lights	CHECK
d.	Wing Tie Downs	REMOVED
e.	Ice Inspection Light	CHECK
f.	Fuel Leakage	CHECK
g.	Main and Outer Fuel Tank Filler Caps	CHECK FOR SECURITY
h.	Main and Outer Fuel Tank Vent Ports	CHECK FOR OBSTRUCTION
i.	Engine Air Intake	CHECK FOR DAMAGE AND FOREIGN OBJECTS
j.	(*1) Engine Air Intake Drain Valve	PRESS; NOTE ANY EXCESSIVE FLUID DRAINAGE
k.	Nacelle/Doors and Latches	GENERAL CONDITION AND LATCHES SECURED
l.	Oil Level	CHECK (BETWEEN FULL AND ADD); CAP SECURED

NOTE

Oil level does not show actual quantity after unfeathering with engine stopped. In this case, crank engine to obtain proper oil level. See CRANKING Procedure.

m.	Nacelle Door (Oil Access)	LOCKED

*1 Applicable to S/N 1535SA and subsequent.

PREFLIGHT CHECK (CONT)

LEFT WING TIP TANK, LEADING EDGE, AND NACELLE (3) (CONT)

n.	Oil Leakage	CHECK
o.	Oil Cooler Inlet Anti-Icing Boots.	CHECK FOR TEARS AND ABRASIONS
p.	Propeller	CHECK FOR FLAT PITCH AND FREE ROTATION (Normal Direction of Rotation)
q.	Deicing Boots	CHECK FOR TEARS AND ABRASIONS

NOSE AND FORWARD SECTION OF FUSELAGE (4)

a.	Left Forward Main Gear Door	CHECK
b.	General Condition	CHECK
c.	Pitot Tube Covers	REMOVE
d.	Pitot-Static Holes	CHECK FOR OBSTRUCTION
e.	Lower Rotation Beacon (if installed)	CHECK
f.	Landing Lights	CHECK
g.	Nose Landing Gear Strut	CHECK FOR EXTENSION
h.	Uplimit Mechanism	CHECK
i.	Nose Landing Gear Doors	CHECK FOR SECURITY
j.	Nose Gear Torque Link	CONNECTED
k.	Tire Inflation/Condition	CHECK
l.	Static Wire	CHECK
m.	Nose Landing Gear Tie Downs and Chocks	REMOVE
n.	Windshield	CHECK FOR CLEANLINESS AND DAMAGE
o.	Windshield Wipers	CHECK CONDITION AND SECURITY
p.	Right Forward Main Gear Door	CHECK

RIGHT WING NACELLE, LEADING EDGE, AND TIP TANK (5)

a.	Other check items are the same as those of (3) except for Step "e"	
b.	Stall Warning Vane	CHECK

RIGHT WING TRAILING EDGE (6)

a.	Check items are the same as those of (2)	

RIGHT CENTER AND REAR SECTION OF FUSELAGE (7)

a.	General Condition	CHECK
b.	Main Landing Gear Door	CHECK FOR SECURITY
c.	Main Landing Gear Strut and Tire	CHECK FOR EXTENSION AND PROPER INFLATION
d.	Main Landing Gear Brake Disc and Wheel Well	CHECK
e.	Landing Gear Door Ground Control Switch	NORMAL AND SAFETIED
f.	Main Landing Gear	REMOVE CHOCKS
g.	Ram-Air Intake	CHECK FOR OBSTRUCTIONS
h.	Aft Fuselage Tie Down	REMOVE
i.	Cooling Air Discharge Duct	CHECK FOR DAMAGE AND FOREIGN OBJECTS

PREFLIGHT CHECK (CONT)

EMPENNAGE (8)

a. General Condition ..... CHECK
b. External Surface Locks ..... REMOVE
c. Control Surface and Tabs ..... CHECK
d. Upper Rotating Beacon ..... CHECK
e. Tail Light ..... CHECK
f. Deicing Boots ..... CHECK FOR TEARS AND ABRASIONS

LEFT REAR AND CENTER SECTIONS OF FUSELAGE (9)

a. Cooling Air Intake ..... CHECK FOR DAMAGE AND FOREIGN OBJECTS
b. External Power Receptacle Door ... CHECK
c. Battery Vent ..... CHECK FOR DAMAGE AND FOREIGN OBJECTS
d. Other Check Items are the same as those of (7) except for Steps "e", "g", "h", and "i"
e. Ejector Exhaust Port ..... CHECK FOR OBSTRUCTIONS

CABIN CHECK

1. Oxygen Cylinder ..... CHARGED, **VALVE OPEN** (Note Pressure) MASKS AVAILABLE

WARNING

IF THE VALVE ON THE OXYGEN CYLINDER IS CLOSED, NO OXYGEN CAN BE SUPPLIED TO THE MASK OUTLETS.

2. Emergency Exit Door ..... SECURED
3. Cabin Door ..... LOCKED
4. Load and Baggage ..... SECURE
5. Seat Backs ..... UPRIGHT
6. Table ..... STOWED AND COVERED
7. Passenger Briefing ..... COMPLETE

COCKPIT CHECK

1. Seat ..... ADJUSTED TO ALLOW FULL AND FREE MOVEMENT OF FLIGHT CONTROLS
2. Safety Belts and Shoulder Harness. CHECK AND FASTEN
3. Oxygen Outlet Valve and Gauge (Copilot's Side Panel) ..... OPEN. ENSURE PRESSURE SAME AS CYLINDER. MASKS AVAILABLE. **CLOSE OXYGEN OUTLET VALVE.**

WARNING

RESIDUAL PRESSURE MAY BE SHOWN ON THE OXYGEN GAUGE EVEN THOUGH THE VALVE ON THE OXYGEN CYLINDER IS CLOSED. ASSURE THAT THE PRESSURE READINGS ARE THE SAME AND THE CYLINDER VALVE IS OPEN. CLOSE THE OXYGEN OUTLET VALVE UPON COMPLETION OF THE CHECK.

COCKPIT CHECK (CONT)

4. Fire Extinguisher ..... CHARGED, SECURE IN BRACKET
5. Static Source Select ..... NORMAL STATIC SOURCE
6. Left Switch Panel
   a. Landing Gear Switch ..... DOWN
   b. Master Switch ..... GUARD DOWN AND SAFETIED (NORMAL)
   c. Trim Aileron Select Switch... GUARD DOWN AND SAFETIED (BOTH)
   d. Other Switches ..... OFF
7. Center Pedestal
   a. Condition Levers ..... TAXI
   b. Power Levers ..... FLIGHT IDLE
   c. Run-Crank-Stop Switches ..... CRANK
   d. Start Selector Switch ..... AIR START AND SAFE
   e. SRL Switches ..... ON
8. Right Switch Panel
   a. Cabin Air Selector Switch .... OFF
   b. Auto-Manual Selector Switch .. OFF
   c. Manual Pressure Control Valve ..... FULL INCREASE
   d. Cabin Altitude Selector Knob . SET APPROXIMATELY 1,000 FEET ABOVE AIRPORT ELEVATION
   e. Cabin Rate Control Knob ..... MINIMUM
9. Overhead Switch Panel
   a. Landing Light Switches ..... RET
   b. Other Switches ..... OFF
10. Instrument Panel ..... CHECK
    a. Continuous Ignition Switches.. OFF
11. Weight and Balance..... CHECK
12. Takeoff Data ..... COMPUTED (Select Takeoff Flap Position and Determine V_R)

BEFORE STARTING ENGINES

1. Battery Start
   a. Battery Isolation Switches ... BOTH NORMAL
   b. Battery Key Switch ..... ON
   c. Battery Temp Warning Test Switch ..... TEST
      1) If normal - Both pointers will move, approximately together, to top of scale illuminating the **BAT TEMP 120°, BATTERY OVER TEMP** and Master Caution light. Speed of travel will vary some depending on ambient battery temperature. The Master Caution can be cancelled, but the lights on the Battery Temperature Indicator instrument will remain illuminated. Release button, all systems will return to normal.
      2) If Probe has become contaminated - The affected Indicator will come to rest at some place down scale (not at the top), or it will remain at bottom. That probe should be replaced prior to flight.

BEFORE STARTING ENGINES (CONT)

3) When Test Button is pressed - If one needle travels at normal speed to top and the other lags appreciably behind, then the probe in the battery connected with the lagging instrument should be checked since an open heat sensor or wiring will cause this indication.

4) While in preflight of airplane - If either of the indicators come to rest at the top of the scale and the test button is not pressed, all lights will illuminate. Have ground crew check and see if battery probe was left disconnected.

WARNING

IF BATTERY TEMPERATURE REACHES 150°F DURING START, BATTERY MUST BE REMOVED FOR BENCH TEST AND INSPECTION PRIOR TO FLIGHT.

NOTE

The expanded scale will not start to indicate until a cell temperature of 100°F or above is reached.

d. Check Voltmeters ..... 22 VDC MINIMUM

Proceed to 2 **OR**

1. APU Start
   a. Battery Select Switch ..... PARALLEL
   b. APU ..... CONNECT
   c. Check Voltmeters ..... 28 VDC DESIRED (APU must be capable of 800 AMPS and minimum of 16 VDC during start cycle).
   d. Battery Key Switch ..... ON

NOTE

Battery select switch must be in parallel position for APU to come on line.

2. Inverter Switch ..... STBY then MAIN
   a. **INVERTER FAIL** Annunciator .... EXTINGUISHED
3. Circuit Breakers ..... SET
4. Radio Master Switches ..... OFF
5. Warning and Indicator Lights ..... CHECK (**SRL FAILED** Annunciators Illuminated)
6. Master Caution System ..... CHECK
7. Boost Pumps ..... CHECK
   a. **L** and **R BOOST PUMP FAIL** Annunciators ..... EXTINGUISHED
8. Stall Warning System ..... CHECK

BEFORE STARTING ENGINES (CONT)

9. Fuel Quantity Test Switch ..... TEST (Check Main, Outer and Tir indicator needles move smoothly t. "0" position)
   a. **FUEL LOW LEVEL** Annunciator .. ILLUMINATES (When Main Tank Quantity indicator indicates approximately 200 pounds)
10. Fuel Low Level Test Switch ..... TEST
    a. **FUEL LOW LEVEL** Annunciator .. ILLUMINATES
11. Outer Pump Test Switch ..... TEST

NOTE

Both Fuel Transfer Switches must be in the OFF position for the system to TEST effectively.

   a. **OUTER FUEL EMP** Annunciators (With Fuel) ..... ILLUMINATE then EXTINGUISH
   b. **OUTER FUEL EMP** Annunciators (No Fuel) ..... ILLUMINATE
12. Condition Levers ..... FREE MOVEMENT, SET AT TAXI
13. Power Levers ..... FREE MOVEMENT, SET BETWEEN GROUND IDLE AND FLIGHT IDLE
14. Flight Controls ..... FREE MOVEMENT
15. Trim Controls ..... CHECK AND SET FOR TAKEOFF
16. Rotating Beacon ..... ON

R ## STARTING ENGINES

R **CAUTION**

R BEFORE STARTING ENGINES, FEATHER VALVE AND NEGATIVE TORQUE
R SENSOR (NTS) CHECKS MUST BE PERFORMED PRIOR TO THE FIRST
R FLIGHT OF THE DAY AND BEFORE EVERY FLIGHT DURING WHICH AN
R INTENTIONAL ENGINE SHUTDOWN IS PLANNED. THESE CHECKS MUST
R ALSO BE PERFORMED BEFORE EVERY FLIGHT AFTER FEATHERING
R LINKAGE IS ADJUSTED AND/OR AFTER MAINTENANCE OF THE
R FEATHERING SYSTEM.

The airplane's series-parallel battery power or an Auxiliary Power Unit (APU) is utilized for engine starts.

Source Selection:
1. OAT 10°C or Less ..... APU RECOMMENDED
2. Battery Temperature Above 120°F ... APU REQUIRED

APU Starts:
APU must be regulated 28 VDC and capable of 16 VDC, 800 amps during start cycle. Battery Select Switch must be in parallel for APU to come on line.

Battery Starts:
1. Battery Select Switch ..... SERIES OR PARALLEL (OAT 10°C OR LESS, SERIES RECOMMENDED)
2. Battery Temperature ..... MONITOR BATTERY TEMPERATURE INDICATOR

STARTING ENGINES (CONT)

If Parallel Start Selected :

a. Battery Temperature Above 120 ° F ····· APU REQUIRED
b. **BAT TEMP 120°** Annunciator Illuminates ···· MONITOR
c. Battery Temperature Rises to 140 ° F ····· ISOLATE BATTERY
d. Remaining Battery Temperature
Rises to 150 ° F ····· ABORT START

CAUTION

INDICATOR HOT LIGHT, **BATTERY OVER TEMP** AND **MASTER CAUTION** ANNUNCIATORS ILLUMINATES WHEN THE BATTERY TEMPERATURE REACHES 150 ° F.

If Series Start Selected :

a. **BAT TEMP 120 ° F** Annunciator Illuminates ·· MONITOR
b. Battery Temperature Rises to 150 ° F ····· ABORT START

CAUTION

ABORT IS RECOMMENDED BUT NOT REQUIRED AT 140 ° F.

APU or BATTERY

3. Main Fuel Valve Switches ····· OPEN
4. SRL Switches ····· ON
5. Propellers ····· ON LOCKS

NOTE

If the propeller is feathered, place the Power Lever in REVERSE and hold the Unfeather Switch until the blades reach the lock position.

6. Both Run-Crank-Stop Switches ····· RUN

R 6A. Auto-Ignition Switches ····· CONT, NOTE LH AND RH IGNITION LIGHTS
R (If Auto-Ignition System is installed) ILLUMINATED
R 6B. Auto-Ignition Switches ····· AUTO, NOTE LH AND RH IGNITION LIGHTS
R (If Auto-Ignition System is installed) ILLUMINATED
R 6C. Auto-Ignition Switches ····· OFF, NOTE LH AND RH IGNITION LIGHTS
R (If Auto-Ignition System is installed) EXTINGUISHED

7. Start Selector Switch ····· LH GND START or RH GND START

On Engine to be started :

8. Engine Start Switch ····· PRESS AND HOLD
9. Ignition and EGT Rise ····· RELEASE ENGINE START SWITCH
a. **SRL FAIL** Annunciator ····· EXTINGUISHES ABOVE 14% RPM

STARTING ENGINES (CONT)

b. Exhaust Gas Temperature ..... MONITOR

c. Within 10 seconds past 10% RPM
or by 20% RPM ..... INDICATED COMBUSTION or Place Run-Crank-Stop Switch to STOP

d. Above 25% RPM with Slow Acceleration
if EGT is below 700°C ..... USE FUEL ENRICHMENT SWITCH

e. Prior to 50% RPM ..... INCREASING OIL PRESS or Place Run-Crank-Stop Switch to STOP

f. 60% RPM, End of Ignition,
Engine Start Indicator Light ..... EXTINGUISHES. If ILLUMINATED Place Run-Crank-Stop Switch to STOP

CAUTION

IF ANY MALFUNCTION OCCURS, ENGINE STOPS, OR RPM STAGNATES PRIOR TO 40% RPM DURING STARTING PROCEDURES, SHUT DOWN ENGINE IMMEDIATELY BY PLACING CONDITION LEVER IN EMERGENCY STOP POSITION.

IF EGT RAPIDLY APPROACHES 770°C DURING START, POSITION THE CONDITION LEVER TO EMERGENCY STOP. RESTART SHOULD NOT BE TRIED UNTIL EGT DROPS BELOW 200°C. COOL AND CLEAR ENGINE WITH CRANKING PROCEDURE OF SECTION 5.

NOTE

If fuel does not ignited while attempting engine start, crank engine to expel fuel before attempting start again. Observe starter motor limit. Use Cranking Procedure, Section 5.

Above 25% RPM, slow acceleration may indicate failure of auto-start system.

Auto-start system will automatically enrich the start fuel schedule to maintain a constant EGT of approximately 690-700°C throughout the start. However, other parameters may influence and cause start temperature to vary, such as engine temperature, tail wind or weak batteries.

10. Engine RPM ..... STABILIZE AT ABOUT 76.5 TO 78.5%
11. **SRL FAIL** Annunciator ..... EXTINGUISHED
12. Engine Instruments ..... CHECK
13. APU Start
    a. Other Engine ..... START, REPEAT SEQUENCE (Steps 6 through 12)
    b. After Start, APU ..... DISCONNECTED
    c. Battery Switch ..... ON, MONITOR TEMPERATURE (Maximum 140° F)
    d. Generator Switches ..... ON, MONITOR CHARGE RATE (Maximum 200 AMPS)

STARTING ENGINE (CONT)

14. Battery Start
    a. Operating Engine Generator Switch ..... ON

If charging rate in excess of 200 amps
    b. Both Generator Switches ..... ON (equalization circuits energized)

When charging rate is less than 100 amps
    c. Inoperative Engine Generator . OFF
    d. Operating Engine Condition Lever ..... SET TO TAKEOFF LAND
    e. Charge Rate ..... 200 AMPS MAXIMUM
    f. Battery Temperature ..... 140°F MAXIMUM

When charge rate is less than 100 amps
    g. Operating Engine Condition Lever ..... TAXI
    h. Both Generator Switches ..... OFF

CAUTION

DO NOT ATTEMPT ANOTHER BATTERY START IF **BAT TEMP 120°** ANNUNCIATOR IS ILLUMINATED. SHUT DOWN AND CORRECT PROBLEM PRIOR TO FLIGHT.

    i. Other Engine ..... START, REPEATING SEQUENCE (Steps 6 through 12, 15, and 16)

15. Start Select Switch ..... AIR START AND SAFE
16. Generator Switches ..... EITHER LH OR RH ON. CHECK FOR 28.5 +1.0/-1.5 VOLTS ON BOTH VOLTMETERS
    THEN
    BOTH ON. CHECK FOR 28.5 +1.0/-1.5 VOLTS ON BOTH VOLTMETERS

CAUTION

IF EITHER VOLTMETER INDICATES BATTERY VOLTAGE (22 - 24 VOLTS) INSTEAD OF GENERATOR VOLTAGE (28.5 + 1.0/-1.5 VOLTS), THE 200 AMP BUS TIE CIRCUIT BREAKER IS OPEN AND MALFUNCTION MUST BE CORRECTED PRIOR TO FLIGHT.

AFTER STARTING ENGINES

1. Overspeed Governor Check (First Flight of Day and as Required) ..... CHECKED (Use Procedure Section 5)
2. Single Red Line (SRL) System Check (Propellers must be on locks)

NOTE

If torque, EGT and fuel flow increase, and RPM remains constant as power lever is advanced, propeller is not on the locks. Shutdown the engine and restart, carefully placing the power lever forward of the GROUND IDLE position to prevent start lock disengagement.

On Engine to be Checked

a. Condition Lever ..... TAKEOFF LAND
b. Power Lever ..... SET TO 100% RPM
c. EGT ..... STABILIZE AND NOTE VALUE
d. Delta P/P Test ..... TEST (momentary)

CAUTION

EGT VALUES SHOULD INCREASE ABOUT 5°C IN TEST POSITION. IF EGT READINGS DO NOT CHANGE, THE DELTA P/P TRANSDUCER MUST BE CHECKED AND CORRECTED BEFORE FURTHER FLIGHT.

DO NOT INITIATE FLIGHT WITH SRL SYSTEM INOPERATIVE.

e. SRL Switch ..... OFF, **SRL FAIL** ANNUNCIATOR ILLUMINATED
Note change in EGT value
f. SRL Switch ..... ON, **SRL FAIL** ANNUNCIATOR EXTINGUISHES
g. Power Lever ..... GROUND IDLE
h. Condition Lever ..... TAXI
i. Repeat steps a. through h. on opposite engine

CAUTION

THE CHANGE IN EGT NOTED FOR EACH ENGINE SHOULD BE THE SAME WITHIN 10°C TOLERANCE. IF NOT, THE SRL SYSTEM MUST BE CHECKED AND CORRECTED BEFORE FURTHER FLIGHT.

NOTE

The EGT indicators can be observed to suddenly change in value as the engines sweep through 80% RPM, which indicates a functioning SRL System.

AFTER STARTING ENGINES (CONT)

3.	Propellers	REMOVE FROM START LOCKS
	a. Condition Levers	TAKEOFF LAND
	b. Power Levers	MOVE SLOWLY TOWARD REVERSE POSITION. Both **BETA RANGE** annunciators should extinguish and re-illuminate. Increasing fuel flow, torque pressure and EGT indicate disengagement of propeller locks
	c. Power Levers	CHECK FOR TORQUE INCREASE AS POWER LEVERS ARE ADVANCED ABOVE FLIGHT IDLE
	d. Power Levers	GROUND IDLE
	e. Condition Levers	TAXI
R 4.	(Deleted)	
5.	Check Voltmeters	27 TO 29.5 VDC
6.	Air Conditioning and Pressurization System	ON
7.	Fuel Transfer Control Switches	AUTO
8.	Oil Temperature	CHECK
9.	Pilot Communication Door	CLOSED
10.	Annunciator Panel	CHECK

PREFLIGHT OPERATION CHECK

ITEM	POWER LEVER	CONDITION LEVER	CHECK ITEMS
LOW SPEED TAXI	GROUND IDLE	TAXI	1. Engine Speed must be 76.5% - 78.5% RPM 2. **BETA RANGE** annunciator normally illuminated 3. Oil Pressure minimum 40 psi 4. Fuel Pressure minimum 15 psi 5. No Caution Lights illuminated
HIGH SPEED TAXI	GROUND IDLE	TAKEOFF LAND	1. Engine Speed must be 96% - 97% RPM 2. **BETA RANGE** annunciator must be illuminated
REVERSE	REVERSE	TAKEOFF LAND	1. Engine Speed must be above 94.5% RPM 2. **BETA RANGE** annunciator must be illuminated
TAKEOFF	TAKEOFF POWER POSITION	TAKEOFF LAND	1. Engine Speed must be 99.5% - 101% RPM 2. Oil Pressure must be 70 - 120 psi 3. **BETA RANGE** annunciator must be extinguished

TAXI

1. Radio Master Switches ..... ON
2. Flaps ..... TAKEOFF SETTING 5° or 20°
3. LG UNSAFE Warning Light ..... CHECK
4. Condition Levers ..... TAXI
5. Power Levers ..... GROUND IDLE
6. Landing Lights/Taxi Lights ..... AS REQUIRED
7. Parking Brake ..... OFF
8. Power ..... SET AS REQUIRED (Maintain Minimum 76.5% RPM)

BEFORE TAKEOFF

1. Engine Instruments ..... CHECK
2. Flight Instruments ..... CHECK
3. NAV/COMM/Transponder ..... CHECK & SET
4. Annunciator Panel ..... CHECK
5. Pitot & Static Anti-Ice ..... ON
6. Windshield Heat ..... LOW
7. Friction Levers for Engine Controls ..... SET AS REQUIRED
8. Anti-Ice Systems ..... AS REQUIRED
9. Trim Tabs ..... SET FOR TAKEOFF
10. Flight Controls ..... FREE MOVEMENT TO THE STOPS
11. Flaps ..... TAKEOFF SETTING 5° OR 20°

WARNING

IF FLAPS 20° TAKEOFF IS ELECTED AND ENGINE FAILURE OCCURS AFTER LIFTOFF, CONTINUED CLIMB PERFORMANCE IS NOT ASSURED UNLESS THE LANDING GEAR HAS COMPLETELY RETRACTED, THE GEAR DOORS ARE CLOSED, AND FLAPS ARE RETRACTED TO 5° OR LESS.

12. Cabin Air Selector Switch ..... RAM
13. Condition Levers ..... TAKEOFF LAND
14. Landing Lights/Taxi Lights ..... AS REQUIRED
15. Strobe Lights ..... AS REQUIRED - OBSERVE PLACARD LIMITATIONS
16. Cabin Sign ..... ON

CAUTION

ALL ANTI-ICE SYSTEMS MUST BE ON PRIOR TO TAKEOFF IN VISIBLE MOISTURE IF OAT IS +10°C OR COLDER. R

NORMAL TAKEOFF

To attain the takeoff performance shown in Section 6 of this Airplane Flight Manual, the following procedures apply:

1. Brakes ..... SET AND HOLD
2. Condition Levers ..... TAKEOFF LAND (100% RPM)
3. Ignition Switches ..... AUTO (If Auto-Ignition installed)
   (Ignition Annunciator Lights extinguished)
   or ..... AS REQUIRED
   (If Auto-Ignition not installed)

CAUTION

DO NOT USE IGNITION SWITCH IN AUTO POSITION WHEN THE CONDITION LEVER IS AT TAXI.

CAUTION

CONTINUOUS IGNITION SHALL BE SELECTED TO ON DURING TAKEOFF AND CLIMB OUT IN ACTUAL OR POTENTIAL ICING CONDITIONS OR WHERE THERE IS WATER, SLUSH OR SNOW ON THE RUNWAY. (IF AUTO-IGNITION NOT INSTALLED)

4. Power Levers ..... ADVANCE SLOWLY TO 100% TORQUE OR 650°C EGT WHICHEVER OCCURS FIRST. STABILIZE POWER SETTING.

CAUTION

WHEN MAKING A ROLLING TAKEOFF UNDER TEMPERATURE LIMITED CONDITIONS, ADVANCE POWER LEVERS NO HIGHER THAN 600°C EGT, SINCE EGT WILL INCREASE APPROXIMATELY 50°C DURING TAKEOFF ROLL DUE TO SYSTEM LAG. A ROLLING TAKEOFF SHOULD ONLY BE MADE IF RUNWAY LENGTH AND OBSTACLE CLEARANCE WILL PERMIT.

NOTE

If temperature limited, the EGT system requires approximately 20 seconds to stabilize.

5. Brakes ..... RELEASE
6. Accelerate to computed rotation speed (V_R) for 5° or 20° flaps and liftoff ..... PITCH 13° MAXIMUM

AFTER TAKEOFF

1. Maintain pitch attitude 13° Nose UP maximum

When positive rate of climb is established

2. Landing Gear ..... UP
3. Airspeed ..... 120 KCAS (5° Flap Takeoff)
   113 KCAS (20° Flap Takeoff)

AFTER TAKEOFF (CONT)

4. Flaps - After gear retraction complete
   a. 20° Flap Takeoff ..... TO 5°
   b. 5° Flap Takeoff ..... TO UP

NOTE

It is recommended to set the flap switch at 5° position and confirm the 5° indication light illuminates before selecting the UP position.

5. Airspeed ..... 140 KCAS MINIMUM
6. Flaps (20° Flap Takeoff) ..... UP
7. Airspeed (Normal Climb) ..... 155 KCAS

NOTE

If takeoff was made from a snow or slush covered runway, cycle the landing gear one or two times at a safe altitude to shed any ice accumulation.

8. Landing Light/Taxi Lights ..... OFF
9. Power ..... MAXIMUM CONTINUOUS

NOTE

If takeoff was made with EGT at 650°C during visible moisture, reduce EGT to 630°C for Normal or Cruise Climb only after gear and flaps are UP and all obstacles have been cleared.

10. Cabin Air Selector Switch ..... BOTH
11. Wing Deice ..... AS REQUIRED
12. Cabin Sign ..... AS REQUIRED
13. Ignition Switches ..... AUTO (If Auto-Ignition installed)
R (Ignition Annunciator Lights extin-
R guished)
or ..... AS REQUIRED
(If Auto-Ignition not installed)

CAUTION

R 1. CONTINUOUS IGNITION SHALL BE SELECTED TO **ON**, WHEN ICE IS VISIBLE ON, OR SHEDDING FROM PROPELLER(S), SPINNER(S), OR LEADING EDGE(S).

R 2. CONTINUOUS IGNITION SHALL BE SELECTED TO **ON** , BEFORE SELECTING ANTI-ICE, WHEN ICE HAS ACCUMULATED.

R 3. CONTINUOUS IGNITION SHALL BE SELECTED TO **ON**, IMMEDIATELY, ANYTIME ENGINE FLAMEOUT OCCURS AS A POSSIBLE RESULT OF ICE INGESTION.

AFTER TAKEOFF (CONT)

14.	Cabin Pressurization	CHECK, SET AND MONITOR
15.	Engine Instruments	CHECK
16.	Synchrophaser	AS DESIRED
17.	Anti-Ice Systems	AS REQUIRED

NORMAL CLIMB

1.	Power	MAINTAIN 100% TORQUE OR 650°C EGT WHICHEVER LIMITS
2.	Airspeed	SEA LEVEL TO 10,000 FT - 155 KCAS 15,000 FT - 150 KCAS 20,000 FT - 145 KCAS 25,000 FT - 140 KCAS 30,000 FT - 135 KCAS
3.	Ignition Switches	AUTO (If Auto-Ignition installed) (Ignition Annunciator Lights extinguished)
	or	AS REQUIRED (If Auto-Ignition not installed)
4.	Anti-Ice/Deice Systems	AS REQUIRED

CRUISE CLIMB

1.	RPM	96% TO 98%
2.	EGT	MAXIMUM 650°C
3.	Torque	MAXIMUM 100%
4.	Airspeed	AS REQUIRED FOR DESIRED RATE OF CLIMB
5.	Ignition Switches	AUTO (If Auto-Ignition installed) (Ignition Annunciator Lights extinguished)
	or	AS REQUIRED (If Auto-Ignition not installed)
6.	Anti-Ice/Deice Systems	AS REQUIRED

VISIBLE MOISTURE ENCOUNTERS

Entering Visible Moisture from Dry Conditions (Cruise at 650°C EGT)

Engine EGT will decrease when entering visible moisture. Unless a critical thrust condition exists:

1.	Power Levers	DO NOT MOVE. MONITOR EGT. IF EGT DECREASES BELOW 630°C, ADJUST POWER LEVERS TO MAINTAIN 630°C UNTIL CLEAR OF VISIBLE MOISTURE.

Intermittent Moisture (Cruise at 650°C EGT)

Engine EGT will fluctuate in intermittent visible moisture. Unless a critical thrust condition exists:

1.	Power Levers	MONITOR CAREFULLY TO MAINTAIN MAXIMUM 650°C EGT IN DRIEST CONDITIONS

VISIBLE MOISTURE ENCOUNTERS (CONT)

CAUTION

DURING ALL OPERATIONS IN VISIBLE MOISTURE, CAREFULLY MONITOR EGT. DO NOT ALLOW EGT TO EXCEED 650°C.

INADVERTENT ICING ENCOUNTER

R 1. Ignition Switches ..... BOTH CONT
(If Auto-Ignition installed)

R or ..... BOTH ON
(If Auto-Ignition not installed)

2. LH Engine Intake Anti-Ice ..... ON

WARNING

WHEN ICING CONDITIONS ARE ENCOUNTERED DO NOT DELAY OPERATION OF THE ENGINE INLET ANTI-ICE SYSTEMS.

3. Remaining Anti-Ice/Deice Systems ..... ON (AS REQUIRED)

When Proper operation of the LH Engine is Assured:

4. RH Engine Intake Anti-Ice ..... ON

When Proper Operation of Both Engines is Assured:

5. Ignition Switches ..... BOTH AUTO

R (If Auto-Ignition installed)

FLIGHT IN ICING CONDITIONS

NOTE

Conditions for icing exist when the outside air temperature (OAT) on the ground is +10°C or below or the indicated OAT (RAT) in flight is +10°C or below and visible moisture in any form is present.

Icing conditions also exist when the OAT on the ground is +10°C or below and where surface snow, slush, ice or standing water may be ingested by the engines or freeze on engine inlets or engine sensor probes.

WARNING

DUE TO DISTORTION OF AIRFOILS, STALLING SPEEDS SHOULD BE EXPECTED TO INCREASE AS ICE ACCUMULATES ON THE AIRPLANE. STALL WARNING DEVICES MAY NOT BE ACCURATE AND SHOULD NOT BE RELIED UPON.

FLIGHT IN ICING CONDITIONS (CONT)

IN ORDER TO MINIMIZE ICE ACCUMULATIONS ON UNPROTECTED LOWER SURFACES, MAINTAIN A MINIMUM SPEED OF 180 KIAS DURING OPERATIONS IN SUSTAINED CRUISE IN ICING CONDITIONS. THIS WILL PROVIDE AN ANGLE OF ATTACK THAT REDUCES EXPOSURE (FRONTAL AREA) OF THE LOWER SURFACES TO ICE ACCUMULATION. IF UNABLE TO MAINTAIN 180 KIAS AT MAXIMUM CONTINUOUS POWER, A CHANGE OF ALTITUDE AND/OR COURSE MAY BE NECESSARY TO MAINTAIN MINIMUM AIRSPEED AND/OR EXIT THE ICING CONDITIONS.

FOR OPERATION IN ICING CONDITIONS IN OTHER THAN SUSTAINED CRUISE, INCREASE NORMAL SPEEDS BY AT LEAST 10% WITHIN OPERATIONAL AIRCRAFT LIMITS.

DURING LANDING, DO NOT SELECT 40° FLAPS WHEN OPERATING IN ICING CONDITIONS. THE FAA HAS DETERMINED THAT ICE ACCUMULATIONS ON THE TAIL PLANE OF MANY AIRCRAFT MAY RESULT IN A REDUCED DOWN FORCE ON THE HORIZONTAL STABILIZER WHEN FULL FLAPS ARE USED. THIS REDUCED DOWN FORCE MAY RESULT IN THE AIRCRAFT PITCHING NOSE DOWN.

CLIMB CHECK

1.	Altimeters	SET 29.92 INCHES HG. (AS REQUIRED)
2.	Cabin Pressurization	CHECK
3.	Oxygen/Crew Mask	CHECK (AS REQUIRED)
4.	Fuel Balance and Transfer	CHECK
5.	Windshield Heat	LOW
6.	Pitot Heat	ON
7.	Generator Load	CHECK
8.	Ignition Switches	AUTO (If Auto-Ignition installed)
R		(Ignition Annunciator Lights extin-
R		guished)
	or	AS REQUIRED
		(If Auto-Ignition not installed)
9.	Anti-Ice/Deice Systems	AS REQUIRED

CRUISE

1.	Power	SET AS REQUIRED (96% RPM TO 98% RPM)

CAUTION

DO NOT MOVE CONDITION LEVER BELOW MIN CRUISE DURING FLIGHT EXCEPT TO FEATHER A FAILED ENGINE.

2.	Engine Instruments	MONITOR
3.	Generator Load	CHECK - OBSERVE PLACARD LIMITATIONS
4.	Fuel Transfer Control Switches ..	OFF - AFTER TIP TANKS AND OUTER WING TANKS ARE EMPTY
5.	Ignition Switches	AUTO (If Auto-Ignition installed)
R		(Ignition Annunciator Lights extin-
R		guished)
	or	AS REQUIRED
		(If Auto-Ignition not installed)
6.	Anti-Ice/Deice Systems	AS REQUIRED

DESCENT

1. Cabin Altitude Selector Knob .... SELECT CABIN ALTITUDE 1,000 FEET ABOVE AIRPORT LANDING ELEVATION
2. Fuel Transfer Control Switches .. TIP MANUAL or OFF
3. Altimeters ..... SET
4. Windshield Heat ..... LOW
5. Pitot Heat ..... ON
6. Windshield Defog ..... AS REQUIRED
7. Ignition Switches ..... AUTO (If Auto-Ignition installed)
R (Ignition Annunciator Lights extin-
R guished)
or ..... AS REQUIRED
(If Auto-Ignition not installed)
8. Anti-Ice/Deice Systems ..... AS REQUIRED

CAUTION

DO NOT USE OUTER FUEL TANKS DURING DESCENT.

IN RANGE

1. Landing Data/Approach Speed ..... COMPUTED
2. Tip Tank Fuel Quantity/Balance .. CHECK - IN LIMITS
3. Synchrophaser ..... OFF
4. Cabin Sign ..... ON
5. Passenger Briefing ..... COMPLETE

APPROACH

1. Cabin Altitude Differential Pressure Indicator ..... CHECK FOR ZERO
2. Condition Levers ..... TAKEOFF LAND
3. Ignition Switches ..... AUTO (If Auto-Ignition installed)
R (Ignition Annunciator Lights extin-
R guished)
or ..... AS REQUIRED
(If Auto-Ignition not installed)

CAUTION

R CONTINUOUS IGNITION SHALL BE SELECTED TO **ON** DURING APPROACH AND LANDING WHILE IN OR SHORTLY FOLLOWING FLIGHT IN ACTUAL OR POTENTIAL ICING CONDITIONS.

4. Anti-Ice/Deice Systems ..... AS REQUIRED
5. Power ..... AS REQUIRED
6. Flaps ..... 5° (below 175 KCAS)
7. Landing Gear ..... DOWN (below 175 KCAS)

NOTE

It is recommended to set the flap switch at 5° position and confirm the 5° indication light illuminates before going to 20° position.

8. Airspeed ..... 140 KCAS MINIMUM
9. Landing Lights ..... AS REQUIRED (BELOW 175 KCAS)

BEFORE LANDING

WARNING

USE OF 40° FLAPS FOR LANDING CONSIDERABLY RESTRICTS THE GO AROUND CAPABILITY SHOULD AN ENGINE FAILURE OCCUR IN THE APPROACH OR LANDING PHASE.

DURING LANDING, DO NOT SELECT 40° FLAPS WHEN OPERATING IN ICING CONDITIONS. THE FAA HAS DETERMINED THAT ICE ACCUMULATIONS ON THE TAIL PLANE OF MANY AIRCRAFT MAY RESULT IN A REDUCED DOWN FORCE ON THE HORIZONTAL STABILIZER WHEN FULL FLAPS ARE USED. THIS REDUCED DOWN FORCE MAY RESULT IN THE AIRCRAFT PITCHING NOSE DOWN.

1. Flaps ..... 20° (BELOW 155 KCAS) OR 40° (BELOW 120 KCAS)
2. Airspeed ..... PER SECTION 6 APPROPRIATE FOR WEIGHT AND FLAP SETTING
3. Ignition Switches ..... AUTO (If Auto-Ignition installed) (Ignition Annunciator Lights extinguished)

   or ..... AS REQUIRED (If Auto-Ignition not installed)

CAUTION

CONTINUOUS IGNITION SHALL BE SELECTED TO **ON** WHERE THERE IS WATER, SLUSH OR SNOW ON THE RUNWAY. (IF AUTO-IGNITION NOT INSTALLED)

BEFORE LANDING (CONT)

4. Windshield Heat ..... LOW
R 5. Anti-Ice Systems ..... AS REQUIRED
R 5A. Deice Systems ..... OFF
R
R
R
R
R
R
R

NOTE

If Wing deice system is in Automatic mode during approach, cycle system OFF then ON to allow one additional cycle, then select the system OFF prior to landing.

6. Landing Gear ..... RECHECK DOWN AND LOCKED
7. Condition Levers ..... RECHECK TAKEOFF LAND

NOTE

Approach speeds should not be below those specified in Section 6 until landing flare.

LANDING

1. Power Levers ..... SLOWLY RETARD TO FLIGHT IDLE

NOTE

When landing in a crosswind, center the rudder pedals just prior to nose gear touchdown.

AFTER TOUCHDOWN

Maintain directional control by rudder pedals and differential braking if necessary

1. Power Levers ..... GROUND IDLE
2. **BETA RANGE** Annunciators ..... ILLUMINATED

CAUTION

ENSURE BOTH **BETA RANGE** ANNUNCIATORS ARE ILLUMINATED BEFORE SELECTING REVERSE OR UNSYMMETRICAL REVERSE THRUST MAY RESULT. NOSE WHEEL MUST BE ON THE GROUND AND AIRSPEED BELOW 90 KCAS BEFORE SELECTING REVERSE.

3. Power Levers ..... REVERSE (AS REQUIRED)
4. Power Levers ..... GROUND IDLE WHEN REVERSING COMPLETED

CAUTION

DO NOT RETARD CONDITION LEVERS BELOW TAKEOFF LAND POSITION UNLESS POWER LEVERS ARE OUT OF REVERSE.

5. Ignition Switches ..... OFF

CAUTION

DO NOT USE IGNITION SWITCH IN AUTO POSITION WHEN THE CONDITION LEVER IS AT TAXI.

6. Condition Levers ..... TAXI (after completion of landing ground roll)

AFTER LANDING CHECKLIST

1. Anti-ice and Deice Systems ..... OFF
2. Flaps ..... UP
3. Landing Lights/Taxi Lights ..... AS REQUIRED
4. Strobe Lights ..... OFF

STOPPING ENGINES

1. Parking Brake ..... SET
2. Cabin Air Selector Switch ..... OFF
3. Radio Master Switches ..... OFF
4. Cabin Sign ..... OFF
5. Power Levers ..... GROUND IDLE
6. Run-Crank-Stop Switches ..... STOP AND HOLD UNTIL 50% RPM

NOTE

Engine rpm and EGT will increase momentarily after placing Run-Crank-Stop Switch to STOP.

STOPPING ENGINES (CONT)

7.	Power Levers	MOVE POWER LEVERS TO REVERSE POSITION AS ENGINE RPM DECELERATES TO 50% TO POSITION PROPELLERS ON LOCKS
8.	DC Generator Switches	OFF
9.	Inverter Switch	OFF
10.	Start Selector Switch	AIR START AND SAFE
11.	All Other Switches (except main Fuel Valves and SRL Switches) .	OFF
12.	Flight Control Lock	INSTALL
13.	Oxygen Outlet Valve	CLOSED
14.	Oxygen Cylinder Valve	CLOSED
15.	Engine Ground Plugs	INSTALL (if necessary, after cooldown)

TURNAROUND

If engine restarts are anticipated in 10 to 45 minutes

1. Park airplane into wind if possible
2. Manually turn engine rotating group in direction of normal rotation occasionally to minimize thermal distortion

NOTE

One blade width movement turns rotating group about 180°

3. Continue these procedures until engine restart required

CAUTION

DO NOT ATTEMPT TO START AN ENGINE WITH THERMAL DISTORTION.
R ACCELERATION MAY STAGNATE BETWEEN THE 18% to 28% RPM RANGE ACCOMPANIED BY A RAPID INCREASE IN EGT. ENGINE ROTATING GROUP DAMAGE MAY OCCUR.

R FEATHER VALVE CHECK

R
R NOTE
R
R This check must be performed prior to the first flight
R of the day and before every flight during which an
R intentional engine shutdown is planned. This check must
R also be performed before every flight after feathering
R linkage was adjusted and/or maintenance of the feather-
R ing system was conducted.
R
R 1. Left Unfeather Switch ..... PRESS AND HOLD
R LH BETA RANGE LIGHT ILLUMINATES.
R
R 2. Left Condition Lever ..... EMERGENCY STOP
R LH BETA RANGE LIGHT EXTINGUISHES.
R
R 3. Left Condition Lever ..... TAXI
R LH BETA RANGE LIGHT ILLUMINATES.

FEATHER VALVE CHECK (CONT)

R 4. Left Unfeather Switch ..... RELEASE
R LH BETA RANGE LIGHT EXTINGUISHES.
R
R 5. Repeat Steps 1 through 4 for Right Engine.
R
R
R
R
R
R
R
R
R

WARNING

IF THE BETA RANGE LIGHT DOES NOT EXTINGUISH OR DOES NOT ILLUMINATE AS REQUIRED DURING THE ABOVE PROCEDURE, ENGINE START SHOULD NOT BE ATTEMPTED UNTIL MAINTENANCE HAS BEEN CONDUCTED ON THE AIRCRAFT TO CORRECT THE DISCREPANCY.

STARTING ENGINES AND NEGATIVE TORQUE SENSOR CHECK (NTS)(FIRST FLIGHT OF THE DAY)

NTS check must be performed the first flight of the day and any time intentional engine shutdowns are to be performed. The NTS must also be checked after maintenance or system adjustment.

The airplane series-parallel battery power or an Auxiliary Power Unit (APU) is utilized for engine starts.

Source Selection:

1. OAT +10°C or Less ..... APU RECOMMENDED
2. Battery Temperature Above 120°F . APU REQUIRED

APU Starts:

The APU must be regulated to 28 VDC and capable of 16 VDC, 800 amps during start cycle. The Battery Select Switch must be parallel for the APU to come on line.

STARTING ENGINES AND NEGATIVE TORQUE SENSOR CHECK (NTS)(FIRST FLIGHT OF THE DAY) (CONT)

Battery Starts:

1. Battery Select Switch ..... SERIES OR PARALLEL (OAT +10°C OR LESS, SERIES RECOMMENDED)
2. Battery Temperature ..... MONITOR BATTERY TEMPERATURE INDICATOR

If Parallel Start Selected:

a. Battery Temperature Above 120°F ..... APU REQUIRED
b. BAT TEMP 120° Annunciator Illuminates ..... MONITOR
c. Battery Temperature Rises to 140°F ..... ISOLATE BATTERY
d. Remaining Battery Temperature Rises to 150°F ..... ABORT START

CAUTION

INDICATOR HOT LIGHT, BATT OVER TEMP AND MASTER CAUTION ANNUNCIATORS ILLUMINATE WHEN THE BATTERY TEMPERATURE REACHES 150°F.

If Series Start Selected:

a. BAT TEMP 120° Annunciator Illuminates ..... MONITOR
b. Battery Temperature Rises to 150°F ..... ABORT START

CAUTION

ABORT IS RECOMMENDED BUT NOT REQUIRED AT 140°F.

APU or BATTERY

3. Main Fuel Valve Switches ..... OPEN
4. SRL Switches ..... ON
5. Propellers ..... ON LOCKS

NOTE

If the propeller is feathered, place the Power Lever in REVERSE and hold the Unfeather Switch until the blades reach the lock position.

6. Power Levers ..... SLIGHTLY FORWARD OF FLIGHT IDLE
7. Both Run-Crank-Stop ..... RUN
8. Auto-Ignition ..... CHECK
   (If Auto-Ignition System installed)
   a. Ignition Switches ..... AUTO
      (Ignition Annunciator Lights illuminated)

STARTING ENGINES AND NEGATIVE TORQUE SENSOR CHECK (NTS)(FIRST FLIGHT OF THE DAY)

R b. Ignition Switches ..... CONT
R (Ignition Annunciator Lights illuminated)
R c. Ignition Switches ..... OFF
R (Ignition Annunciator Lights extinguished)
R 9. Start Selector Switch ..... LH GND START or RH GND START

On Engine to be Started:

10. Unfeather Switch ..... PRESS AND HOLD
    a. **BETA RANGE** Annunciator ..... ILLUMINATES
11. Engine Start Switch ..... PRESS AND HOLD WHILE OBSERVING **BETA RANGE** LIGHT
    a. **BETA RANGE** Annunciator ..... EXTINGUISHES as engine rotation starts
    b. Continue to hold unfeather switch.
12. Ignition Annunciator and EGT Rise ..... RELEASE ENGINE START SWITCH
    a. **SRL FAIL** Annunciator ..... EXTINGUISHES ABOVE 14% RPM
    b. Exhaust Gas Temperature ..... MONITOR
    c. Within 10 seconds past 10% RPM or by 20% RPM ..... INDICATED COMBUSTION or Place Run-Crank-Stop Switch to STOP
13. Illumination of **BETA RANGE** Annunciator ..... RELEASE UNFEATHER SWITCH

NTS System check is satisfactory if

a. **BETA RANGE** Annunciator extinguishes as engine starts to rotate.
b. **BETA RANGE** Annunciator illuminates at 18% to 30% rpm (maybe as late as 40% rpm).

CAUTION

IF NTS CHECK IS UNSATISFACTORY, CONTINUE START. WARM OIL TO NORMAL RANGE (55°C MINIMUM) THEN SHUT DOWN AND PERFORM CHECK AGAIN. IF NTS CHECK IS AGAIN UNSATISFACTORY, FLIGHT SHALL NOT BE ATTEMPTED UNTIL MALFUNCTION IS CORRECTED.

NOTE

The **BETA RANGE** annunciator should not illuminate before 10% RPM and may blink between 10% and 40% RPM, but must be illuminated by 40% RPM. Releasing the Unfeather switch and moving the Power Lever slightly forward of GROUND IDLE after steady illumination of the **BETA RANGE** annunciator may cause the **BETA RANGE** annunciator to blink.

WARNING

IF ENGINE FAILS NTS CHECK, CORRECT PRIOR TO FLIGHT.

STARTING ENGINES AND NEGATIVE TORQUE SENSOR CHECK (NTS)(FIRST FLIGHT OF THE DAY)

14. Power Lever
(engine being started) ..... SLIGHTLY ABOVE GROUND IDLE
a. Above 25% RPM with Slow Acceleration if EGT is below 700°C ..... USE FUEL ENRICHMENT SWITCH
b. Prior to 50% RPM ..... INCREASING OIL PRESSURE or Place Run-Crank-Stop Switch to STOP
c. 60% RPM, End of Ignition, Engine Start Indicator Light ..... EXTINGUISHES, if ILLUMINATED Place Run-Crank-Stop Switch to STOP

CAUTION

IF ANY MALFUNCTION OCCURS, ENGINE STOPS, OR RPM STAGNATES PRIOR TO 40% RPM DURING STARTING PROCEDURES, SHUT DOWN ENGINE IMMEDIATELY BY PLACING CONDITION LEVER IN EMERGENCY STOP POSITION.

IF EGT RAPIDLY APPROACHES 770°C DURING START, POSITION THE CONDITION LEVER TO EMERGENCY STOP. RESTART SHOULD NOT BE TRIED UNTIL EGT DROPS BELOW 200°C, COOL AND CLEAR ENGINE WITH CRANKING PROCEDURE SECTION 5.

NOTE

R If fuel is not ignited when attempting engine start, crank engine to expel fuel before attempting start again. Observe starter motor limit. Use Cranking Procedure, Section 5.

Above 25% RPM, slow acceleration may indicate failure of auto-start system.

Auto-start system will automatically enrich the start fuel schedule to maintain a constant EGT of approximately 690-700°C throughout the start. However, other parameters may influence and cause start temperature to vary, such as engine temperature, tail wind or weak batteries.

15. Engine RPM ..... STABILIZE AT 76.5% TO 78.5%
16. **SRL FAIL** Annunciator ..... EXTINGUISHED
17. Engine Instruments ..... CHECK
18. APU Start
a. Other Engine ..... START, REPEAT SEQUENCE (Steps 9 through 17)
b. After Start, APU ..... DISCONNECTED
c. Battery Key Switch ..... ON, MONITOR TEMPERATURE (Maximum 140°F)
d. Generator Switches ..... ON, MONITOR CHARGE RATE (Maximum 200 AMPS)

STARTING ENGINES AND NEGATIVE TORQUE SENSOR CHECK (NTS)(FIRST FLIGHT OF THE DAY)

R 19. Battery Start

a. Operating Engine Generator
Switch ..... ON

If charging rate in excess of 200 amps

b. Both Generator Switches ..... ON (equalize circuits energized)

When charging rate is less than 100 amps

c. Inoperative Engine
Generator ..... OFF

d. Operating Engine Condition
Lever ..... SET TO TAKEOFF LAND

e. Charge Rate ..... 200 AMPS MAXIMUM

f. Battery Temperature ..... 140° F MAXIMUM

When charging rate is less than 100 amps

g. Operating Engine Condition
Lever ..... TAXI

h. Both Generator Switches ..... OFF

CAUTION

DO NOT ATTEMPT ANOTHER BATTERY START IF BAT TEMP 120° F ANNUNCIATOR IS ILLUMINATED. SHUT DOWN AND CORRECT PROBLEM PRIOR TO FLIGHT.

R i. Other Engine ..... START, REPEATING SEQUENCE (Steps 9 through 17)

R 20. Start Selector Switch ..... AIR START AND SAFE

R 21. Generator Switches ..... EITHER LH OR RH ON. CHECK FOR 28.5 +1.0/-1.5 VOLTS ON BOTH VOLTMETERS THEN BOTH ON. CHECK FOR 28.5 +1.0/-1.5 VOLTS ON BOTH VOLTMETERS

CAUTION

IF EITHER VOLTMETER INDICATES BATTERY VOLTAGE (22-24 VOLTS) INSTEAD OF GENERATOR VOLTAGE (28.5 + 1.0/-1.5 VOLTS), THE 200 AMP BUS TIE CIRCUIT BREAKER IS OPEN AND MALFUNCTION MUST BE CORRECTED PRIOR TO FLIGHT.

OVERSPEED GOVERNOR CHECK (FIRST FLIGHT OF DAY)

Perform prior to the first flight of the day and for any flight when air starts are anticipated. The Overspeed Governor must also be checked after control system adjustment, maintenance, and for indication of malfunction.

Follow STARTING ENGINES procedures before checking

1. Condition Lever ..... TAKEOFF LAND (Propellers must be on locks)
2. Power Lever ..... FLIGHT IDLE
3. Power Lever ..... SLOWLY ADVANCE TOWARD TAKEOFF POSITION UNTIL ENGINE SPEED IS STABILIZED

NOTE

If torque, EGT and fuel flow increase, and RPM remains constant as power lever is advanced, propeller is not on the locks. Shutdown the engine and restart, carefully placing the power lever forward of the GROUND IDLE position to prevent start lock disengagement.

4. Engine Speed ..... OVERSPEED GOVERNOR SHOULD REGULATE ENGINE SPEED BETWEEN 103.0% TO 105.0% RPM

CAUTION

IF ENGINE SPEED REACHES 106% RPM, MOVE POWER LEVER TO FLIGHT IDLE POSITION IMMEDIATELY, THEN SHUT DOWN ENGINES AND ADJUST OVERSPEED GOVERNOR SETTING BEFORE PROCEEDING WITH FLIGHT.
LIMIT OPERATION AT SPEEDS OVER 101% RPM TO THE MINIMUM NECESSARY TO MAKE OVERSPEED GOVERNOR CHECK.

DO NOT EXCEED 106% RPM AT ANY TIME.

5. Repeat for other engine

R **SUPPLEMENTAL NTS CHECK (FIRST FLIGHT OF DAY)**

R Perform prior to the first flight of the day or for any flight when air starts are anticipated. The Supplemental
R NTS check must also be checked after fuel control system adjustment or propeller governor maintenance.
R
R Follow STARTING ENGINES and NEGATIVE TORQUE SENSOR CHECK procedure before checking
R 1. Propellers ..... REMOVE FROM START LOCKS
R 2. Condition Lever ..... TAXI
R 3. Power Lever ..... ADVANCE UNTIL BETA RANGE ANNUNCIATOR EXTINGUISHES

SUPPLEMENTAL NTS CHECK (FIRST FLIGHT OF DAY)(CONT)

Supplemental NTS check is satisfactory if,

a. BETA RANGE Annunciator extinguishes
b. Torque increases
R c. RPM stabilizes at or below 96%

WARNING

IF ENGINE FAILS ANY PART OF THE SUPPLEMENTAL NTS CHECK, CORRECT PRIOR TO FLIGHT PER ENGINE MANUAL.

4. Power Lever..... RETARD to GROUND IDLE
5. Repeat for other engine

CRANKING

Complete BEFORE STARTING ENGINES Checklist Before Using This Procedure

1. Battery Select Switch ..... PARALLEL or SERIES
2. Main Fuel Valve Switches ..... OPEN
3. Run-Crank-Stop Switch ..... CRANK
4. Start Selector Switch ..... LH GND START or RH GND START
5. Engine Start Switch ..... PRESS and HOLD

NOTE

Release starter when rpm stagnates. Allow rotation to stop before attempting another CRANKING.

CAUTION

DO NOT EXCEED STARTER DUTY CYCLE LIMITS.

FEATHERING OPERATION

CAUTION

IF PRACTICE ENGINE SHUTDOWNS AND AIRSTARTS ARE PLANNED, OVERSPEED GOVERNOR (OSG) AND NEGATIVE TORQUE SENSOR (NTS) CHECKS MUST BE ACCOMPLISHED PRIOR TO FLIGHT.

WARNING

INTENTIONAL SIMULATED ENGINE FAILURES SHOULD NOT BE ACCOMPLISHED AT SPEEDS LESS THAN 125 KCAS.

FEATHERING OPERATION (CONT)

On Engine to be Shutdown:

1. Synchrophaser ..... OFF
2. Power Lever ..... FLIGHT IDLE
3. DC Generator Switch ..... OFF
4. Run-Crank-Stop Switch ..... STOP (HOLD TO 50% RPM)
5. Condition Lever ..... EMERGENCY STOP (AT 30% RPM)
6. Run-Crank-Stop Switch ..... RUN

NOTE

The feathered propeller should not rotate any significant amount between 120 KTS and 180 KTS. If windmilling exceeds 5% RPM reduce airspeed (if feasible). If windmilling is in a reverse direction increase airspeed (if feasible).

CAUTION

DO NOT ALLOW FEATHERED ENGINE TO ROTATE IN A REVERSE DIRECTION.

Engine Cooldown: (If EGT is above 200°C)

If a prolonged shutdown is anticipated, some propeller windmilling (below 5% RPM) is desirable to equalize cooling and the following is permissible if propeller is not rotating:

7. Condition Lever ..... MINIMUM CRUISE DETENT
8. Unfeather Switch ..... PRESS AS REQUIRED TO ACHIEVE MINIMUM WINDMILL - MAXIMUM 5% RPM UNTIL EGT IS BELOW 200°C

CAUTION

AVOID OPERATION BETWEEN 18% AND 28% RPM EXCEPT FOR TRANSIENTS OCCURING DURING ENGINE START AND SHUTDOWN.

When EGT is Below 200°C or if RPM exceeds 5%

9. Condition Lever ..... EMERGENCY STOP

WARNING

PLACE SHUTDOWN ENGINE POWER LEVER AND CONDITION LEVER IN CORRECT POSITION FOR AIRSTART AS SOON AS POSSIBLE SHOULD AN IMMEDIATE RESTART BE REQUIRED.

SYSTEM OPERATION

SYNCHROPHASER

NOTE

Do not operate synchrophaser during takeoff and landing.

1. Engines ..... SYNCHRONIZE MANUALLY (99.5% Maximum)
2. Synchrophaser Control Switch ..... ON
3. To Change Blede Relationship
   Between Propellers ..... ADJUST PHASE SELECT AS NECESSARY

CAUTION

TURN SYNCHROPHASER OFF PRIOR TO MOVING CONDITION LEVERS TO PREVENT RPM SURGE ON BOTH ENGINES. TO CHANGE RPM SETTING, MOVE CONDITION LEVERS AND SYNCHRONIZE MANUALLY, THEN TURN SYNCHROPHASER ON.

NOTE

Failure to maintain synchronization indicates trim has reached its limit. When the switch is OFF, the trim will return to the center position.
The phase select allows changes of blade relationship, for noise control, between propellers while synchronized.

ENGINE CONTINUOUS IGNITION SYSTEM (If Auto-Ignition System is not installed)

The continuous ignition system, which operates engine ignition manually, shall be selected to ON during takeoff, landing or flight in severe weather conditions especially all operations in actual or potential icing conditions described herein and where there is water, slush or snow on the runway.

CONTINUOUS IGNITION SWITCHES SHOULD BE ON :

1. During takeoff and climb out in actual or potential icing conditions.
2. When ice is visible on, or shedding from propeller(s), spinner(s), or leading edge(s).
3. Before selecting ANTI-ICE, when ice has accumulated.
4. Immediately, anytime engine flameout occurs as a possible result of ice ingestion.
5. During approach and landing while in or shortly following flight in actual or potential icing conditions or where there is water, slush or snow on the runway.

NOTE

Potential icing conditions in precipitation or visible moisture meteorological conditions ;

R 1. Begin when the OAT is plus 10 degrees C (plus 50 degrees F) or colder, and
2. End when the OAT is plus 10 degrees C (plus 50 degrees F) or warmer.

SYSTEM OPERATION (CONT)

ENGINE CONTINUOUS IGNITION SYSTEM (CONT)

R OPERATION
R (1) Continuous Ignitions - ON
R (2) Both Indicator Lights - ILLUMINATED
R
R RECOMMENDED DUTY CYCLES
R Applicable to 868962-1/-2 Ignition Unit
R (Engine not modified by GTEC S/B TPE/TSE 331-74-0003)
R
R 1 Minute Cycles
R First Cycle - 1 Minute ON - 1 Minute OFF
R Repetitive Cycles - 1 Minute ON - 1 Minute OFF
R
R 2 Minute Cycles
R First Cycle - 2 Minutes ON - 2 Minutes OFF
R Repetitive Cycles - 2 Minutes ON - 23 Minutes OFF
R
R 5 Minute Cycles
R First Cycle - 5 Minutes ON - 55 Minutes OFF
R Repetitive Cycles - 5 Minutes ON - 55 Minutes OFF
R
R Applicable to 868962-3 Ignition Unit
R (Engine modified by GTEC S/B TPE/TSE 331-74-0003 and not modified by GTEC S/B TPE/TSE
R 331-75-0004)
R Up to one hour continuous duty. The total ON cannot exceed one hour without one hour OFF.
R The one hour ON can be either continuous or intermittent.
R
R (Engine modified by GTEC S/B TPE/TSE 331-74-0003 and GTEC S/B TPE/TSE 331-75-0004)
R Above +50 degrees F (+10°C) ambient temperature.
R Up to one hour continuous duty. The total ON cannot exceed one hour without one hour
R OFF. The one hour ON can be either continuous or intermittent.
R
R Below +50 degrees F (+10°C) ambient temperature.
R Continuous.
R
R **CAUTION**
R OPERATIONAL TIMES IN EXCESS OF THE DUTY CYCLE WILL DECREASE
R THE LIFE OF IGNITERS AND IGNITION UNIT.

SYSTEM OPERATION (CONT)

AUTO-IGNITION SYSTEM (If Auto-Ignition System is installed)

1. The Ignition System is activated by a torque pressure switch sensing the high pressure output of the hydraulic torque sensor. If the engine flames out, the torque pressure drops rapidly below the torque switch set point, thus turning on the ignition. Following relight, the ignition is deactivated as the torque pressure goes above the switch set point pressure. The system is deactivated unless the CRANK-RUN-STOP switch is in the "RUN" position.
2. During ignition operation, the yellow LH IGNITION or RH IGNITION annunciator is illuminated.
3. The Auto-Ignition System shall be placed in AUTO for all normal flight conditions.
4. R R R The Auto-Ignition System shall be placed in CONT (within duty cycle limitations) for all flight in icing conditions. This operation shall be conducted prior to turning on the engine intake anti-ice switch especially if inadvertent icing is encountered.

AUTOMATIC OPERATION

1. Ignition Switches ..... AUTO
2. Annunciator Lights ..... EXTINGUISHED

NOTE

The ignition annunciators may illuminate under some low power conditions. Increase power as required to extinguish the annunciators.

CONTINUOUS OPERATION

1. Ignition Switches ..... ON
2. Annunciator Lights ..... ILLUMINATED

CAUTION

OPERATIONAL TIMES IN EXCESS OF THE DUTY CYCLE WILL DECREASE THE LIFE OF IGNITORS AND IGNITION UNIT.

FUEL TRANSFER SYSTEM

AUTO FUEL FEED

1. L and R Fuel Transfer Switches ..... AUTO

NOTE

If the tip and outer tanks contain fuel, all fuel will automatically feed to the main tank. When the tip tanks and the outer tanks are empty, the **LH** and **RH OUTER FUEL EMP** lights will illuminate.

Both tip tanks must be empty before the outer tanks will begin to transfer.

SYSTEM OPERATION (CONT)

FUEL TRANSFER SYSTEM (CONT)

2. Appropriate Fuel Transfer Control Switch ..... OFF

NOTE

Extended cruise above 25,000 feet may result in a small amount of residual fuel in the tip tanks. This is due to the nose up pitch attitude associated with high altitude flight. To recover the fuel, place the Tip Tank Manual switches ON during descent at near level attitude.

AIR CONDITIONING AND PRESSURIZATION SYSTEM

HEATING/COOLING/PRESSURIZATION

1. Manual Pressure Control Valve ... FULL INCREASE
2. Auto-Manual Selector Switch ..... AUTO
3. Cabin Supply Air Temperature Selector ..... AS DESIRED
4. Cabin Air Selector Switch ..... BOTH (LH OR RH AS DESIRED)
5. Cabin Altitude Selector Knob .... AS DESIRED
6. Cabin Rate Control Knob ..... AS DESIRED
7. Cabin Air Outlet Select Switch .. AS DESIRED (CEILING OR FLOOR)
8. Forward Conditioned Air Outlet Knob ..... NORMAL

MAXIMUM COOLING

1. Cabin Supply Air Temperature Selector ..... FULL COLD (or Auto-Manual Selector Switch ..... MANUAL COLD)
2. Air Outlets ..... OPEN

MAXIMUM HEATING

1. Cabin Supply Air Temperature Selector ..... FULL HOT (or Auto-Manual Selector Switch ..... MANUAL HOT)
2. Air Outlets ..... OPEN

SYSTEM OPERATION (CONT)

AIR CONDITIONING AND PRESSURIZATION SYSTEM (CONT)

FORCED VENTILATION

1. Cabin Air Selector Switch ..... BOTH
2. Manual Pressure Control Valve ... DECREASE

NOTE

R Cabin differential pressure will reduce in proportion to the position of the control valve.

RAM AIR VENTILATION

1. Manual Pressure Control Valve ... DECREASE UNTIL CABIN DEFFERENTIAL PRESSURE IS ZERO
2. Auto-Manual Selector Switch ..... OFF
3. Cabin Air Selector Switch ..... RAM

CAUTION

USE OF OXYGEN IS RECOMMENDED ABOVE 15,000 FEET PRESSURE ALTITUDE.

SYSTEM OPERATION (CONT)

AIR CONDITIONING AND PRESSURIZATION SYSTEM (CONT)

WINDSHIELD DEFOG SYSTEM

1. Cabin Air Selector Switch ..... BOTH
2. Forward Conditioned Air Outlet Knob ..... DEFOG

If sufficient defogging cannot be obtained:

3. Cabin Supply Air Temperature Selector ..... FULL HOT
   (or Auto-Manual Selector Switch. MANUAL HOT)

OXYGEN SYSTEM

PILOT, COPILOT, 9-PASSENGERS MAXIMUM

WARNING

IF THE VALVE ON THE OXYGEN CYLINDER IS CLOSED, NO OXYGEN CAN BE SUPPLIED TO THE MASK OUTLETS. PRESSURE MAY BE INDICATED ON THE REGULATOR GAUGE IN THE COCKPIT WITH THE OXYGEN VALVE CLOSED. CHECK PRIOR TO FLIGHT.

SYSTEM USAGE

1. Cockpit Outlet Valve ..... FULL OPEN
2. Oxygen Mask ..... INSERT HOSE IN OUTLET, ROTATE 1/4 TURN CLOCKWISE TO DETENT POSITION AND DON MASK
3. Flow Indicator ..... CONFIRM OXYGEN FLOW BY ABSENCE OF RED LINE INDICATOR IN HOSE

CAUTION

IF THE RED LINE INDICATOR IS VISIBLE, OXYGEN IS NOT BEING SUPPLIED. RECHECK VALVES AND HOSE CONNECTIONS.

ENSURE NO IGNITION SOURCES ARE PRESENT DURING OXYGEN USE (I.E. SMOKING MATERIALS, OILY RAGS AND/OR CLOTHES, OPEN FLAMES).

AFTER USING

1. Cockpit Outlet Valve ..... CLOSE
2. Oxygen Mask ..... DISCONNECT
3. Oxygen Cylinder Shutoff Valve .... CLOSE (after landing)

SYSTEM OPERATION (CONT)

OXYGEN SYSTEM (CONT)

OXYGEN DURATION CHART - 22 CU. FT. CYLINDER (622 LITERS)

PERSONS USING	DURATION IN HRS. AND MIN. AT FOLLOWING ALTITUDES			
	15,000 FT	20,000 FT	25,000 FT	31,000 FT
1	4 hr. 13 min.	3 hr. 22 min.	2 hr. 50 min.	2 hr. 27 min.
2	2 hr. 6 min.	1 hr. 41 min.	1 hr. 25 min.	1 hr. 13 min.
3	1 hr. 24 min.	1 hr. 7 min.	56 min.	49 min.
4	1 hr. 3 min.	50 min.	42 min.	36 min.
5	50 min.	40 min.	34 min.	29 min.
6	42 min.	33 min.	28 min.	24 min.
7	36 min.	28 min.	24 min.	21 min.
8	31 min.	25 min.	21 min.	18 min.
9	29 min.	22 min.	18 min.	16 min.
10	25 min.	20 min.	17 min.	14 min
11	23 min.	18 min.	15 min.	13 min.

PITOT AND STATIC ANTI-ICE SYSTEM

Preflight and Inflight Operation - Prior to Flight Into Known Icing Conditions

1. Pitot & Static Anti-Ice Switches . ON
2. Loadmeter Select Switch ..... LH PITOT AND STATIC POSITION
3. Loadmeter ..... OPERATING RANGE - .50 TO .85
4. Loadmeter Select Switch ..... RH PITOT AND STATIC POSITION
5. Loadmeter ..... OPERATING RANGE - .50 TO .85

CAUTION

MAXIMUM 10 SECONDS OPERATION DURING GROUND PREFLIGHT.

6. Pitot & Static Anti-Ice Switches . OFF. AS REQUIRED IN FLIGHT

SYSTEM OPERATION (CONT)

STALL WARNING ANTI-ICE SYSTEM

Preflight and Inflight Operation - Prior to Flight Into Known Icing Conditions

1. Stall Vane Anti-Ice Switch ..... ON
2. Loadmeter Select Switch ..... STALL VANE
3. Loadmeter ..... OPERATING RANGE - .30 TO .70

CAUTION

MAXIMUM 10 SECONDS OPERATION DURING GROUND PREFLIGHT.

ICE ACCUMULATION ON THE WING DEICE BOOT MAY DISRUPT AIR FLOW OVER THE STALL VANE AND PREVENT THE SYSTEM FROM PROVIDING ACCURATE STALL WARNING.

4. Stall Vane Anti-Ice Switch ..... OFF. AS REQUIRED IN FLIGHT

PROPELLER ANTI-ICE SYSTEM

CAUTION

DO NOT CHECK PROPELLER ANTI-ICE SYSTEM UNTIL AFTER ENGINE START.

Preflight and Inflight Operation - Prior to Flight Into Known Icing Conditions

1. Prop Deice Switches ..... ON
2. Loadmeter Select Switch ..... POSITION TO LH PROP
3. Loadmeter ..... OPERATING RANGE - .85 TO 1.05
4. Loadmeter Select Switch ..... POSITION TO RH PROP
5. Loadmeter ..... OPERATING RANGE - .85 TO 1.05

NOTE

The loadmeter will fluctuate in about 30 second cycles as power shifts to heater mats on other blades.

6. Prop Deice Switches ..... OFF. AS REQUIRED IN FLIGHT

ENGINE INTAKE AND OIL COOLER AIR INTAKE ANTI-ICE SYSTEMS

CAUTION

DO NOT CHECK UNTIL AFTER ENGINE START.

SYSTEM OPERATION (CONT)

ENGINE INTAKE AND OIL COOLER AIR INTAKE ANTI-ICE SYSTEM (CONT)

Preflight and Inflight Operation - Prior to Flight Into Known Icing Conditions

1. Engine Intake Anti-Ice Switches ..... ON
   a. Indicator Lights ..... ILLUMINATE

CAUTION

R MAXIMUM 10 SECONDS OPERATION FOR TEST PURPOSES WHEN THE
R OAT IS 10°C (50 ° F) OR HIGHER.

NOTE

R This is true whether visible moisture is present or not.

2. Oil Cooler Inlet Anti-Ice Switches ..... ON
   a. Indicator Lights ..... ILLUMINATE

CAUTION

MAXIMUM 10 SECONDS OPERATION DURING GROUND PREFLIGHT.

3. Engine Intake and Oil Cooler
   Anti-Ice Switches ..... OFF. AS REQUIRED IN FLIGHT

HEATED WINDSHIELD ANTI-ICE SYSTEM

PREFLIGHT CHECK

Preflight check cannot be performed when OAT is above 38.5°C or if the windshields have been exposed to direct sunlight for extended periods.

1. Windshield Heat Low Switches ..... ON
   a. Overhead Panel Indicator Lights ..... ILLUMINATED
2. After Indicator Lights Cycle, Hi Heat Switches .. ON
   a. Instrument Panel Hi Heat Indicator Lights .... ILLUMINATED

NOTE

Heating may be confirmed by touching windshield.
Windshield Heat Low Switches in the overhead panel must be ON for the Hi Heat switches in the control wheels to be operational.
The overhead panel indicator light will cycle as the windshield reaches operational temperature for Low and Hi Heat modes.
Instrument panel Hi Heat Indicator Lights do not cycle.

SYSTEM OPERATION (CONT)

HEATED WINDSHIELD ANTI-ICE SYSTEM (CONT)

3. All Windshield
   Anti-Ice Switches ..... OFF

INFLIGHT OPERATION

Windshield heat shall be on LOW for all normal flight operations.

1. Windshield Heat Low Switches,
   LH and RH ..... ON
2. If ice forms, Hi Heat Switches ... ON (L or R as Required)
3. When ice is removed, Hi Heat
   Switches ..... OFF

When clear of icing conditions

1. Windshield Heat Low Switches
   LH and RH ..... ON

CAUTION

WINDSHIELD HI HEAT FOR ICE REMOVAL ONLY.
STANDBY COMPASS INDICATION IS NOT CORRECT WHEN THE WINDSHIELD HEAT IS ON.

WING AND EMPENNAGE DEICE SYSTEM

PREFLIGHT CHECK (AFTER STARTING ENGINES)

1. Wing Deice Switch ..... ON
2. Inflation and Deflation of
   Boots ..... VISUAL CHECK
   a. Wing Deice Indicator Light ... ILLUMINATES (During Inflation)
3. Wing Deice Switch ..... OFF

INFLIGHT OPERATION

1. Wing Ice Light Switch ..... ON (at night)
2. At the first sign of ice formation anywhere on the aircraft, or upon annunciation from an ice detector system, whichever occurs first, Wing Deice Switch ..... ON
   a. Indicator Light ..... ILLUMINATES (During Inflation)

NOTE

System will cycle at approximately three minute intervals, with indicator light illuminating during boot inflation.

3. Ice Accumulation on Wing Leading Edge ..... MONITOR
4. Wing Deice Switch ..... OFF AFTER LEAVING ICING CONDITIONS AND AIRCRAFT IS CLEAR OF ACCUMULATED ICE

SYSTEM OPERATION (CONT)

WING AND EMPENNAGE DEICE SYSTEM (CONT)

SEVERE ICING CONDITIONS

1. Wing Deice Switch ..... MANUALLY CYCLE - 6 SECONDS ON, 10 SECONDS OFF

NOTE

Manual cycles more frequent than above will decrease deice boot capability.

R
R
R
2. Wing Deice Switch ..... OFF AFTER LEAVING ICING CONDITIONS AND AIRCRAFT IS CLEAR OF ACCUMULATED ICE

BLENING ANTI-ICE ADDITIVE TO FUEL

Approved fuel system icing inhibitor conforming to MIL-I-27686 must be added to the fuel in all tanks, unless fuel is premixed. The icing inhibitor must be added during refueling to be soluble in the fuel, but not in excess of 0.15% maximum by volume.

Premixed fuel containing icing inhibitor is available and caution must be exercised so that additional icing inhibitor is not added. When using premixed fuel, disregard the following procedures.

BLENDING PROCEDURES

CAUTION

JP-4 FUEL PER MIL-T-5624 HAS ANTI-ICING ADDITIVE PER MIL-I-27686 BLENDED IN THE FUEL AT THE REFINERY AND NO FURTHER TREATMENT IS NECESSARY. SOME FUEL SUPPLIERS BLEND ANTI-ICING ADDITIVE IN THEIR STORAGE TANKS. PRIOR TO REFUELING, CHECK WITH THE FUEL SUPPLIER TO DETERMINE WHETHER OR NOT THE FUEL HAS BEEN BLENDED. TO ASSURE PROPER CONCENTRATION BY VOLUME OF FUEL ON BOARD, BLEND ONLY ENOUGH ADDITIVE FOR THE UNBLENDED FUEL.

WARNING

HI-FLO PRIST MAY BE HARMFUL IF INHALED OR SWALLOWED. USE ADEQUATE VENTILATION. AVOID CONTACT WITH SKIN AND EYES. IF SPRAYED INTO EYES, FLUSH WITH LARGE AMOUNTS OF WATER AND CONTACT A PHYSICIAN IMMEDIATELY.

BLENDING ANTI-ICE ADDITIVE TO FUEL (CONT)

BLENDING PROCEDURES (CONT)

1. Using HI-FLO PRIST blender manufactured by PPG INDUSTRIES, INC., remove actuator cap.
2. Press valve button (attached to tube and clip assembly) into valve on top of can.
3. Reattach actuator cap by positioning onto can.
4. Place clip with tubing onto fuel nozzle.
5. To start flow, press actuator down fully. To stop flow, press tilt to side and return to normal position.
6. Use can upright and start flow of PRIST after refueling begins (refueling should be at a minimum rate of 30 gal/min. to a maximum of 60 gal/min.). A rate of less than 30 gal/min. may be used when topping off tanks.
7. Stop flow of PRIST a moment before refueling stops.

CAUTION

ASSURE THAT THE ADDITIVE IS DIRECTED INTO AND BLENDS WITH FLOWING FUEL FROM FUELING NOZZLE. DO NOT ALLOW CONCENTRATED ADDITIVE TO CONTACT INTERIOR OF FUEL TANKS OR AIRCRAFT PAINTED SURFACES. USE NOT LESS THAN 20 FL. OZ. OF ADDITIVE PER 260 GALLONS OF FUEL OR MORE THAN 20 FL. OZ. OF ADDITIVE PER 104 GALLONS OF FUEL.

ALTERNATE BLENDERS

If alternate blenders must be used such as PRIST proportioner Model PRB-101 or AP-2, use instructions furnished with blender.

LANDING GEAR AND FLAP SYSTEMS - EXTEND/RETRACT CYCLES

The following approximate extension and retraction cycle times should be taken into consideration when making configuration changes:

Landing Gear	
Extension or Retraction	17 seconds
Flap Extension	
Up to 5°	17 seconds
5° to 20°	10 seconds
20° to 40°	6 seconds
Flap Retraction	
40° to 20°	4 seconds
20° to 5°	10 seconds
5° to Up	21 seconds

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GENERAL

INTRODUCTION

Information in this section stipulates the conditions, configurations, and operating modes in which the appropriate performance criteria of CAR 3 has been demonstrated. It is the responsibility of the operator to observe the limiting conditions specified.

NOISE LEVEL

The results of flight testing with approved noise measuring equipment in accordance with FAR PART 36, Appendix F, Noise Requirements For Propeller Driven Small Airplanes, have determined that the noise level of the MU-2B-60 is 76.5 db(A).

No determination has been made by the Federal Aviation Administration that the noise levels of this airplane are or should be acceptable or unacceptable for operation at, into, or out of any airport.

PERFORMANCE DATA CONDITIONS

The following performance data was obtained during flight tests and may be realized under conditions indicated with the airplane and engines in good condition, and with average piloting techniques. The approved performance contained in this flight manual can only be achieved when the resulting torque from a power assurance check is equal to or exceeds the value in the appropriate power assurance check charts.

All performance is given for various gross weights, with no wind, and on level, dry, paved runways. In using the following data, allowance for actual conditions should be made. Variable wind velocities from 10 kts tail wind to 30 kts head wind are shown in takeoff and landing distances.

AIRSPEED CORRECTION TABLE △K

△K = CORRECTION (KNOTS) PRIMARY STATIC SYSTEM
(ZERO INSTRUMENT ERROR)

△K = Correction (KNOTS)

KCAS = KIAS +△K

CONFIG.	KIAS												
GEAR UP OR DWN	70	80	90	100	110	120	140	160	180	200	220	240	260
FLAPS UP OR DWN	+4	+3	+2	+2	+2	+1	+1	0	0	-1	-1	-2	-2

ALTIMETER CORRECTION TABLE $\triangle h_i$

PRIMARY STATIC SYSTEM
(ZERO INSTRUMENT ERROR)

$\triangle h_i$ = Correction (ft)
Hpi = Indicated Press Alt.

Corrected Altitude = Hpi +$\triangle h_i$

CONFIG.	H_{pi}	KIAS												
	ALT	70	80	90	100	110	120	140	160	180	200	220	240	260
GEAR UP FLAPS UP	S.L.	--	--	+7	+9	+10	+10	+8	+5	-3	-13	-27	-45	-55
	10000	--	--	+11	+12	+13	+13	+11	+7	-4	-18	-36	-60	-91
	20000	--	--	+15	+16	+17	+17	+15	+9	-6	-25	-51	-83	-124
	30000	--	--	+22	+23	+25	+25	+22	+12	-8	-36	-72	-118	-179
GEAR DOWN FLAPS 5°	S.L.	--	+10	+11	+13	+13	+12	+10	+4	-2	--	--	--	--
	10000	--	+15	+16	+17	+17	+17	+12	+6	-3	--	--	--	--
GEAR DOWN FLAPS 20°	S.L.	+23	+23	+23	+23	+21	+18	+12	+1	--	--	--	--	--
	10000	+31	+32	+32	+30	+28	+25	+16	+1	--	--	--	--	--
GEAR DOWN FLAPS 40°	S.L.	+23	+23	+21	+19	+17	+13	+3	-11	--	--	--	--	--
	10000	+30	+30	+28	+26	+23	+18	+3	-15	--	--	--	--	--

PRIMARY STATIC SYSTEM

AIRSPEED CORRECTION TABLE △K
ALTERNATE STATIC SYSTEM
(ZERO INSTRUMENT ERROR)

△K = Correction (KNOTS)

KCAS = KIAS +△K

CONFIG.	KIAS												
	70	80	90	100	110	120	140	160	180	200	220	240	260
GEAR UP FLAPS UP	--	--	+16	+14	+12	+10	+7	+4	+3	+1	-1	-3	-5
GEAR DOWN FLAPS 5°	--	+16	+14	+11	+10	+8	+5	+3	0	--	--	--	--
GEAR DOWN FLAPS 20°	+18	+14	+12	+9	+7	+5	+2	0	--	--	--	--	--
GEAR DOWN FLAPS 40°	+12	+9	+6	+4	+2	0	-3	-5	--	--	--	--	--

ALTIMETER CORRECTION TABLE $\triangle h_i$
ALTERNATE STATIC SYSTEM
(ZERO INSTRUMENT ERROR)

$\triangle h_i$ = Correction (ft)
Hpi = Indicated Press Alt.

Corrected Altitude = Hpi +$\triangle h_i$

CONFIG.	H_{pi}	KIAS												
		70	80	90	100	110	120	140	160	180	200	220	240	260
GEAR UP FLAPS UP	S.L.	--	--	+130	+120	+115	+105	+85	+65	+45	+20	-15	-60	-130
	10,000	--	--	+175	+160	+150	+135	+110	+80	+55	+25	-20	-85	-170
	20,000	--	--	+240	+230	+210	+190	+155	+120	+80	+35	-25	-115	-235
	30,000	--	--	+345	+320	+300	+275	+230	+170	+115	+50	-35	-170	-325
GEAR DOWN FLAPS 5°	S.L.	--	+140	+120	+110	+100	+85	+65	+45	+20	--	--	--	--
	10,000	--	+180	+160	+150	+140	+125	+90	+60	+25	--	--	--	--
GEAR DOWN FLAPS 20°	S.L.	+110	+100	+90	+80	+70	+55	+25	-15	--	--	--	--	--
	10,000	+150	+135	+125	+110	+95	+75	+35	-15	--	--	--	--	--
GEAR DOWN FLAPS 40°	S.L.	+70	+60	+45	+30	+15	-5	-40	-80	--	--	--	--	--
	10,000	+95	+85	+65	+45	+20	-5	-55	-100	--	--	--	--	--

ALTERNATE STATIC SYSTEM

STALL SPEED

ZERO THRUST
FLAPS AS INDICATED

FUEL FLOW FOR ZERO THRUST

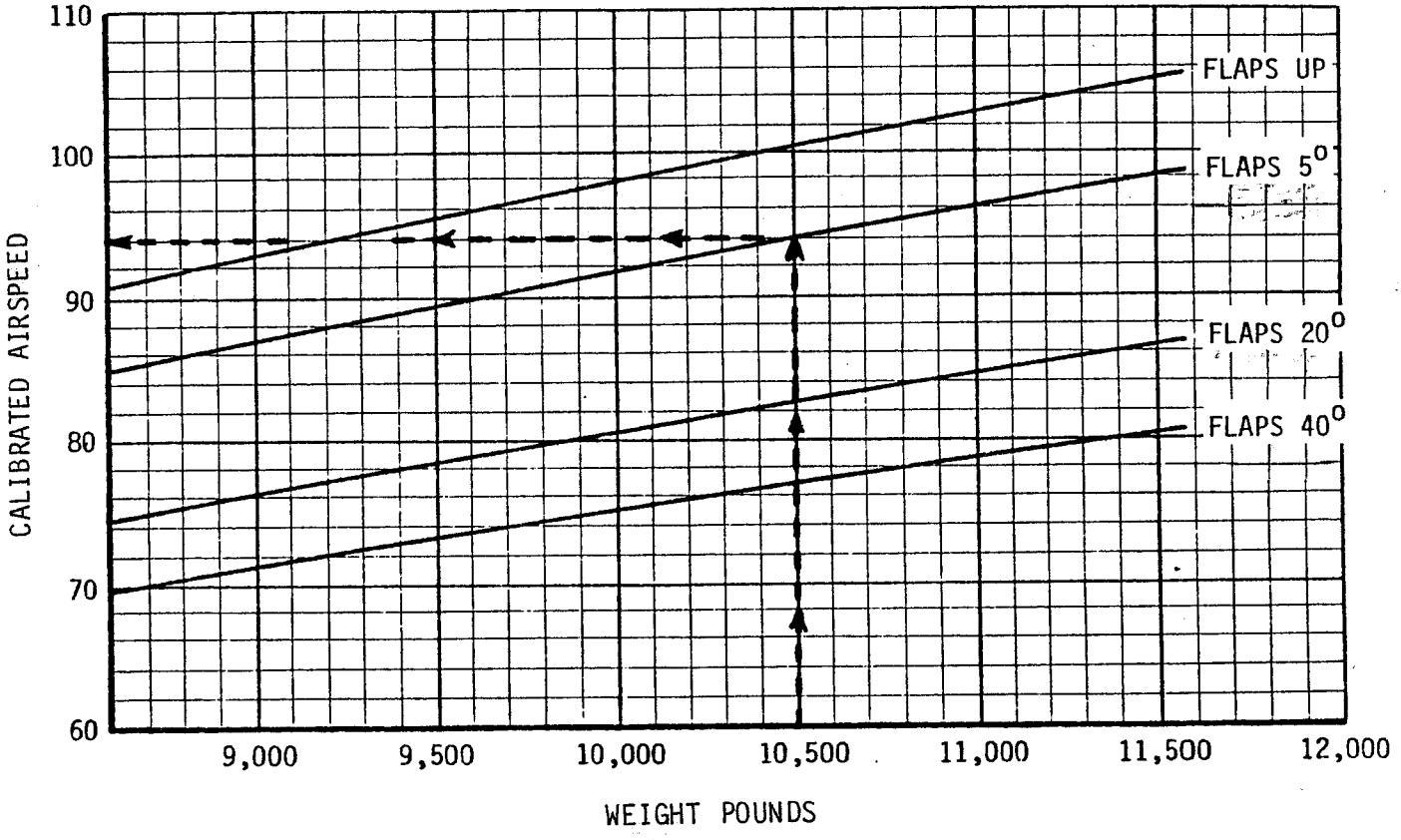
ALTITUDE (FEET)	FUEL FLOW/ENGINE lbs/Hour
0	213
5,000	188
10,000	162
15,000	137

NOTE

Up to 560 feet of altitude loss can be expected in recovery from a full stall

EXAMPLE:

Airplane Weight	10,500 Lbs
Flaps	5° Down
Stall Speed	94 KCAS



STALL SPEED vs ANGLE OF BANK

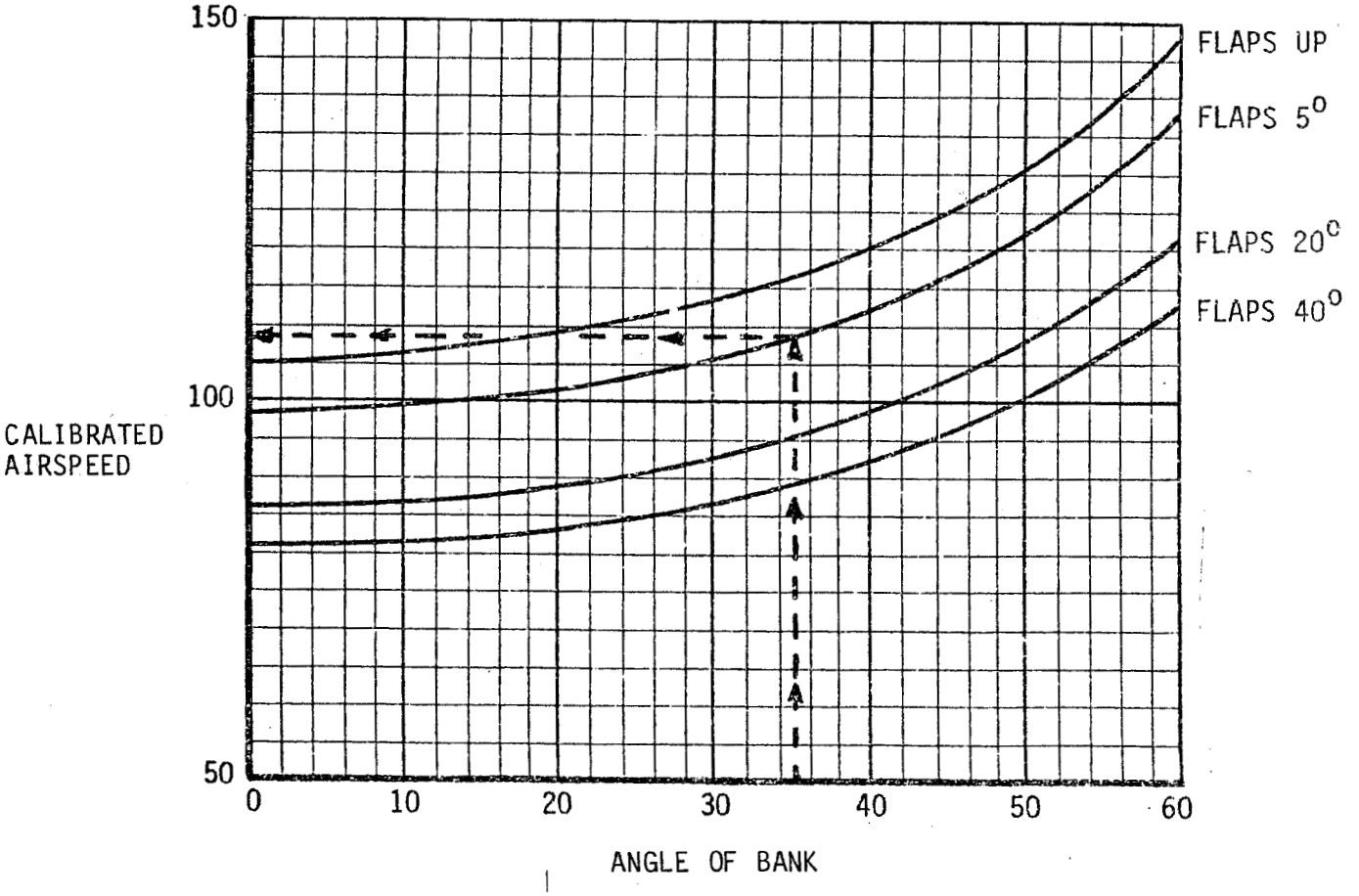
GROSS WEIGHT - 11,575 LBS (5,250 KGS)
ZERO THRUST
FLAPS AS INDICATED

NOTE

Up to 560 feet of altitude loss can be expected in recovery from a full stall

EXAMPLE:

Angle of Bank	35^{o}
Flaps	5^{o} Down
Stall Speed	108 KCAS



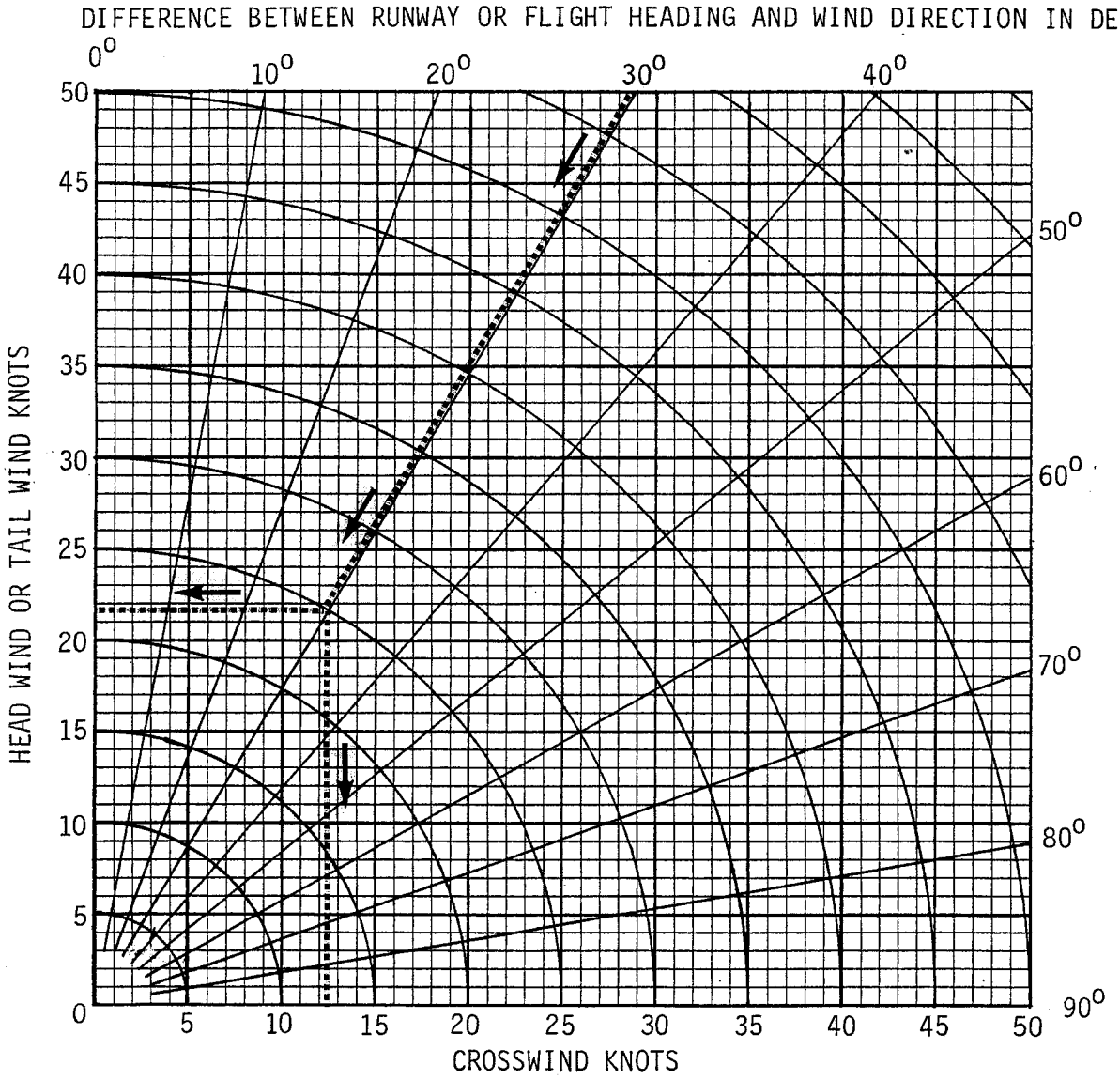
WIND COMPONENTS

NOTE

Use Maximum Gust Conditions When Figuring Crosswind

EXAMPLE:

Runway Heading	280°
Surface Wind	250° at 25 KTS
Difference in Deg	30°
Head Wind	22 KTS
Crosswind	13 KTS



DEMONSTRATED CROSSWIND

LANDING: Flaps 20° or 40° ..... 0 - 18 KTS

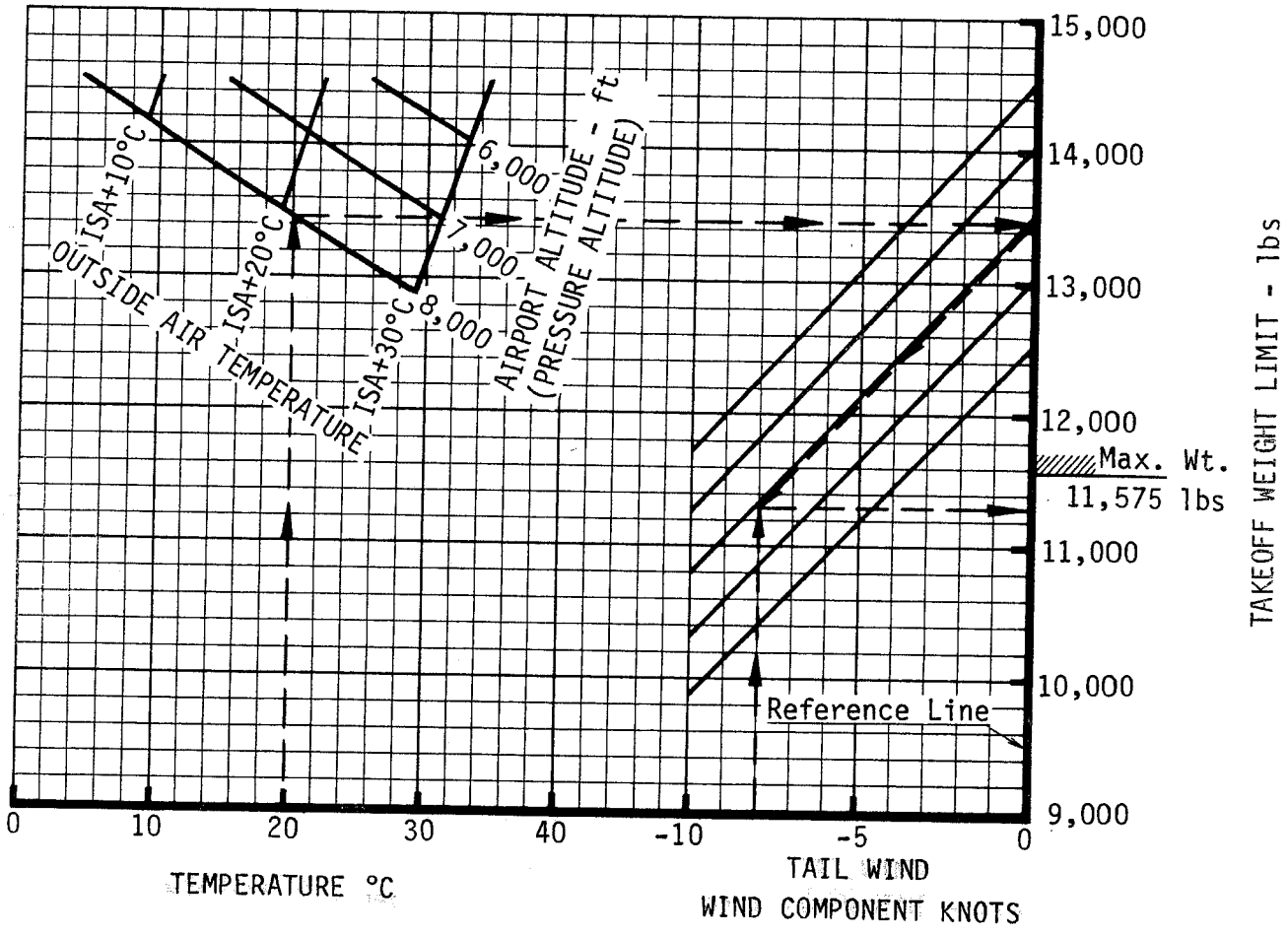
TAKEOFF: Flaps 5° or 20° ..... 0 - 22 KTS

MAXIMUM TAKEOFF WEIGHT LIMITED BY MAXIMUM TIRE SPEED FLAPS 5°

ENGINES : TAKEOFF POWER
FLAPS : 5°

EXAMPLE:

OAT	20°C
Pressure Altitude	8,000 Ft
Wind Condition	-8 Kts (Tail Wind)
Takeoff Weight Limit	11,300 Lbs

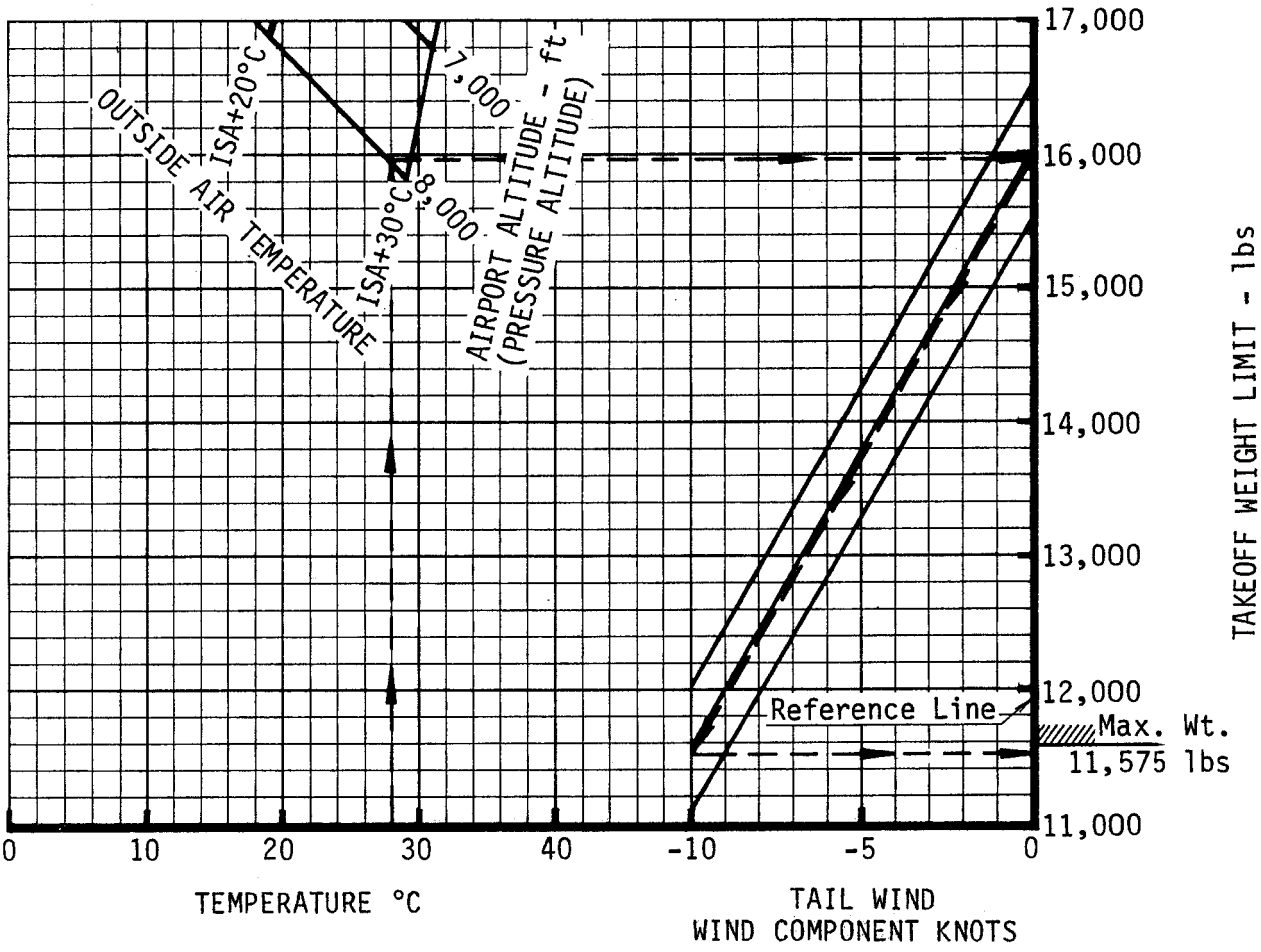


MAXIMUM TAKEOFF WEIGHT LIMITED BY MAXIMUM TIRE SPEED FLAPS 20°

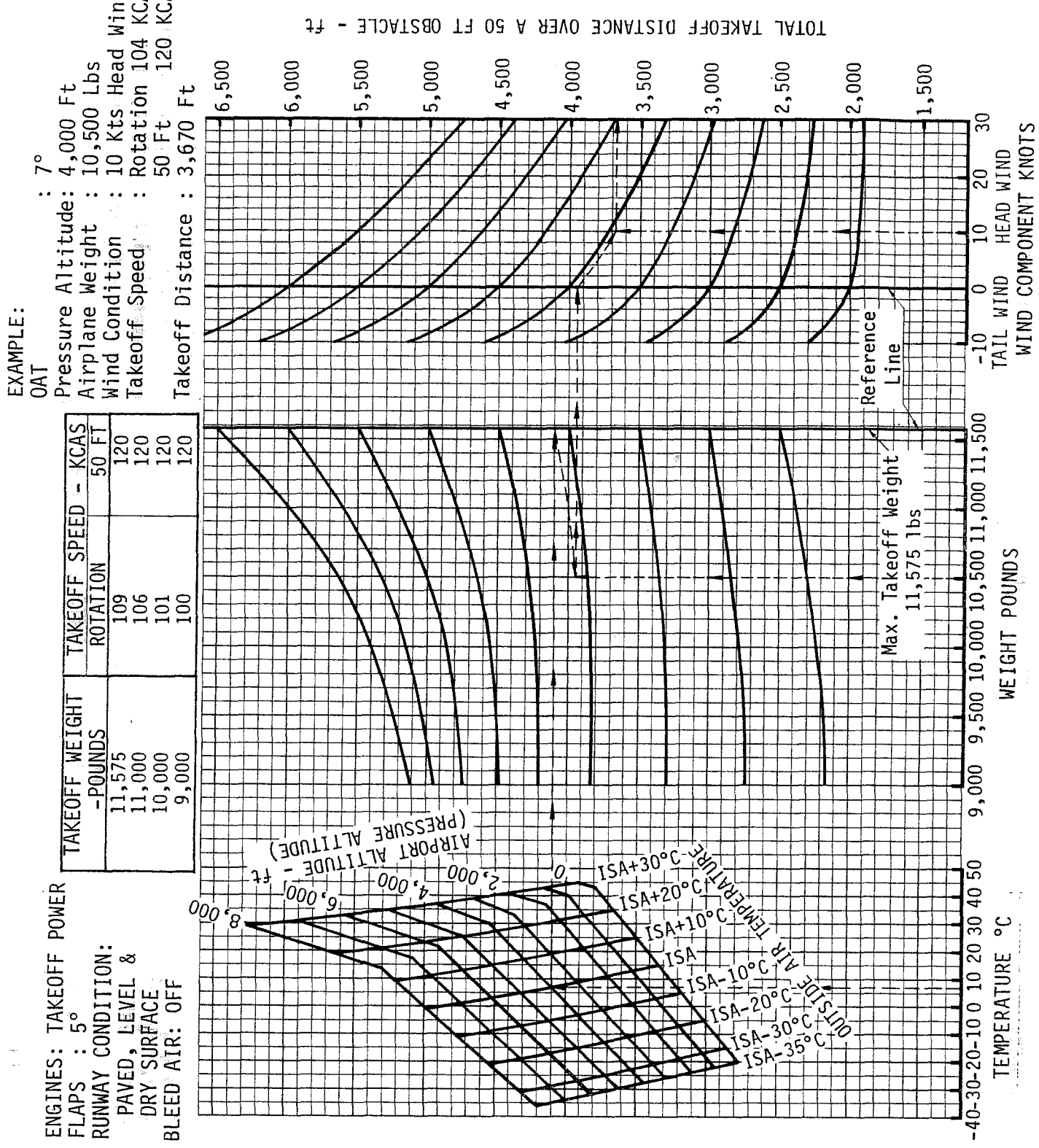
ENGINES : TAKEOFF POWER
FLAPS : 20°

EXAMPLE:

OAT	28°C
Pressure Altitude	8,000 Ft
Wind Condition	-10 Kts (Tail Wind)
Takeoff Weight Limit	11,510 Lbs



TAKEOFF DISTANCE - FLAPS 5°



EXAMPLE:
OAT : 7°
Pressure Altitude: 4,000 Ft
Airplane Weight : 10,500 Lbs
Wind Condition : 10 Kts Head Wind
Takeoff Speed : Rotation 104 KCAS
50 Ft 120 KCAS
Takeoff Distance : 3,670 Ft

TAKEOFF WEIGHT -POUNDS	TAKEOFF SPEED - KCAS ROTATION	50 FT
11,575	109	120
11,000	106	120
10,000	101	120
9,000	100	120

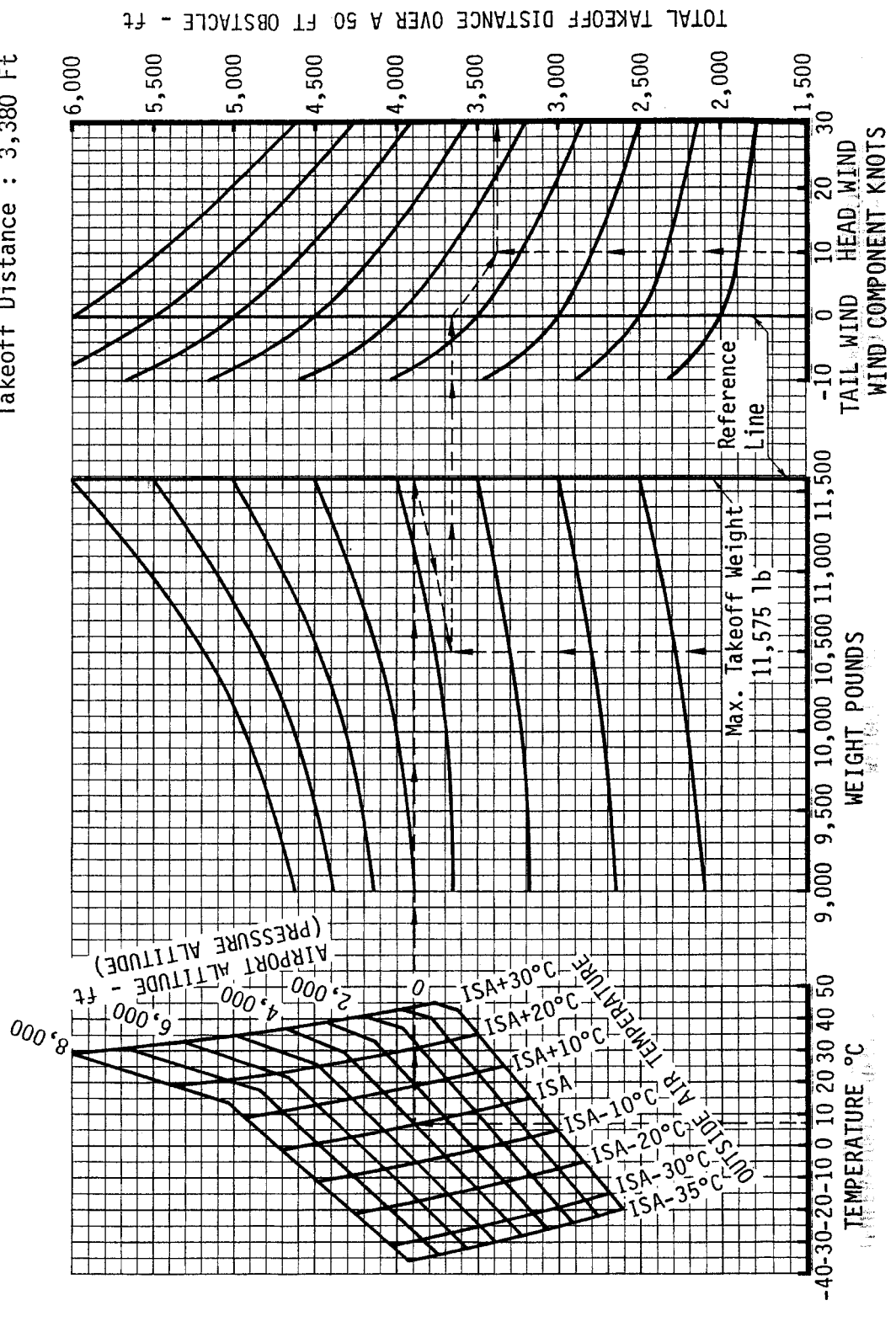
ENGINES: TAKEOFF POWER
FLAPS : 5°
RUNWAY CONDITION:
PAVED, LEVEL &
DRY SURFACE
BLEED AIR: OFF

TAKEOFF DISTANCE - FLAPS 20°

TAKEOFF WEIGHT -POUNDS	TAKEOFF SPEED - KCAS	
	ROTATION	50 FT
11,575	105	113
11,000	103	113
10,000	100	113
9,000	100	113

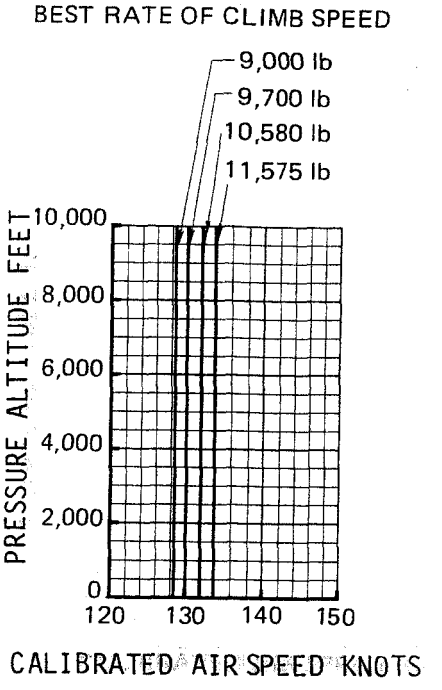
EXAMPLE:
OAT : 7°C
Pressure Altitude: 4,000 Ft
Airplane Weight : 10,500 Lbs
Wind Condition : 10 Kts Head Wind
Takeoff Speed : Rotation 102 KCAS
50 Ft 113 KCAS
Takeoff Distance : 3,380 Ft

ENGINES: TAKEOFF POWER
FLAPS : 20°
RUNWAY CONDITION:
PAVED, LEVEL &
DRY SURFACE
BLEED AIR: OFF



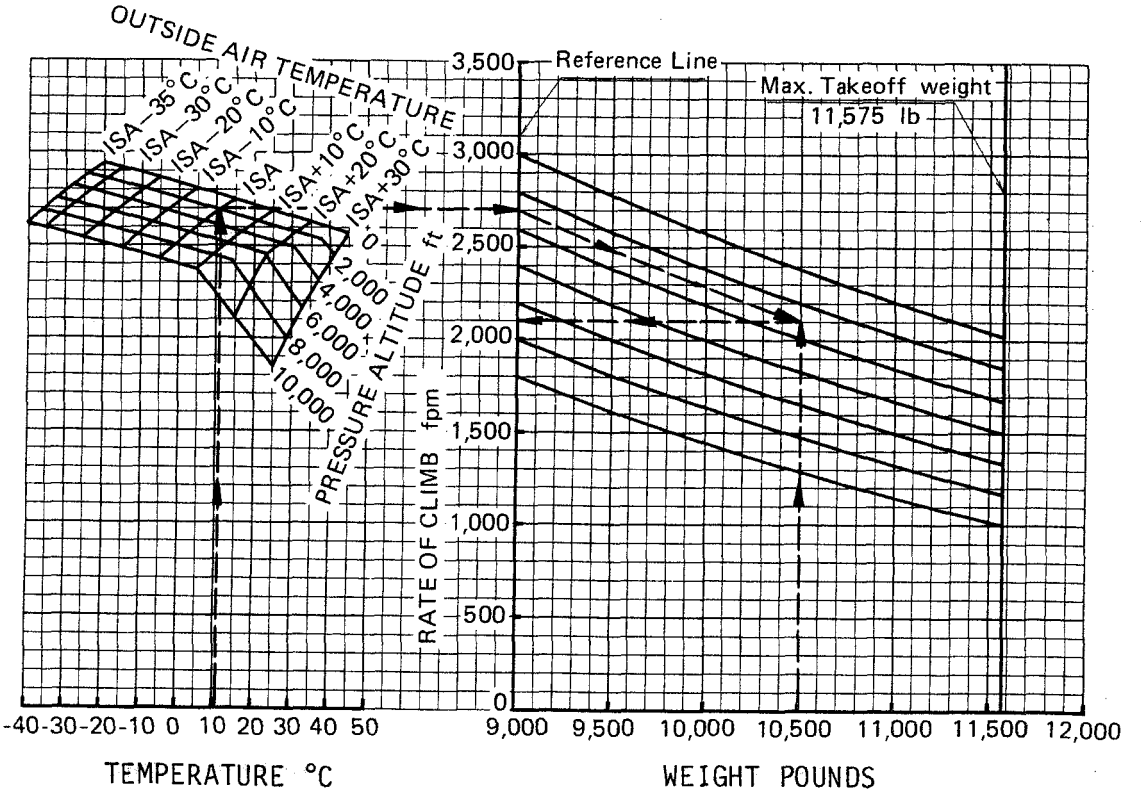
NORMAL BEST RATE OF CLIMB

ENGINES : MAXIMUM CONTINUOUS POWER
CLIMB SPEED : BEST RATE OF CLIMB SPEED
LANDING GEAR : RETRACTED
FLAPS : 5° OR 20°
BLEED AIR : OFF



EXAMPLE:

OAT	11°C
Pressure Altitude	2,000 Ft
Airplane Weight	10,500 Lbs
Climb Rate	2,100 Ft/Min
Climb Speed	131 KCAS



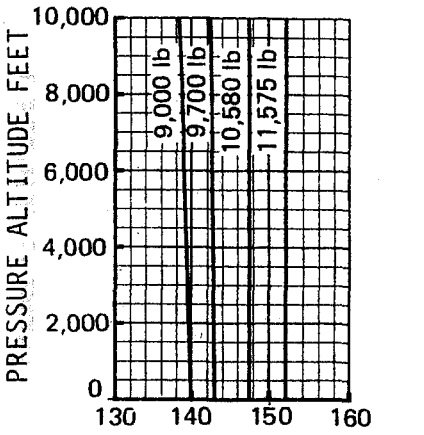
SINGLE ENGINE BEST RATE OF CLIMB

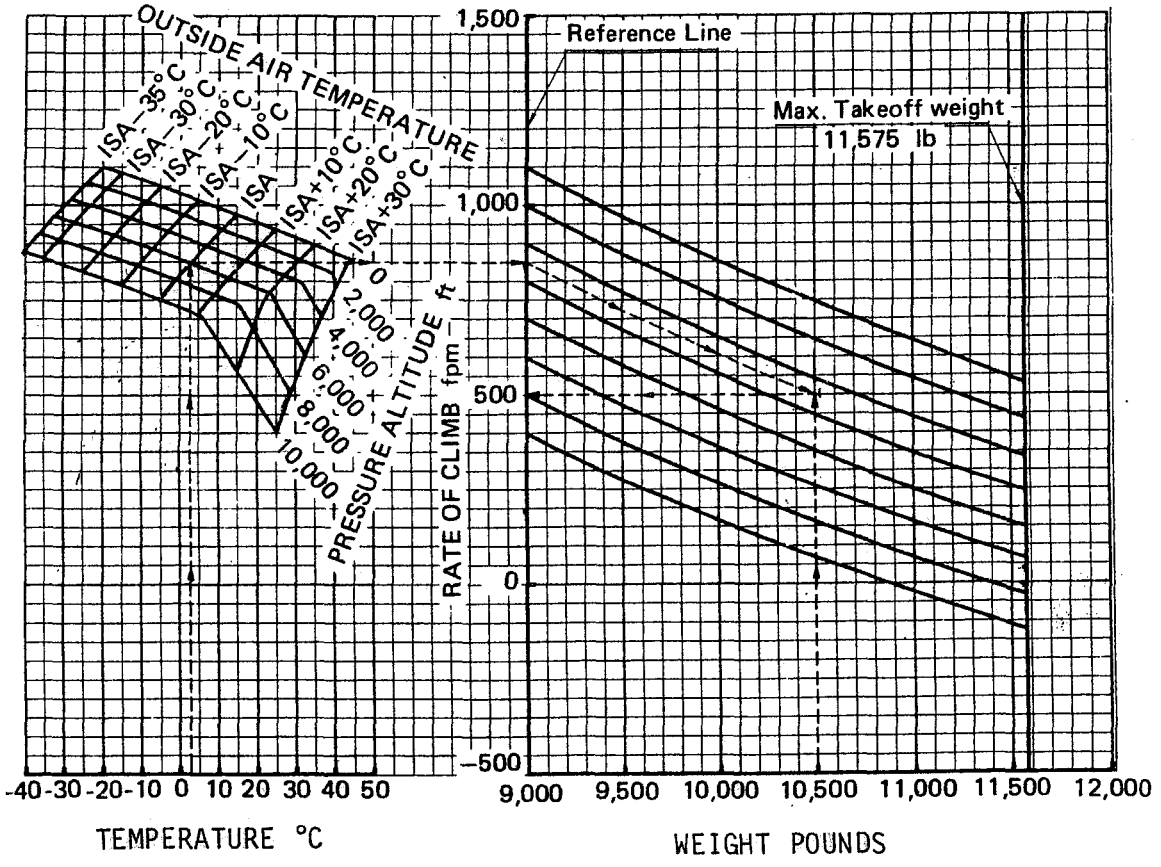
OPERATIVE ENGINE	: MAXIMUM CONTINUOUS POWER
INOPERATIVE ENGINE	: PROPELLER FEATHERED
CLIMB SPEED	: BEST RATE OF CLIMB SPEED
LANDING GEAR	: RETRACTED
FLAPS	: UP
BLEED AIR	: OFF
WINGS	: LEVEL

EXAMPLE:

OAT	3°C
Pressure Altitude	6,000 Ft
Airplane Weight	10,500 Lbs
Climb Rate	500 Ft/Min
Climb Speed	147 KCAS

BEST RATE OF CLIMB SPEED





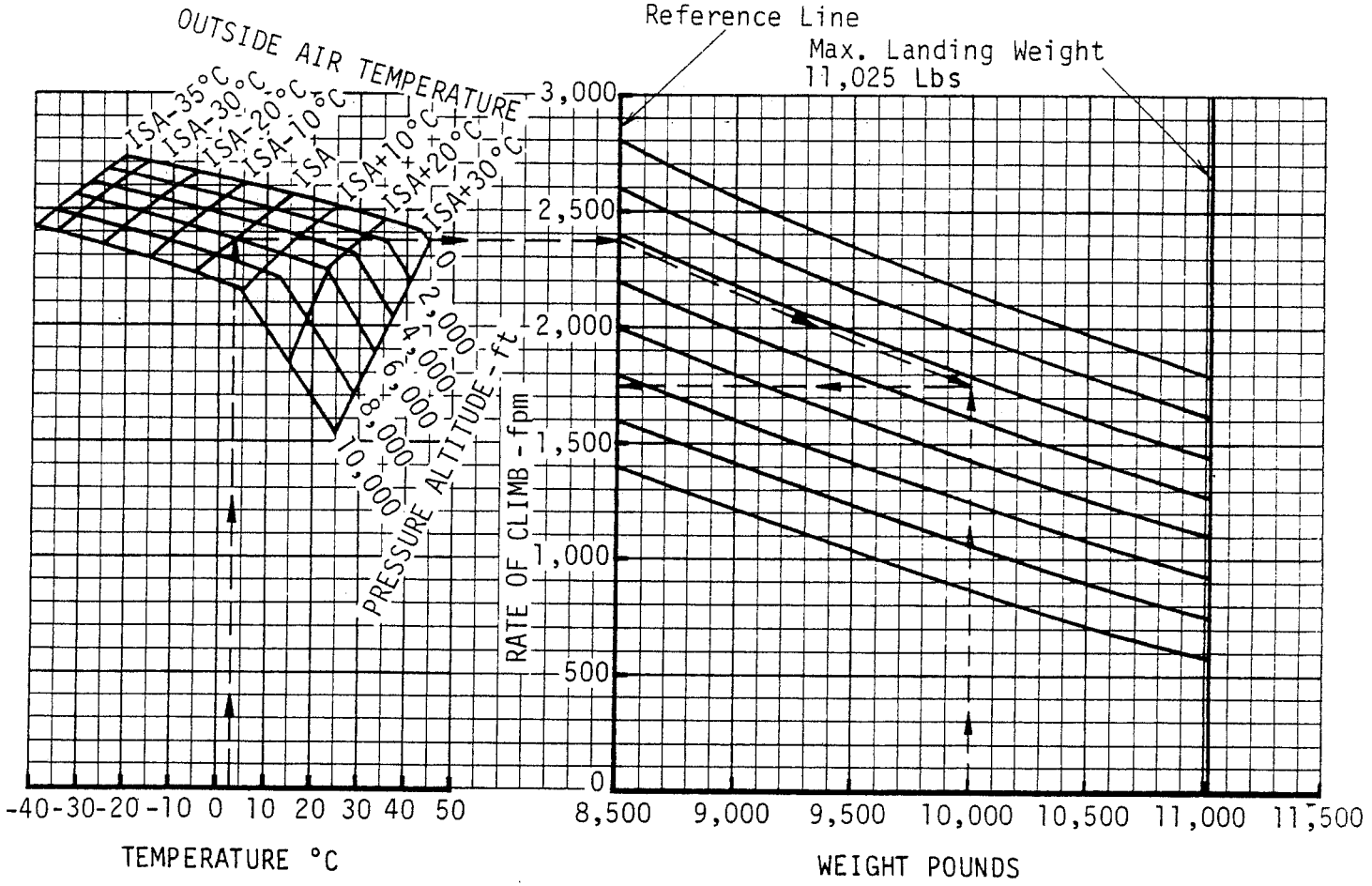
BALKED LANDING BEST RATE OF CLIMB - FLAPS 20°

ENGINES : TAKEOFF POWER
CLIMB SPEED : BEST RATE OF CLIMB SPEED
120 KCAS
LANDING GEAR : EXTENDED
FLAPS : 20°

NOTE: Subtract 140 fpm from chart value when planning bleed air ON climb.

EXAMPLE :

OAT	3°C
Pressure Altitude	6,000 Ft
Airplane Weight	10,000 Lbs
Climb Rate	1,750 Ft/Min



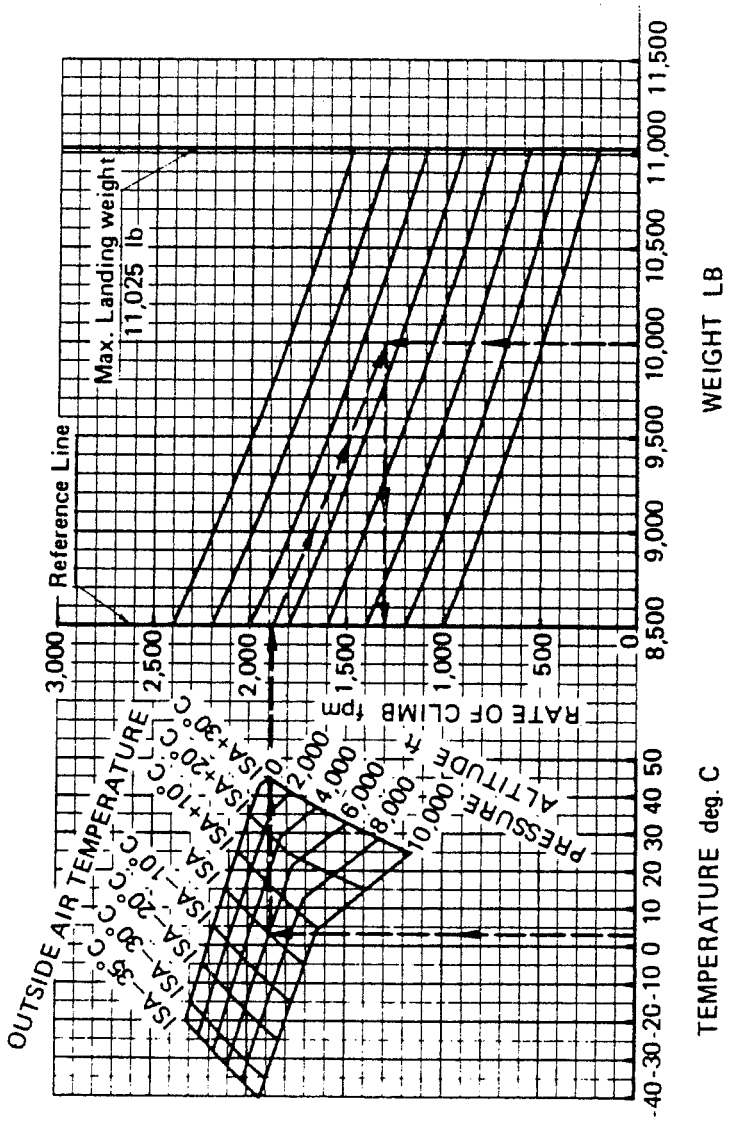
BALKED LANDING BEST RATE OF CLIMB - FLAPS 40°

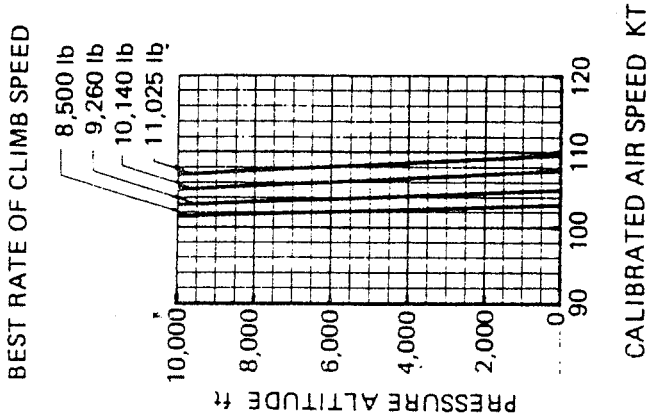
ENGINES : TAKEOFF POWER
CLIMB SPEED : BEST RATE OF CLIMB SPEED
LANDING GEAR : EXTENDED
FLAPS : 40°

EXAMPLE:

OAT	3°C
Pressure Altitude	6,000 Ft
Airplane Weight	10,000 Lbs
Climb Rate	1,300 Ft/Min
Climb Speed	105 KCAS

NOTE: Subtract 140 fpm from chart value when planning bleed air ON climb.



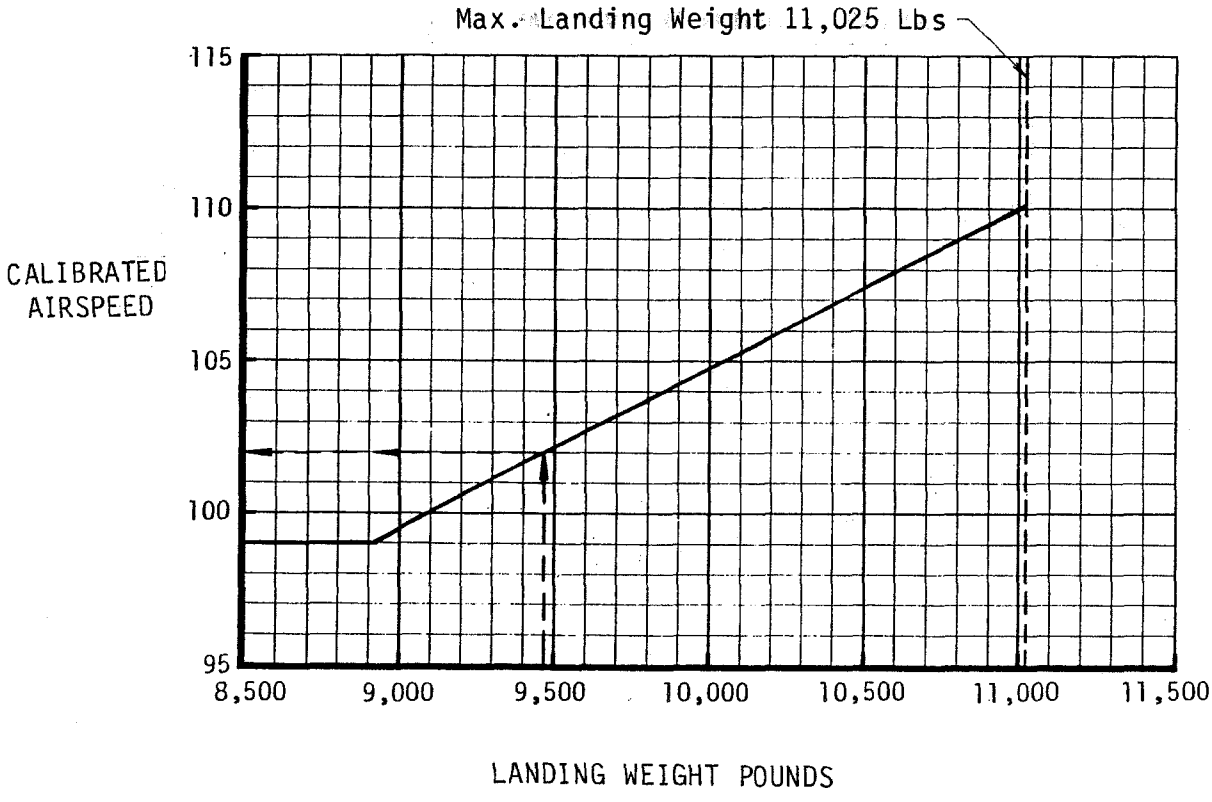


LANDING APPROACH SPEED - FLAPS 20°

EXAMPLE:

Airplane Weight	9,470 Lbs
Landing Speed	102 KCAS

NOTE: Minimum single engine approach speed is 110 KCAS.

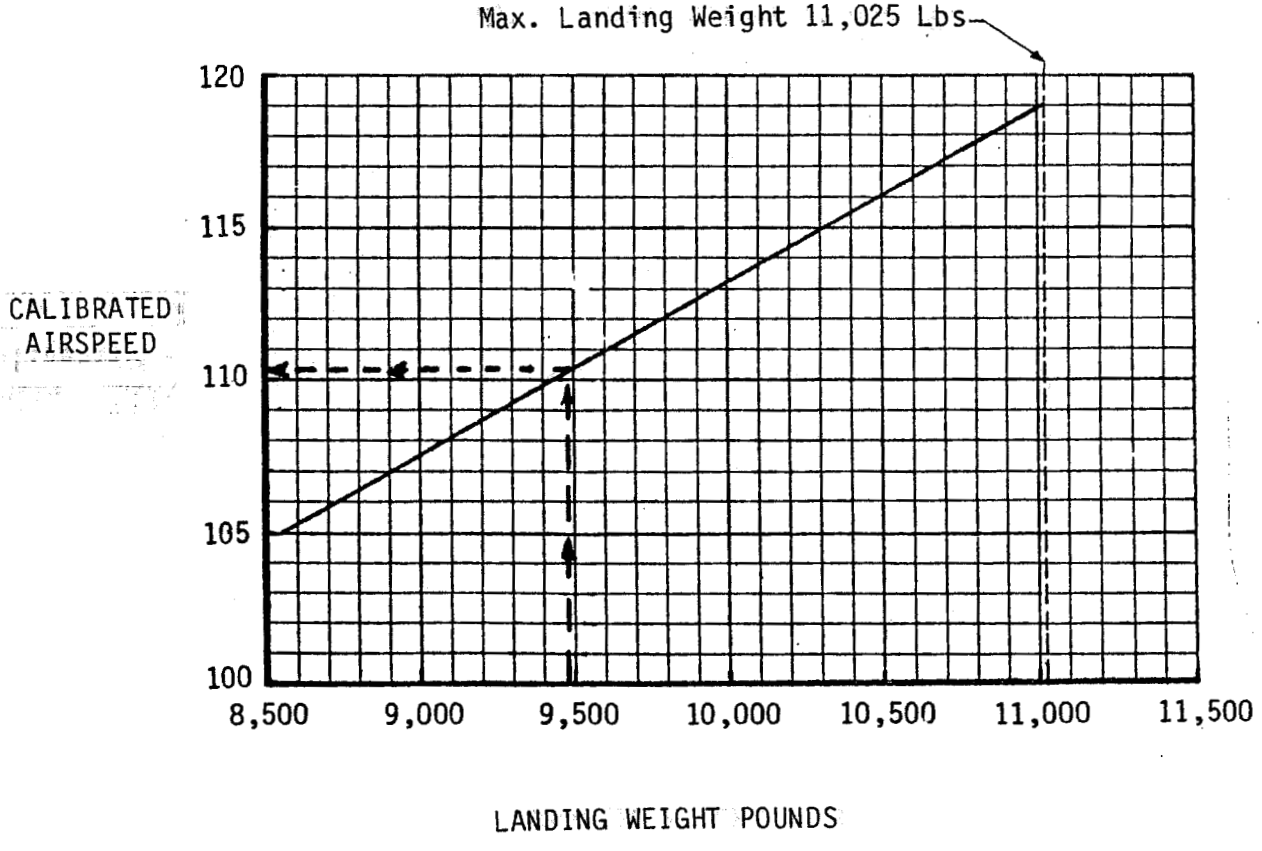


LANDING APPROACH SPEED - FLAPS 40°

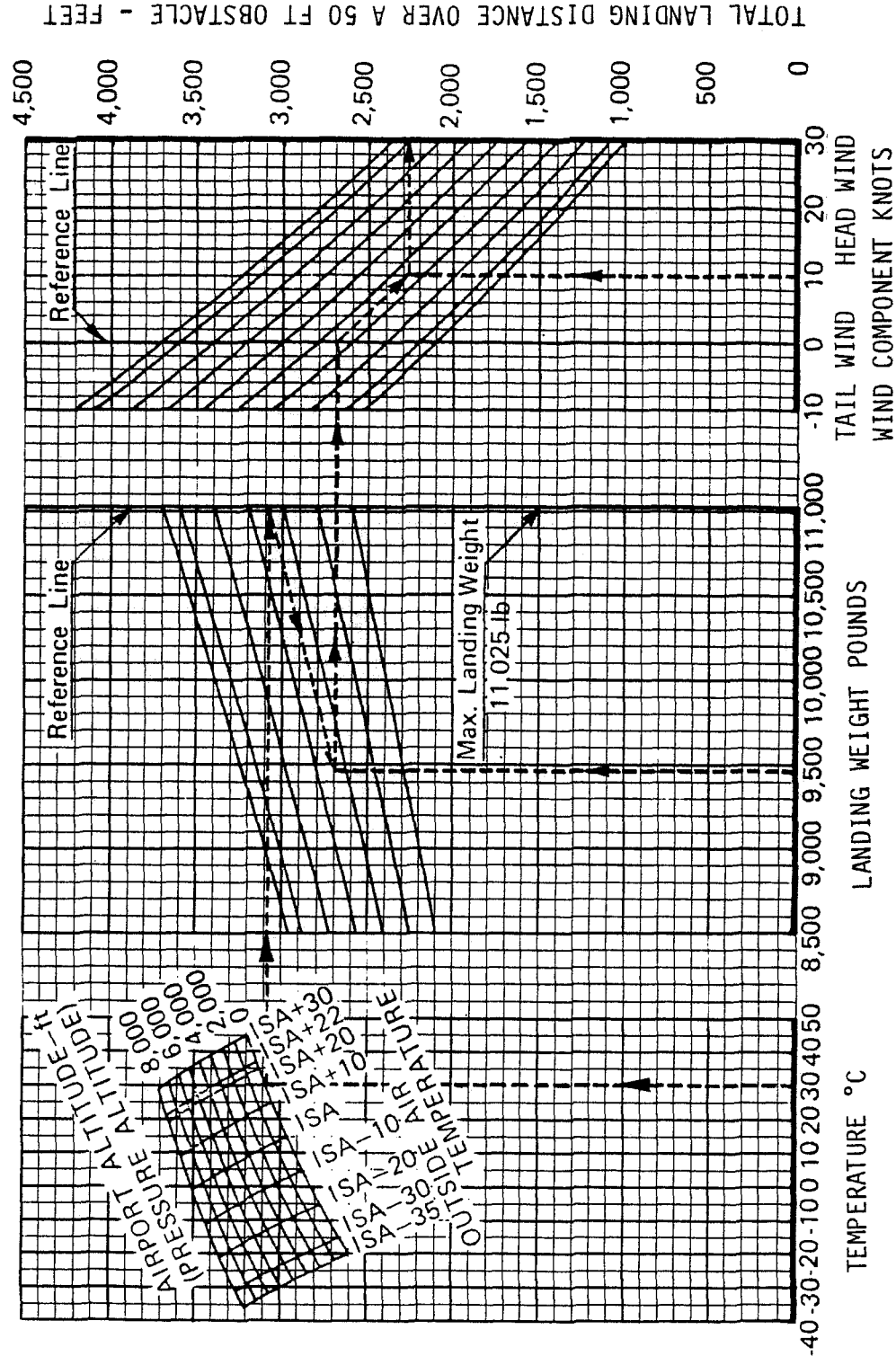
EXAMPLE:

Airplane Weight	9,470 Lbs
Landing Speed	110.3 KCAS

NOTE: Minimum single engine approach speed is 115 KCAS.



LANDING DISTANCE - FLAPS 20°



EXAMPLE:

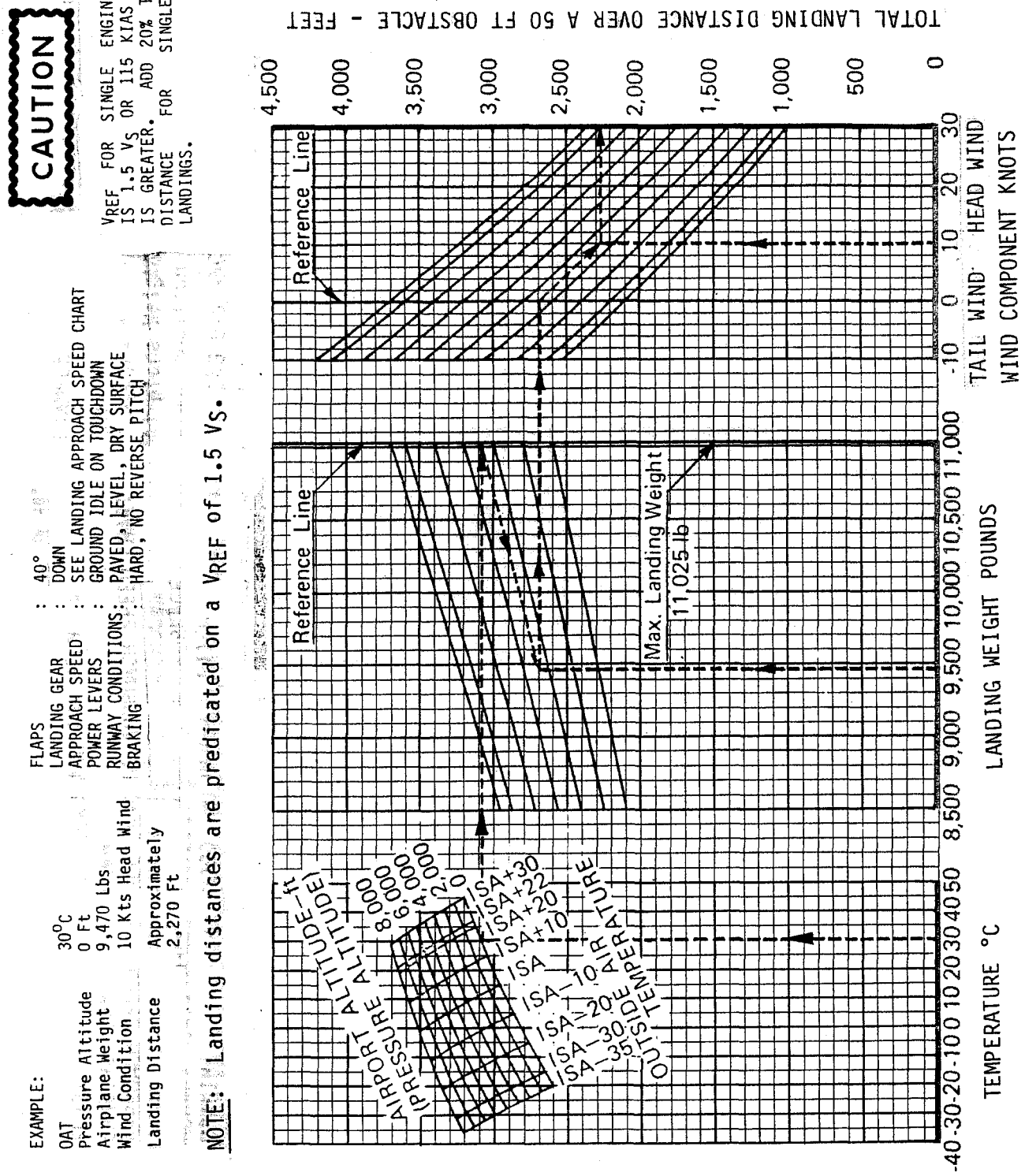
		FLAPS	: 20°
OAT	30°C	LANDING GEAR	: DOWN
Pressure Altitude	0 Ft	APPROACH SPEED	: SEE LANDING APPROACH SPEED CHART
Airplane Weight	9,470 Lbs	POWER LEVERS	: GROUND IDLE ON TOUCHDOWN
Wind Condition	10 Kts Head Wind	RUNWAY CONDITIONS:	PAVED, LEVEL, DRY SURFACE
		BRAKING	: HARD, NO REVERSE PITCH
Landing Distance	Approximately 2,270 Ft		

NOTE: Landing distances are predicated on a V_{REF} of 1.3 V_S.

CAUTION

V_{REF} FOR SINGLE ENGINE LANDING IS 1.3 V_S OR 110 KIAS WHICHEVER IS GREATER. ADD 10% TO LANDING DISTANCE FOR SINGLE ENGINE LANDINGS.

LANDING DISTANCE - FLAPS 40°



EXAMPLE:

		FLAPS	: 40°
OAT	30°C	LANDING GEAR	: DOWN
Pressure Altitude	0 Ft	APPROACH SPEED	: SEE LANDING APPROACH SPEED CHART
Airplane Weight	9,470 Lbs	POWER LEVERS	: GROUND IDLE ON TOUCHDOWN
Wind Condition	10 Kts Head Wind	RUNWAY CONDITIONS	: PAVED, LEVEL, DRY SURFACE
		BRAKING	: HARD, NO REVERSE PITCH
Landing Distance	Approximately 2,270 Ft		

NOTE: Landing distances are predicated on a V_{REF} of 1.5 V_S.

CAUTION

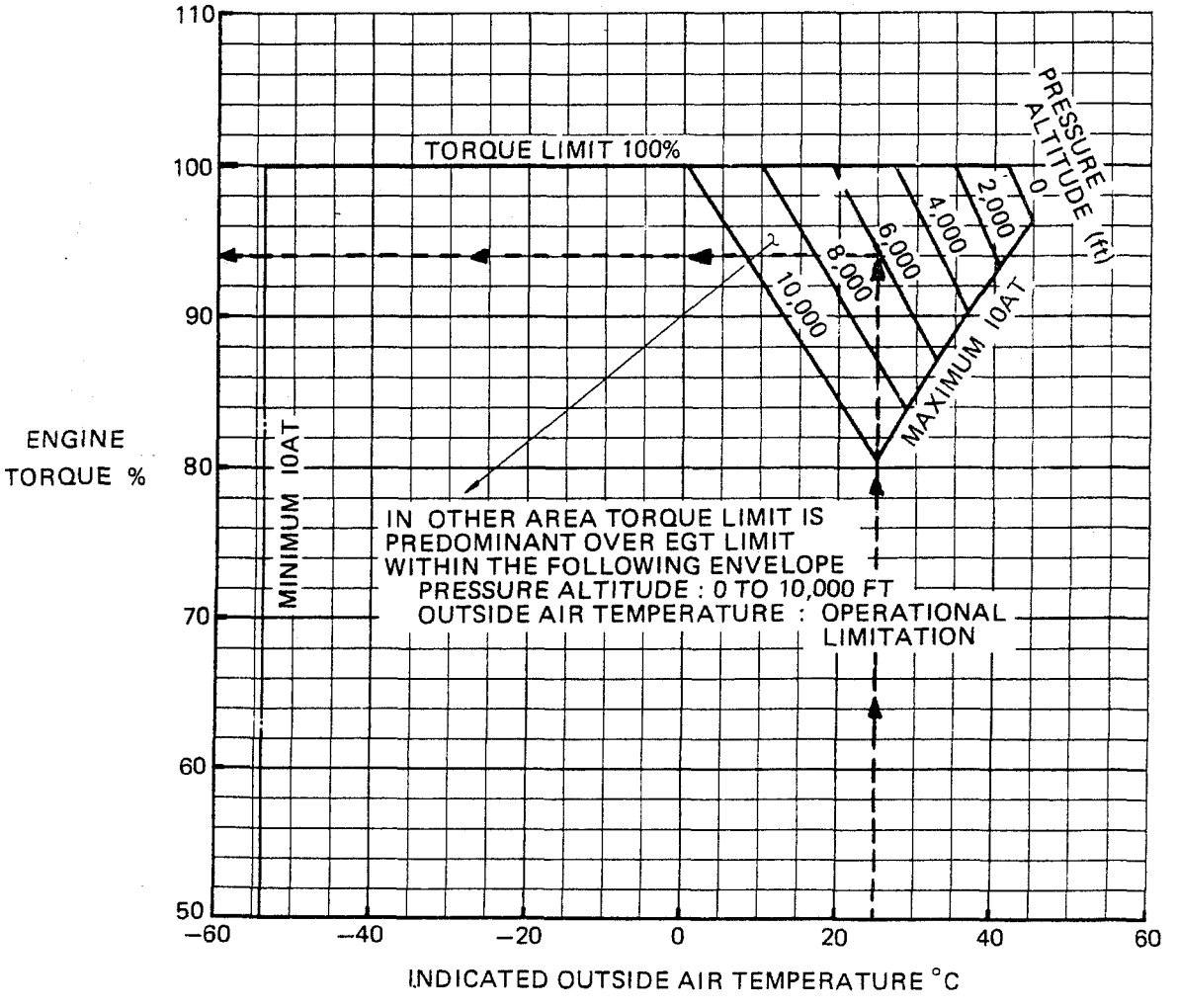
V_{REF} FOR SINGLE ENGINE LANDING IS 1.5 V_S OR 115 KIAS WHICHEVER IS GREATER. ADD 20% TO LANDING DISTANCE FOR SINGLE ENGINE LANDINGS.

POWER ASSURANCE CHART - TAKEOFF

AIRSPEED : 0 KT
IOAT : INSTRUMENT ERROR ZERO
RECOVERY FACTOR 0.8
EGT : 650°C
RPM : 100%
BLEED AIR : OFF

EXAMPLE:

OAT	25°C
Pressure Altitude	6,000 Ft
Engine Torque	94 %

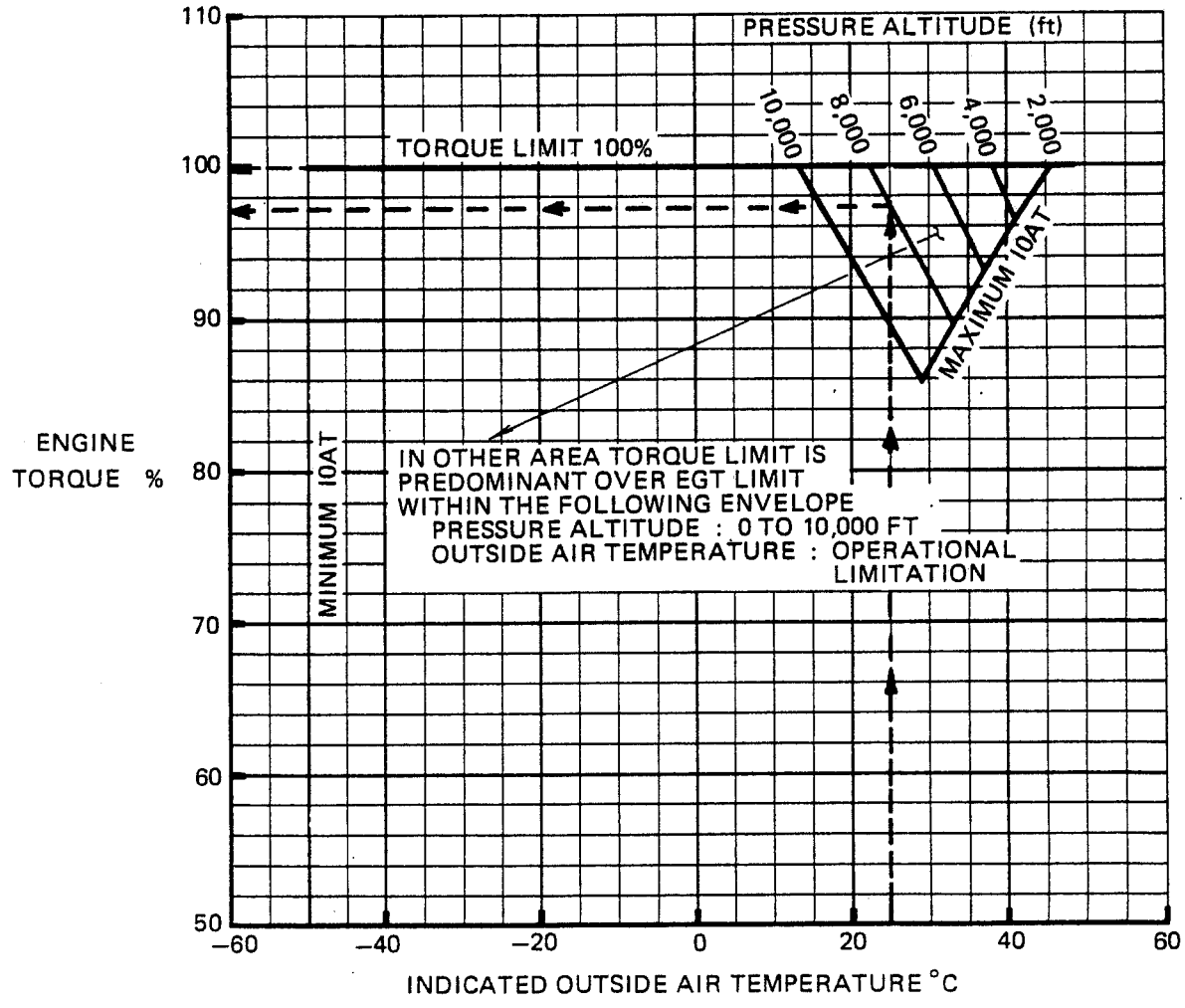


POWER ASSURANCE CHART - MAXIMUM CONTINUOUS

AIRSPEED : 200 KCAS
IOAT : INSTRUMENT ERROR ZERO
RECOVERY FACTOR 0.8
EGT : 650°C
RPM : 100%
BLEED AIR : OFF

EXAMPLE:

OAT	25°C
Pressure Altitude	8,000 Ft
Engine Torque	97.5%



SECTION 7 WEIGHT & BALANCE
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GENERAL

It is the pilot's responsibility to ensure the airplane is loaded properly. The empty weight and center of gravity noted below are for the airplane as delivered from the factory. This section provides the necessary information for the pilot to compute individual loading schedules and for the mechanic to perform weight and balance adjustments.

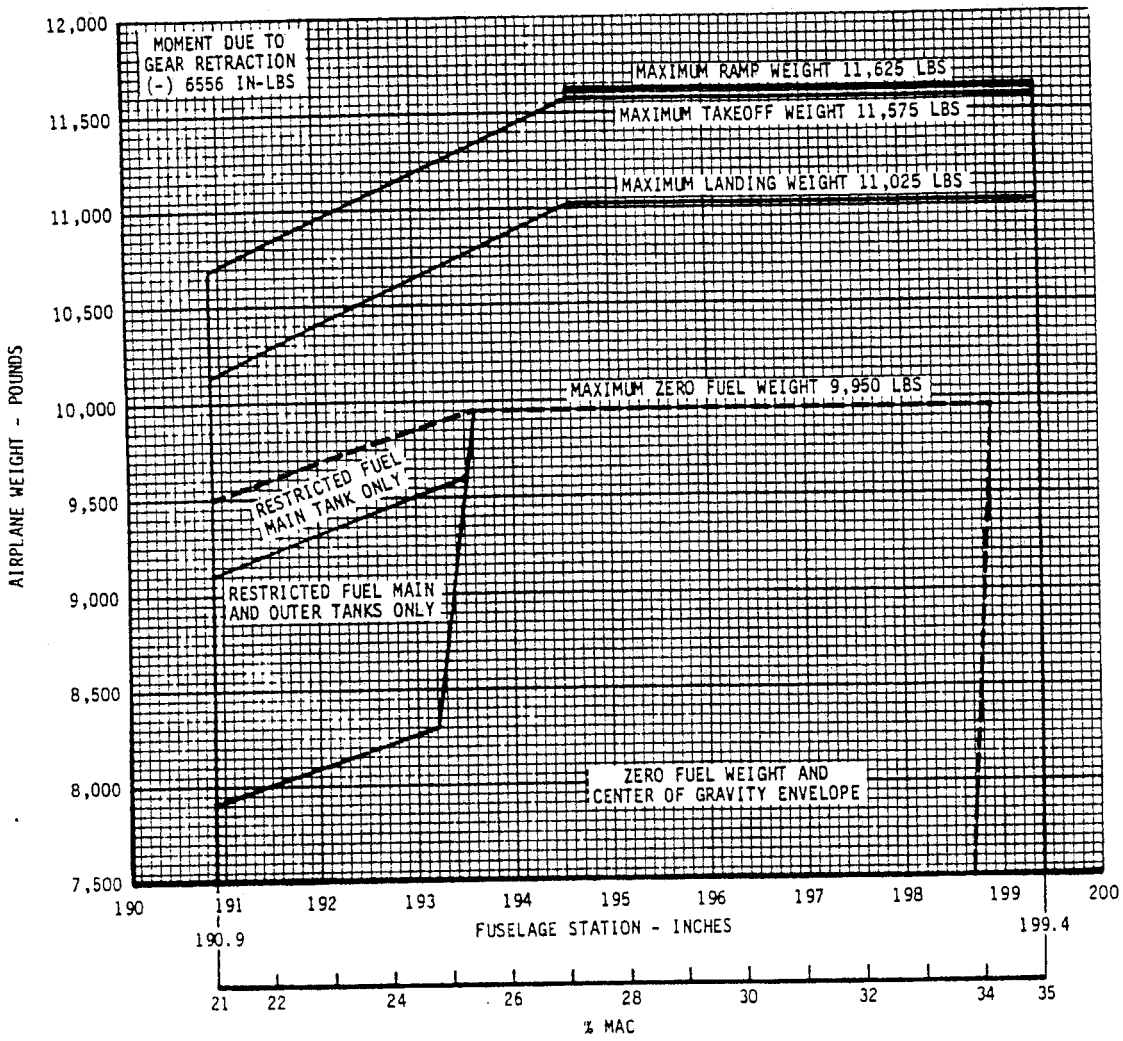
MANUFACTURED DELIVERY WEIGHT

Empty Weight	_____
Center of Gravity	_____
Moment	_____
% MAC	_____
Interior Configuration	_____
Date Weighed	_____

Appreciable changes to the weight and balance after delivery must be recorded in the airplane logbook. It is the pilot's responsiblity to ensure these logbook entries are recorded. To facilitate loading schedule computation, an Empty Weight and Balance Record Form is provided in this section.

EMPTY WEIGHT - Empty weight is defined as the actual empty weight of the airplane plus unusable fuel (12.6 gallons), undrainable oil (1.3 gallons), full hydraulic fluid, standard, and optional equipment.

AIRCRAFT WEIGHT/ZERO FUEL WEIGHT AND C.G. ENVELOPES (LANDING GEAR EXTENDED)



Datum: 6.69 inches (170 mm) aft of the nose or 220.67 inches (5605 mm) forward from front plane of the wing rear spar fuselage connection frame.

MAC: Length is 60.55 inches (1538 mm)
(Leading edge of MAC is at +178.23 inches [4527 mm])

LOADING LIMITATIONS

Airplane loading, exclusive of fuel (ZFW), must remain within the Zero Fuel Weight Envelope. **The order of fuel loading must be Mains, Outers, and Tips.**

LOADING INSTRUCTIONS

The Weight and Balance Loading Form is provided to assist the pilot in calculating weight and balance information. The items on the form are referenced to correspond to the following paragraph numbers:

1. Enter the empty weight and moment of the airplane (from Manufactured Delivered Weight or superseding information).

2. Drainable oil weight and moment are provided. Cross out this entry if the drainable oil weight is included in the empty weight.

3. Enter any extra equipment weight and moment being carried aboard which is not included in the total payload.

4. The total payload is the sum of the pilot, passengers, baggage, and cabinet contents. The pilot and passenger weights and moments are provided in the Personnel Loading Tables. The baggage weights and moments are provided in the Baggage Loading Tables. The cabinet contents weights and moments must be computed by multiplying the weight and fuselage station (in inches) as shown on the seating arrangement.

NOTE

If the anticipated payload is large and/or maximum fuel quantity is desired, the payload should be computed as accurately as possible.

5. The zero fuel weight (ZFW) is the subtotal of items 1 through 4. Compare the ZFW and moment with the table provided to determine if the weight and moment (C.G.) are within a restricted fuel area.

6. Divide the moment by the weight to determine C.G.; then plot weight and C.G. on the ZFW Envelope. (Refer to sample calculation.)

   If the ZFW moment is equal to or between one set of minimum and maximum moments as listed on the chart, the airplane may be loaded with fuel (within fuel limitations and Maximum Ramp Weight) and will remain within the allowable limits for safe operation for both takeoff and landing.

LOADING INSTRUCTIONS (CONT)

NOTE

If the ZFW moment is less than the minimum allowable, reduce forward load items or shift weight aft.

If the ZFW moment is greater than the maximum allowable, reduce aft load items or shift weight forward.

If the ZFW moment is within one of the restricted fuel columns, forward load items may be reduced or shifted aft in order to eliminate the fuel restrictions.

CAUTION

IF THE WEIGHT OR POSITIONING OF THE LOAD IS CHANGED, THE ZERO FUEL WEIGHT AND MOMENT MUST BE RECALCULATED.

7. If the ZFW and moment are not within a restricted fuel area, the maximum allowable fuel can be determined by subtracting the ZFW from the maximum ramp weight. If the fuel is restricted, the maximum allowable fuel is shown on the loading form for easy reference.

8. Enter the fuel weight and moment from the fuel table for the type (density) fuel being used.

9. Add items 5 and 8 to obtain the Ramp Weight Condition. Maximum Ramp Weight is provided in Ref. No. 7 on the loading form.

10. Subtract the Maximum Landing Weight from the Ramp/Takeoff Weight to determine the amount of fuel that must be consumed before the Maximum Landing Weight is reached.

11. Enter the estimated fuel consumption weight and moment for each fuel tank.

12. The estimated fuel consumption is the subtotal from the tips, outers, and main fuel tanks.

13. The landing weight and moment are calculated by subtracting the subtotal estimated fuel consumption (item 12) from the Ramp/Takeoff Weight (item 9).

SAMPLE CALCULATIONS

WEIGHT AND BALANCE LOADING FORM

Serial No.	Registration No.	Date	Completed By
—			A. Sample

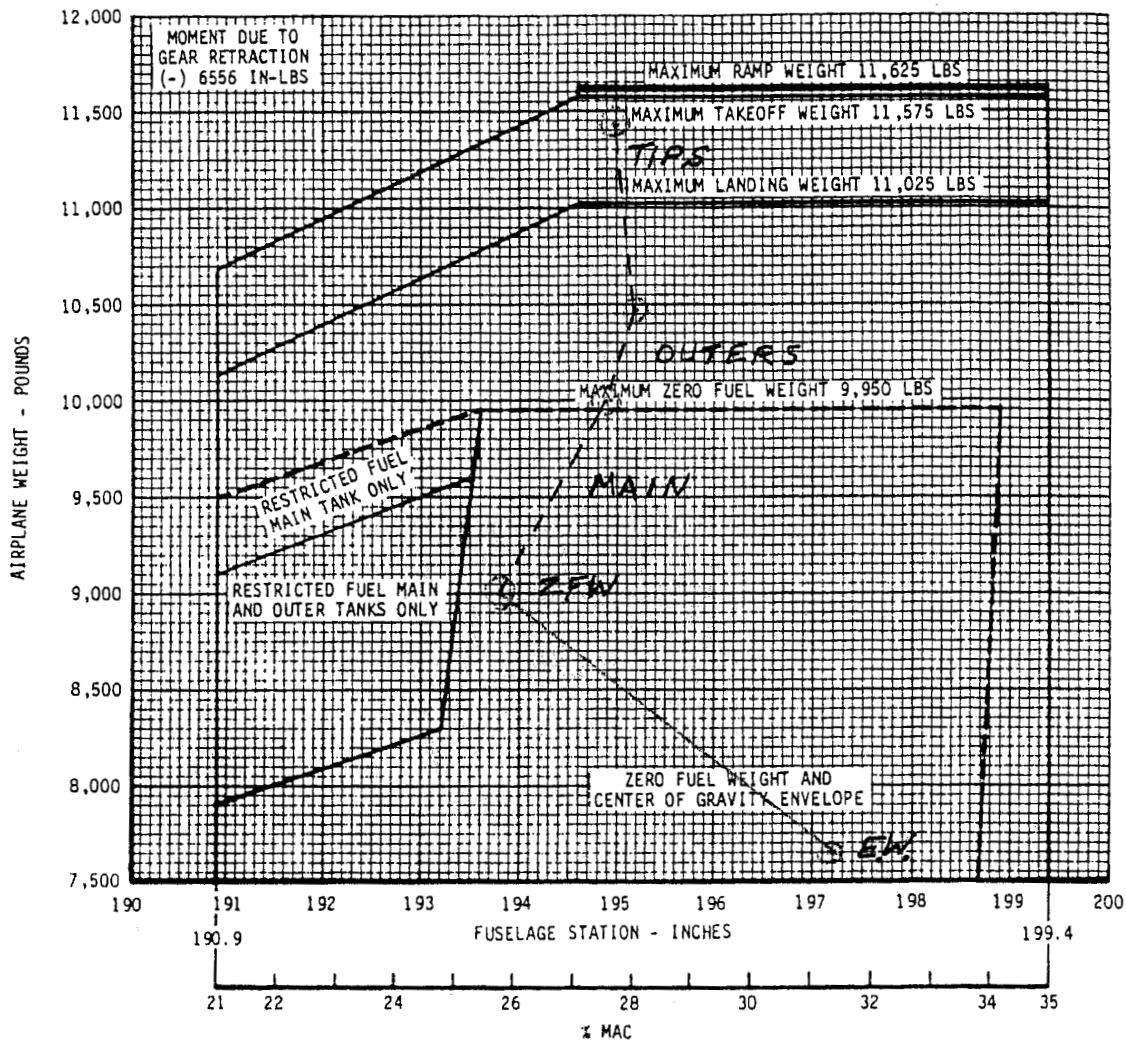
TOTAL COMPUTED PAYLOAD
Compute In Space Below and Enter on Line 4.

Pilots/Pass Cargo/Baggage /Carry On	WEIGHT	MOMENT
Pilot	170	16,524
Copilot	240	23,328
Pass 130.5	170	22,185
Pass 180	170	30,634
Pass 232	170	39,474
Pass 232	170	39,474
Pilots' Case 97.2	20	1,944
BAGGAGE	180	52,866
CABINET CONTENTS x F. STA 134.6	30	4,038
TOTAL PAYLOAD (To Line 4)	1320	239,467

REF NO	ITEM	WEIGHT	MOMENT
1	EMPTY WEIGHT	7,650	1,508,580
2	DRAINABLE OIL (Cross Out if in 1)	30	5,277
3	EXTRA EQUIPMENT (Not Included in 4)	-0-	
4	TOTAL COMPUTED PAYLOAD	1,320	230,467
5	ZERO FUEL WEIGHT (Subtotal 1 thru 4)	9,000	1744324
6	Compare Weight & Moment to table or Divide Moment by Weight to determine C.G. and plot on graph		CG = 193.81
	ALLOWABLE FUEL (Reference Only) Max Ramp Wt	11,625	
	ZFW (Minus)	9,000	
7	MAX ALLOWABLE FUEL Main/Outer/Tips	2,625	
	MAX FUEL Main/Outer	1,494	303,865
	MAX FUEL Main Only	1,032	211,003
	FUEL LOAD MAIN OUTERS		
8	(Main Full)	1,494	303,865
	TIPS (Main/Outers Full)	938	181,127
9	RAMP/TAKEOFF WEIGHT (Subtotal 5 & 8)	11,432	2229316
10	FUEL CONSUMED TO REACH LANDING WT (8 Minus 10)	11,025 / 407	
	ESTIMATED FUEL CONSUMPTION TIPS	938	181,127
11	OUTERS	462	92,922
	MAIN	670	129,377
12	ESTIMATED FUEL CONSUMED (Subtotal)	2070	403,426
13	LANDING WT (9 Minus 12)	9362	1825890

SAMPLE CALCULATION (CONT)

AIRCRAFT WEIGHT/ZERO FUEL WEIGHT AND C.G. ENVELOPES
(LANDING GEAR EXTENDED)



Datum: 6.69 inches (170 mm) aft of the nose or 220.67 inches (5605 mm) forward from front plane of the wing rear spar fuselage connection frame.

MAC: Length is 60.55 inches (1538 mm)
(Leading edge of MAC is at +178.23 inches [4527 mm])

WEIGHT AND MOMENT TABLES

MAIN TANK - USABLE FUEL

US GAL.	Density 6.0 lb/US gal.		Density 6.5 lb/US gal.		Density 6.7 lb/US gal.	
	WEIGHT (lb)	MOMENT (lb-in)	WEIGHT (lb)	MOMENT (lb-in)	WEIGHT (lb)	MOMENT (lb-in)
5	30.0	6,135.0	32.5	6,646.3	33.5	6,850.8
10	60.0	12,270.0	65.0	13,292.5	67.0	13,701.5
15	90.0	18,405.0	97.5	19,938.8	100.5	20,552.3
20	120.0	24,540.0	130.0	26,585.0	134.0	27,403.0
25	150.0	30,675.0	162.5	33,231.3	167.5	34,253.8
30	180.0	36,810.0	195.0	39,877.5	201.0	41,104.5
35	210.0	42,945.0	227.5	46,523.8	234.5	47,955.3
40	240.0	49,080.0	260.0	53,170.0	268.0	54,806.0
45	270.0	55,215.0	292.5	59,816.3	301.5	61,656.8
50	300.0	61,350.0	325.0	66,462.5	335.0	68,507.5
55	330.0	67,485.0	357.5	73,108.8	368.5	75,358.3
60	360.0	73,620.0	390.0	79,755.0	402.0	82,209.0
65	390.0	79,755.0	422.5	86,401.3	435.5	89,059.8
70	420.0	85,890.0	455.0	93,047.5	469.0	95,910.5
75	450.0	92,025.0	487.5	99,693.8	502.5	102,761.3
80	480.0	98,160.0	520.0	106,340.0	536.0	109,612.0
85	510.0	104,295.0	552.5	112,986.3	569.5	116,462.8
90	540.0	110,430.0	585.0	119,632.5	603.0	123,313.5
95	570.0	116,565.0	617.5	126,278.8	636.5	130,164.3
100	600.0	122,700.0	650.0	132,925.0	670.0	137,015.0
105	630.0	128,835.0	682.5	139,571.3	703.5	143,865.8
110	660.0	134,970.0	715.0	146,217.5	737.0	150,716.5
115	690.0	141,105.0	747.5	152,863.8	770.5	157,567.3
120	720.0	147,240.0	780.0	159,510.0	804.0	164,418.0
125	750.0	153,375.0	812.5	166,156.3	837.5	171,268.8
130	780.0	159,510.0	845.0	172,802.5	871.0	178,119.5
135	810.0	165,645.0	877.5	179,448.8	904.5	184,970.3
140	840.0	171,780.0	910.0	186,095.0	938.0	191,821.0
145	870.0	177,915.0	942.5	192,741.3	971.5	198,671.8
150	900.0	184,050.0	975.0	199,387.5	1,005.0	205,522.5
154	924.0	188,958.0	1,001.0	204,704.5	1,031.8	211,003.1

WEIGHT AND MOMENT TABLES (CONT)

OUTER TANKS - USABLE FUEL

US GAL.	Density 6.0 lb/US gal.		Density 6.5 lb/US gal.		Density 6.7 lb/US gal.	
	WEIGHT (lb)	MOMENT (lb-in)	WEIGHT (lb)	MOMENT (lb-in)	WEIGHT (lb)	MOMENT (lb-in)
5	30.0	6,030.0	32.5	6,532.5	33.5	6,733.5
10	60.0	12,060.0	65.0	13,065.0	67.0	13,467.0
15	90.0	18,090.0	97.5	19,597.5	100.5	20,200.5
20	120.0	24,120.0	130.0	26,130.0	134.0	26,934.0
25	150.0	30,150.0	162.5	32,662.5	167.5	33,667.5
30	180.0	36,180.0	195.0	39,195.0	201.0	40,401.0
35	210.0	42,210.0	227.5	45,727.5	234.5	47,134.5
40	240.0	48,240.0	260.0	52,260.0	268.0	53,868.0
45	270.0	54,270.0	292.5	58,792.5	301.5	60,601.5
50	300.0	60,300.0	325.0	65,325.0	335.0	67,335.0
55	330.0	66,330.0	357.5	71,857.5	368.5	74,068.5
60	360.0	72,360.0	390.0	78,390.0	402.0	80,802.0
65	390.0	78,390.0	422.5	84,922.5	435.5	87,535.5
69	414.0	83,214.0	448.5	90,148.5	462.3	92,922.3

WEIGHT AND MOMENT TABLES (CONT)

TIP TANKS - USABLE FUEL

US GAL.	Density 6.0 lb/US gal.		Density 6.5 lb/US gal.		Density 6.7 lb/US gal.	
	WEIGHT (lb)	MOMENT (lb-in)	WEIGHT (lb)	MOMENT (lb-in)	WEIGHT (lb)	MOMENT (lb-in)
5	30.0	5,793.0	32.5	6,275.8	33.5	6,468.9
10	60.0	11,586.0	65.0	12,551.5	67.0	12,937.7
15	90.0	17,379.0	97.5	18,827.3	100.5	19,406.6
20	120.0	23,172.0	130.0	25,103.0	134.0	25,875.4
25	150.0	28,965.0	162.5	31,378.8	167.5	32,344.3
30	180.0	34,758.0	195.0	37,654.5	201.0	38,813.1
35	210.0	40,551.0	227.5	43,930.3	234.5	45,282.0
40	240.0	46,344.0	260.0	50,206.0	268.0	51,750.8
45	270.0	52,137.0	292.5	56,481.8	301.5	58,219.7
50	300.0	57,930.0	325.0	62,757.5	335.0	64,688.5
55	330.0	63,723.0	357.5	69,033.3	368.5	71,157.4
60	360.0	69,516.0	390.0	75,309.0	402.0	77,626.2
65	390.0	75,309.0	422.5	81,584.8	435.5	84,095.1
70	420.0	81,102.0	455.0	87,860.5	469.0	90,563.9
75	450.0	86,895.0	487.5	94,136.3	502.5	97,032.8
80	480.0	92,688.0	520.0	100,412.0	536.0	103,501.6
85	510.0	98,481.0	552.5	106,687.8	569.5	109,970.5
90	540.0	104,274.0	585.0	112,963.5	603.0	116,439.3
95	570.0	110,067.0	617.5	119,239.3	636.5	122,908.2
100	600.0	115,860.0	650.0	125,515.0	670.0	129,377.0
105	630.0	121,653.0	682.5	131,790.8	703.5	135,845.9
110	660.0	127,446.0	715.0	138,066.5	737.0	142,314.7
115	690.0	133,239.0	747.5	144,342.3	770.5	148,783.6
120	720.0	139,032.0	780.0	150,618.0	804.0	155,252.4
125	750.0	144,825.0	812.5	156,893.8	837.5	161,721.3
130	780.0	150,618.0	845.0	163,169.5	871.0	168,190.1
135	810.0	156,411.0	877.5	169,445.3	904.5	174,659.0
140	840.0	162,204.0	910.0	175,721.0	938.0	181,127.8
145	870.0	167,997.0	942.5	181,996.8	971.5	187,596.7
150	900.0	173,790.0	975.0	188,272.5	1,005.0	194,065.5
155	930.0	179,583.0	1,007.5	194,548.3	1,038.5	200,534.4
160	960.0	185,376.0	1,040.0	200,824.0	1,072.0	207,003.2
165	990.0	191,169.0	1,072.5	207,099.8	1,105.5	213,472.1
170	1,020.0	196,962.0	1,105.0	213,375.5	1,139.0	219,940.9
175	1,050.0	202,755.0	1,137.5	219,651.3	1,172.5	226,409.8
180	1,080.0	208,548.0	1,170.0	225,927.0	1,206.0	232,878.6

WEIGHT AND MOMENT TABLES (CONT)

ZERO FUEL WEIGHT

(Lb-in)

AIRCRAFT ZERO FUEL WEIGHT (LBS)	RESTRICTED FUEL				UNRESTRICTED FUEL	
	Main Tank Only		Main & Outer Tanks Only		Main, Outer & Tip Tanks	
	MIN	MAX	MIN	MAX	MIN	MAX
7500				1431750		1490250
7550				1441295		1500222
7600				1450840		1510196
7650				1460385		1520169
7700				1469930		1530144
7750				1479475		1540118
7800				1489020		1550094
7850				1498565		1560069
7900		1508110		1508110		1570046
7950		1517655		1519936		1580022
8000		1527200		1531800		1590000
8050		1536745		1543684		1599977
8100		1546290		1555605		1609956
8150		1555835		1567546		1619934
8200		1565380		1579525		1629914
8250		1574925		1591524		1639893
8300		1584470		1603560		1649874
8350		1594015		1613320		1659854
8400		1603560		1623081		1669836
8450		1613105		1632844		1679817
8500		1622650		1642608		1689800
8550		1632195		1652373		1699765
8600		1641740		1662139		1709731
8650		1651285		1671906		1719697
8700		1660830		1681675		1729664
8750		1670375		1691453		1739631
8800		1679920		1701224		1749598
8850		1689465		1710997		1759592

WEIGHT AND MOMENT TABLES (CONT)

ZERO FUEL WEIGHT (CONT)

(Lb-in)

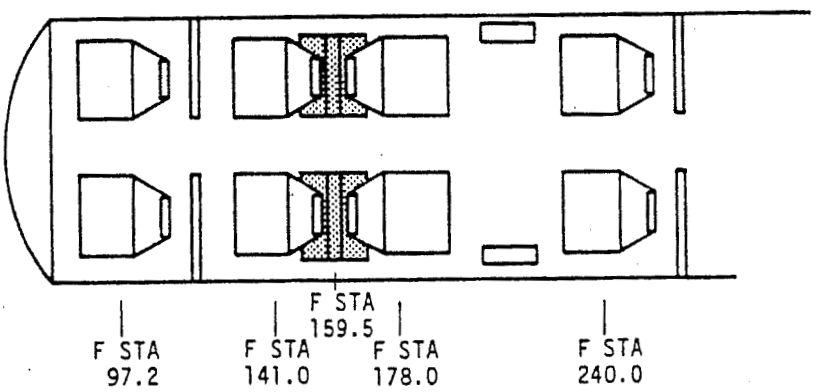
AIRCRAFT ZERO FUEL WEIGHT	RESTRICTED FUEL				UNRESTRICTED FUEL	
	Main Tank Only		Main & Outer Tanks Only		Main, Outer & Tip Tanks	
	MIN	MAX	MIN	MAX	MIN	MAX
8900		1699010		1720770		1769533
8950		1708555		1730545		1779501
9000		1718100		1740321		1789470
9050		1727645		1750098		1799438
9100	1737190	1737190		1759876		1809407
9150	1746735	1749114		1769664		1819376
9200	1756280	1761064		1779445		1829346
9250	1765825	1773040		1789227		1839316
9300	1775370	1785042		1799010		1849286
9350	1784915	1797070		1808794		1859256
9400	1794460	1809124		1818580		1869227
9450	1804005	1821204		1828367		1879198
9500	1813550	1833310		1838155		1889170
9550	1825960	1845442		1847953		1899151
9600	1838400	1857600		1857744		1909132
9650	1850870	1867525		1867535		1919114
9700	1863370	1877328		1877328		1929097
9750	1875900	1887122		1887122		1939080
9800	1888460	1896917		1896917		1949063
9850	1901050	1906713		1906713		1959046
9900	1913670	1916511		1916511		1969030
9950	1926320	1926320		1926320		1979015

WEIGHT AND MOMENT TABLES (CONT)

PILOTS AND PASSENGERS

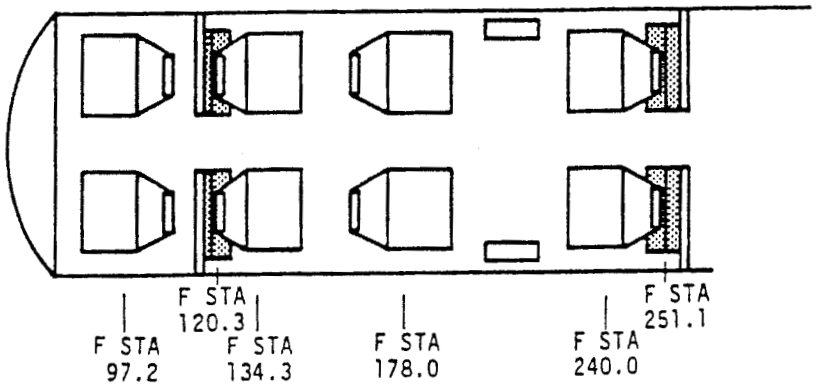
The weight and moment for the manufacturer's basic seating arrangements have been calculated in the tables below using seat station locations and an average weight of 170 pounds per person. To calculate the moment for other seating arrangements, use the formula: Wt (lbs) x Arm (In. Sta) = Moment (lbs-in)

Configuration A



WEIGHT (LBS)	MOMENT (LBS-IN)			
	97.2	141.0	178.0	240.0
170	16,524.0	23,970.0	30,260.0	40,800.0
340	33,048.0	47,940.0	60,520.0	81,600.0

Configuration B

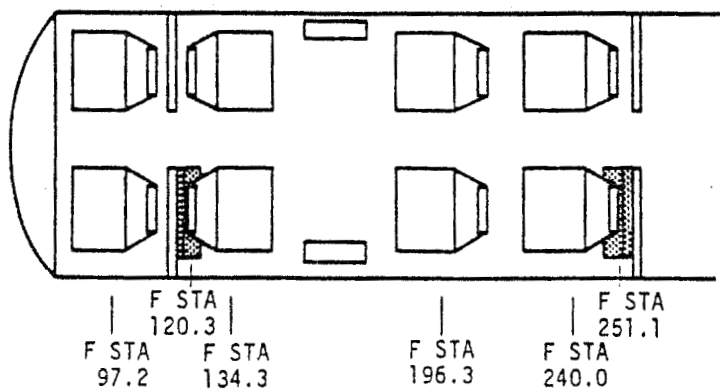


WEIGHT (LBS)	MOMENT (LBS-IN)			
	97.2	134.3	178.0	240.0
170	16,524.0	22,831.0	30,260.0	40,800.0
340	33,048.0	45,662.0	60,520.0	81,600.0

WEIGHT AND MOMENT TABLES (CONT)

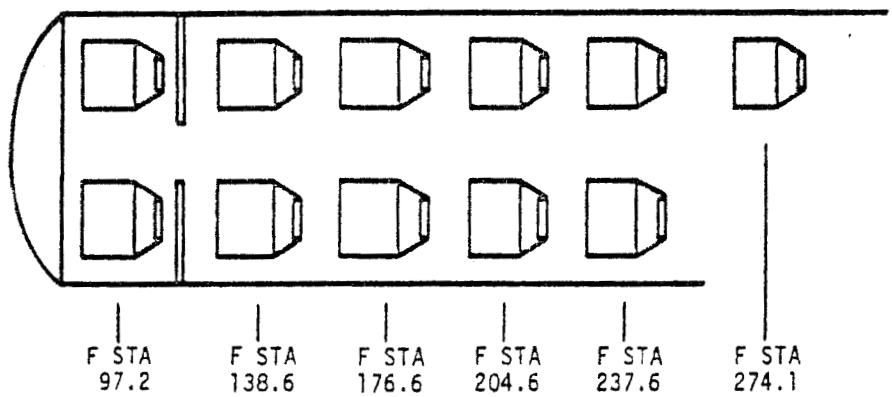
PILOTS AND PASSENGERS (CONT)

Configuration C



WEIGHT (LBS)	MOMENT (LBS-IN)			
	97.2	134.3	196.3	240.0
170	16,524.0	22,831.0	33,371.0	40,800.0
340	33,048.0	45,662.0	66,742.0	81,600.0

Configuration D

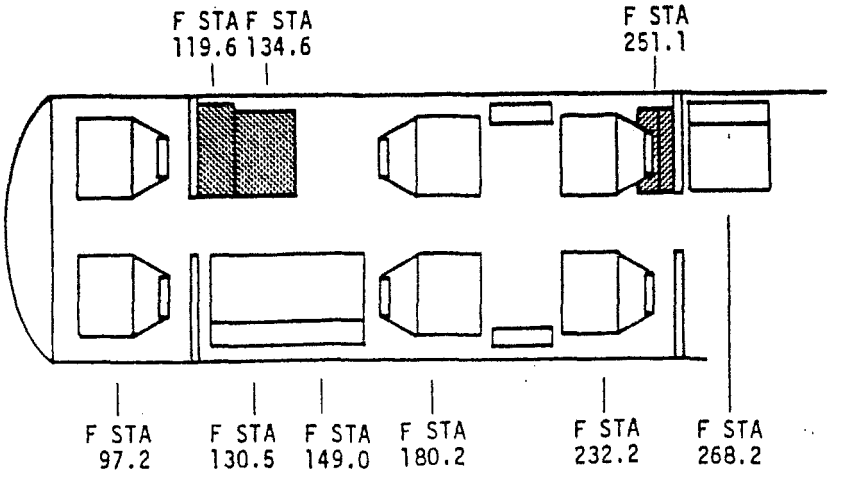


WEIGHT (LBS)	MOMENT (LBS-IN)					
	97.2	138.6	176.6	204.6	237.6	274.1
170	16,524.0	23,562.0	30,022.0	34,782.0	40,392.0	46,597.0
340	33,048.0	47,124.0	60,044.0	69,564.0	80,784.0	

WEIGHT AND MOMENT TABLES (CONT)

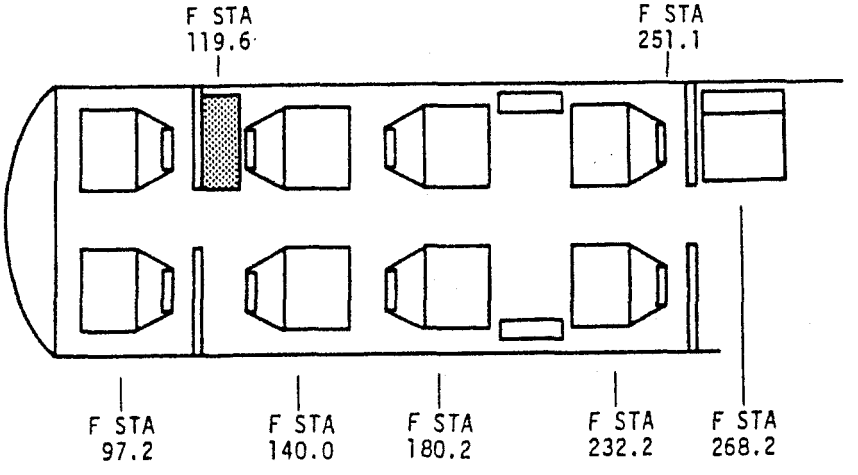
PILOTS AND PASSENGERS (CONT)

Configuration E



WEIGHT	MOMENT (LBS-IN)					
(LBS)	97.2	130.5	149.0	180.2	232.2	268.2
170	16,524	22,185	25,330	30,634	39,474	45,594
340	33,048			61,268	78,948	

Configuration F

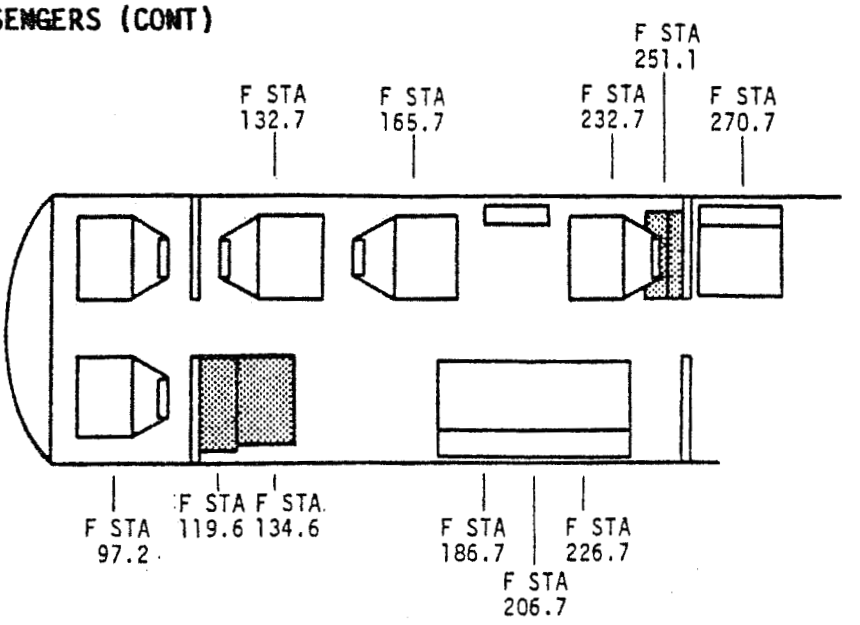


WEIGHT	MOMENT (LBS-IN)				
(LBS)	97.2	140.0	180.2	232.2	268.2
170	16,524	23,800	30,634	39,474	45,594
340	33,048	47,600	61,268	78,948	

WEIGHT AND MOMENT TABLES (CONT)

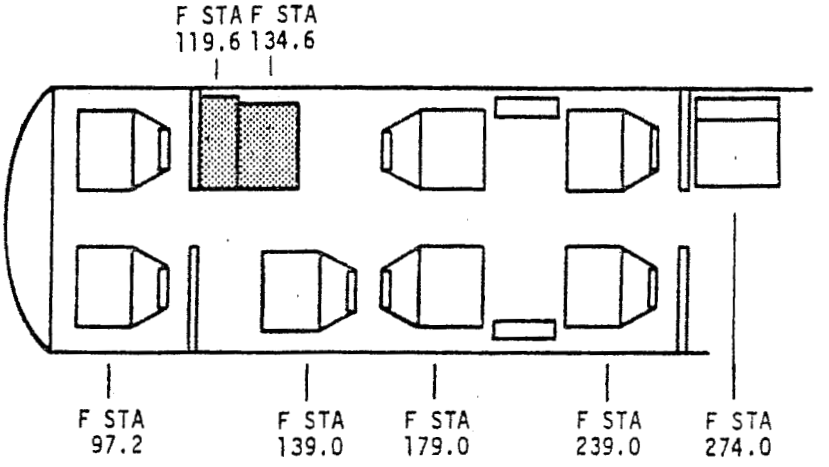
PILOTS AND PASSENGERS (CONT)

Configuration G



WEIGHT (LBS)	MOMENT (LBS-IN)							
	97.2	132.7	165.7	186.7	206.7	226.7	232.7	270.7
170	16,524	22,559	28,169	31,739	35,139	38,539	39,559	46,019
340	33,048							

Configuration H



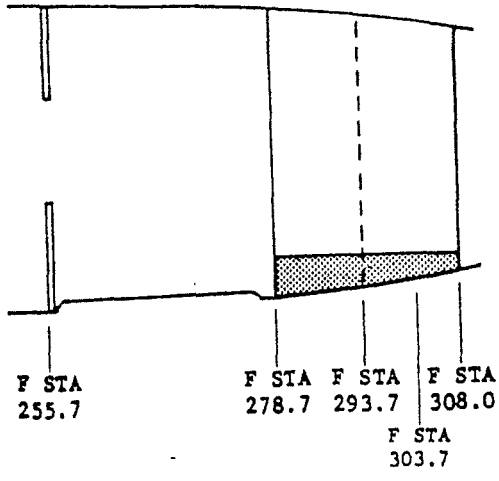
WEIGHT (LBS)	MOMENT (LBS-IN)				
	97.2	139	179	239	274
170	16,524	23,630	30,430	40,630	46,580
340	33,048		60,860	81,260	

WEIGHT AND MOMENT TABLES (CONT)

BAGGAGE

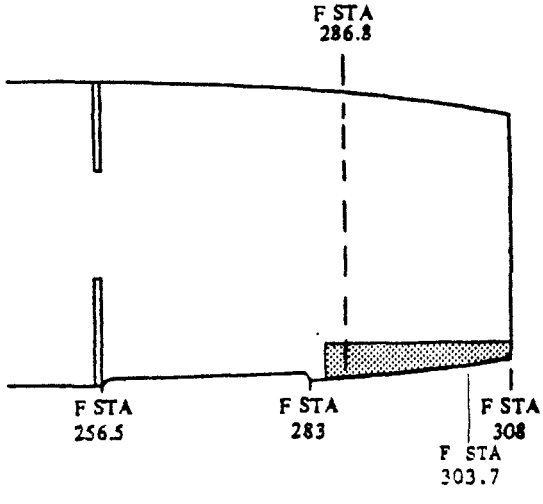
The weight and moment for two basic baggage arrangements have been calculated in the tables below. The tables are based on even weight distribution.

REAR BAGGAGE AREA WITH NET



Weight (lb)	Moment (lb-in)	Weight (lb)	Moment (lb-in)	Weight (lb)	Moment (lb-in)
10	2937	120	35,244	230	67,551
20	5874	130	38,181	240	70,488
30	8811	140	41,118	250	73,425
40	11,748	150	44,055	260	76,362
50	14,685	160	46,992	270	79,299
60	17,622	170	49,929	280	82,236
70	20,559	180	52,866	290	85,173
80	23,496	190	55,803	300	88,110
90	26,433	200	58,740	310	91,047
100	29,370	210	61,677	320	93,984
110	32,307	220	64,614	330	96,921

TOTAL BAGGAGE AREA



Weight (lb)	Moment (lb-in)	Weight (lb)	Moment (lb-in)	Weight (lb)	Moment (lb-in)
10	2,868	210	60,228	410	117,588
20	5,736	220	63,096	420	120,456
30	18,604	230	65,964	430	123,324
40	11,472	240	68,832	440	126,192
50	14,340	250	71,700	450	129,060
60	27,208	260	74,568	460	131,928
70	20,076	270	77,436	470	134,796
80	22,944	280	80,304	480	137,664
90	25,812	290	83,172	490	140,532
100	28,680	300	86,040	500	143,400
110	31,548	310	88,908	510	146,268
120	34,416	320	91,776	520	149,136
130	37,284	330	94,644	530	152,004
140	40,152	340	97,512	540	154,872
150	43,020	350	100,380	550	157,740
170	48,756	370	106,116	570	163,476
180	51,624	380	108,984	580	166,344
190	54,492	390	111,852	590	169,212
200	57,360	400	114,720	600	172,080

WEIGHT AND MOMENT TABLES (CONT)

WEIGHT SHIFT CALCULATION

To determine the amount of weight to shift forward or aft as required to be within the ZFW envelope or within the non-restricted fuel area, apply the following formula:

$$\frac{w}{W} = \frac{d}{D}$$

"w" = Pounds of cargo, baggage, or passengers to be moved.

"W" = ZFW (loaded weight of airplane).

"d" = Distance in inches that ZFW is out of the envelope or the distance required to move ZFW into non-restricted fuel area.

"D" = Distance in inches between forward and aft cargo, baggage, or seat locations that may be utilized to shift the weight.

SAMPLE CALCULATION:

"w" = Pounds of weight to shift is the unknown

"W" = ZFW (loaded airplane weight) is 9,900 lbs

"d" = Distance required to move ZFW into the non-restricted fuel area is 1.75 inches (actual ZFW at F. Sta 192.0 and 9,900 lbs which is in a restricted fuel area of the ZFW envelope; 1.75 inches aft will put ZFW at 193.75 which is within the non-restricted fuel area of the ZFW envelope).

"D" = Distance in inches between forward and aft locations available for weight shift is 99 inches (determined from seat locations, 6 seats, 5 passengers with an aft seat empty, forward seat at F. Sta 141 and aft seat at F. Sta. 240 with the difference being 99 inches).

$\frac{w\ (?)}{9,900} = \frac{1.75}{99}$ Cross multiply and divide answer by 99

$$W = \frac{9,900 \times 1.75}{99} = 175 \text{ lbs}$$

SOLUTION:

Move one passenger (at 175 lbs) from forward seat at F. Sta 141 to aft seat at F. Sta 240.

WEIGHING INSTRUCTIONS

Ensuring all changes to the airplane affecting weight and balance are applied to the empty weight figures is the pilot's responsibility. Periodic weighing may be required to accurately ascertain the current empty weight.

NOTE

Calculate the empty weight after draining fuel and oil (refer to page 7-21).

Weighing should be accomplished in a closed hangar with no wind or strong drafts. The scales used should be calibrated and certified.

1. Place the airplane on landing gear scales.

2. Level the airplane. Hang a plumb bob from the leveling clip in the electrical compartment at F. Sta 8180. Adjust the tire pressure so that the plumb bob tip aligns with the target set point.

NOTE

The leveling clip is accessable through the left electrical compartment access panel. The clip is on the airplane center line and the target set point is approximately 15.0 inches (381 mm) below the clip.

3. Hang plumb bobs from the reference line at left and right F. Sta 4875 (191.9 inches) to establish a ground reference line.

NOTE

The reference line at left and right F. Sta 4875 is identified by a button head rivet approximately 16.0 inches (406 mm) aft of the wing leading edge and approximately 11.0 inches (279 mm) outboard of the wing fuselage fairing.

4. Dimensions X1 and X2 are determined by measuring the distance from the wheel axle center lines to the ground reference line (the line between the plumb bob points).

   X1 = Distance from Nose Wheel to Reference Line.
   X2 = Distance from Main Wheels to Reference Line.

5. Record the scale indications.

   W1 = Nose wheel weight
   W2 = Left plus right wheel weights

WEIGHING INSTRUCTIONS (CONT)

Total the scale reading to determine the empty weight (W).

W = W1 + W2 or Empty Weight

NOTE

If the airplane is weighed with a partial or full fuel load, apply paragraph "Weight With Fuel Load."

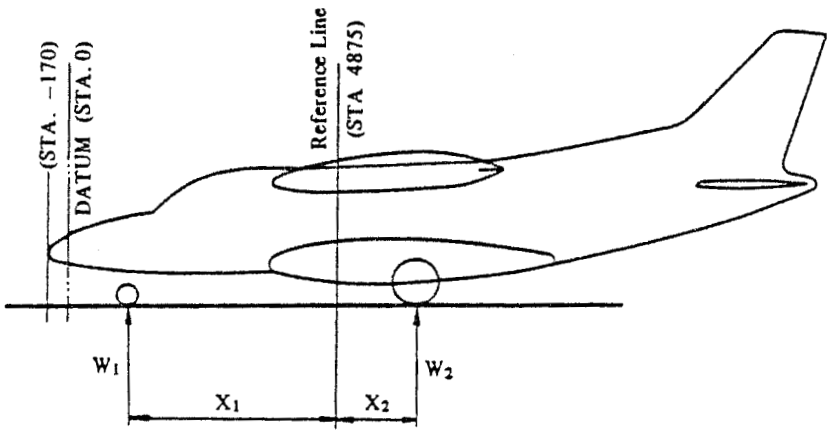
6. The moment is determined using the following equation:

   Moment in lb-in = W1(191.9 - X1) + W2(191.9 + X2)

7. The center of gravity (in inches) and % MAC are determined using the following equations:

   C.G. = Moment ÷ W

$$\% \text{ MAC} = \frac{(\text{C.G.} - 191.5) \times 100}{60.6} + 22.0$$



WEIGHT WITH FUEL LOAD

The computations listed below are to be applied to determine the airplane empty weight when weighing with partial or full fuel load.

1. Determine the fuel density per gallon by obtaining the fuel specific gravity.

   Density (lbs/gal) = Specific Gravity x 8.3461

2. Determine the fuel weight and moment (lb-in) of each fuel tank by using the following formulas:

TANK	GALS	ARM	MOMENT
Main	(159.0 x Density = Weight)	x 204.5	=
Outers	(70.6 x Density = Weight)	x 201.0	=
Tips	(186.0 x Density = Weight)	x 193.1	=

NOTE

The gallon quantities given are for full fuel loads. Substitute the actual fuel quantity for each tank when weighing with a partial fuel load.

3. Subtract the total fuel weight and moment from the actual weight (W1 + W2).

4. Add the unusable fuel weight and moment to the results after step 3 to establish the airplane empty weight.

   (Density x 12.6 = Weight) x 198.6 = Moment

NOTE

12.6 is the unusable fuel in gallons and 198.6 is the arm in inches.

OIL DRAINING

1. Place the airplane on level ground.
2. Feather the propeller to ensure maximum drainage of oil into the oil tank.
3. Remove the drain plug from the oil tank.
4. Motor or manually turn the propeller in its normal direction of rotation to ensure oil flows back into the tank.
5. Remove the drain plug from the oil cooler.

FUEL DRAINING

1. Place the airplane on level ground. Open the fuel drain valves located on the bottom of the tip tanks, in the wing fillet and those located at the bottom of the wing under each outboard and inboard tank. Drain fuel into clean fuel type containers.
2. An acceptable alternate method is described in the Maintenance Manual.

EQUIPMENT NAMES, WEIGHTS AND INSTALLED MOMENT ARM

CLASSIFICATION IN CODE COLUMN

R : REQUIRED EQUIPMENT ITEMS FOR FAA TYPE CERTIFICATION.

S : STANDARD EQUIPMENT ITEMS.

O : OPTIONAL EQUIPMENT ITEMS REPLACING REQUIRED OR STANDARD ITEMS.

A : OPTIONAL EQUIPMENT ITEMS WHICH ARE IN ADDITION TO REQUIRED OR STANDARD ITEMS.

Nomenclature	Part Number	Manufacturer	Qty	Weight (lb)	Arm (in)	Code
CABIN EQUIPMENT						
Pilot Seat	9002-1	Tenryu Ind. Co.	1	33.75	97.2	R
Copilot Seat	9002-2	Tenryu Ind. Co.	1	33.75	97.2	S
Pilot Seat	9002-11	Tenryu Ind. Co.	1	35.5		O
Copilot Seat	9002-12	Tenryu Ind. Co.	1	35.5		O
Passenger Seats						
LH Fwd Face	9001-1	Tenryu Ind. Co.	A/R	23.5		S
RH Fwd Face	9001-2	Tenryu Ind. Co.	A/R	23.5		S
LH Aft Face	9001-11	Tenryu Ind. Co.	A/R	25.0		S
RH Aft Face	9001-12	Tenryu Ind. Co.	A/R	25.0		S
Swivel Seats						
RH Aft Face	1080-7 F/AHCST	Custom Products	A/R	52.0		O
RH Fwd Face	1080-7 FHCST	Custom Products	A/R	52.0		O
LH Aft Face	1080-8 F/AHCST	Custom Products	A/R	52.0		O
LH Fwd Face	1080-8 FHCST	Custom Products	A/R	52.0		O
2 Place Couch	935A-3001-( )	Ward International	A/R	32.0		O
3 Place Couch	935A-3001-( )	Ward International	A/R	57.0		O
Safety Belt	960-1B	American Safety Flight System	A/R			R
OXYGEN SYSTEM						
Cylinder	6350-A4-CC-B	Scott Aviation	1	14.0	198.0	R
Regulator	24552	Scott Aviation	1	1.7	90.6	R
Mask	28314-19	Scott Aviation	2	0.44		R
Mask	803201-05	Scott Aviation	A/R	0.44		R
Mask	802269-05	Scott Aviation	A/R	0.44		R
Outlet	23499-( )	Scott Aviation	A/R	0.13		R

EQUIPMENT NAMES, WEIGHTS AND INSTALLED MOMENT ARM (CONT)

Nomenclature	Part Number	Manufacturer	Qty	Weight (lb)	Arm (in)	Code
INSTRUMENTS						
Airspeed Indicator	960A-9501-1	MAI	1	2.0	71.7	R
Altimeter	A-35-MA-10L	Aerosonic	1		71.7	R
Rate of Climb Indicator	RC-60-MS-10-3	Aerosonic	1	1.0	71.7	R
Turn & Bank Indicator	4099B	Bendix	1	2.1	71.7	S
Torque Meter	935A-5001-3	MAI	2	0.97	71.7	R
EGT Indicator	960A-9501-1	MAI	2	0.75	71.7	R
Fuel Flow Indicator	AR-204A-1D	Foxboro	2	0.6	71.7	R
Tachometer	035A-986418-3	MHI	2	0.8	71.7	R
Oil Temp. Indicator	935A-6007-1	MAI	2	0.6	71.7	R
	147B31N	Lewis	2	0.6	71.7	A
Oil Press Indicator	935A-6008-1	MAI	1	0.5	71.7	R
	SED-04A	U.S. Gauge	1	0.5	71.7	A
Fuel Press Indicator	935A-6009-1	MAI	1	0.5	71.7	R
	SED-03A	U.S. Gauge	1	0.5	71.7	A
Main Fuel Qty Indicator	030A-986403-9	MHI	1	1.75	71.7	R
Tip Fuel Qty Indicator	035A-986428-1	MHI	1	1.5	71.7	R
Outer Fuel Qty Indicator	035A-986432-1	MHI	1	1.5	71.7	R
Fuel Consumption Totalizer	AT-204-17	Foxboro	1	0.4	71.7	O
Magnetic Compass	C-5C	U.S. Gauge	1	0.55	71.7	R
	AN5766T4		1	0.55	71.7	O
Free Air Temp Indicator	47B43	Lewis	1	1.4	71.7	R
Clock	W-33-7510-10	Wakman	1	1.0	71.7	S
Volt Ammeter	936A-9500-501	MAI	2	0.75	71.7	R
Vacuum Gauge	AW1821AB14	U.S. Gauge	1	1.0	71.7	S
Cabin Altitude Diff. Press. Indicator	035A-986404-1	MHI	1	1.17	71.7	R
Cabin Rate of Climb Indicator	RCM-60-AC	Aerosonic	1	1.0	71.7	R

EQUIPMENT NAMES, WEIGHTS AND INSTALLED MOMENT ARM (CONT)

Nomenclature	Part Number	Manufacturer	Qty	Weight (lb)	Arm (in)	Code
AVIONICS EQUIPMENT						
VHF-20A Comm (#1)						
Transceiver	622-1879-002	Collins	1	5.3	34.2	S
Antenna	VC10-126	Collins	1	2.4	209.5	S
VHF-20A Comm (#2)						
Transceiver	622-1879-002	Collins	1	5.3	40.2	S
Antenna	Tail Cap Ant.		1	Pt. of Tailcap Wt.		S
VIR-30A Nav (#1)						
Receiver	622-0876-001	Collins	1	5.8	35.2	S
Nav Antenna	VT-10-02-1	Collins	1	5.0	420.0	S
G.S. Antenna	DMN25-1	Dorne & Morgolin	1	0.5	5.9	S
Mkr Antenna	935A-9051-1	MAI	1	0.8	395.8	S
VIR-30A Nav (#2)						
Receiver	622-0876-001	Collins	1	5.8	40.2	S
Nav Antenna Coupler	AD-3	Antenna Develop Co.	1	0.3	36.6	S
G.S. Antenna Coupler	CI-503	Comant Ind.	1	0.3	36.6	S
ADF-60A (#1)						
Receiver	622-2362-001	Collins	1	4.3	336.2	S
Antenna	ANT-60	Collins	1	3.1	142.0	S
ADF-60A (#2)Opt.B	960A-8024	MAI	Total	12.7	242.7	
Receiver	622-2362-001	Collins	1	4.3	336.2	A
Antenna	ANT-60	Collins	1	3.1	274.0	A
Control Panel	777-1493-003	Collins	1	1.1	71.6	A
Wire Harness Cabin	960A-8740-1	MAI	1	3.2	181.5	A
Wire Harness Aft	960A-8768-1	MAI	1	1.0	326.2	A
SPZ-500 Automatic Flight Control						
A/P Computer	4008519-942	Sperry	1	6.0	30.5	S
F/D Computer	4018369-905	Sperry	1	5.7	33.8	S
ADC Computer	4013241-901	Sperry	1	9.0	37.6	S
ADI, AD-500 (Pilot)	7000836-902	Sperry	1	6.2	67.8	S
HSI RD-500 (Pilot)	4027170-905	Sperry	1	6.3	67.8	S
Altitude Alert Controller	4018285-901	Sperry	1	1.5	67.8	S
Mode Selector	4018368-902	Sperry	1	1.5	72.8	S
Controller	4018639-902	Sperry	1	1.8	82.0	S
HSI, RD-44 (Copilot)	2592920-044	Sperry	1	5.0	67.8	S

EQUIPMENT NAMES, WEIGHTS AND INSTALLED MOMENT ARM (CONT)

Nomenclature	Part Number	Manufacturer	Qty	Weight (lb)	Arm (in)	Code
AVIONICS EQUIPMENT (cont)						
VNAV Computer Opt-B	4020571-901	Sperry	1	2.0	67.8	A
Rudder Trim Comp	4015901-902	Sperry	1	1.0	175.0	S
Aileron Servo & Bracket	4006719-906	Sperry	1	5.6	247.3	S
Elevator Servo Bracket	4006719-904	Sperry	1	5.6	365.0	S
Rudder Servo & Bracket	4006719-904	Sperry	1	5.6	362.0	S
Elevator Trim Servo	4011097-911	Sperry	1	5.5	381.9	S
Rudder Trim Servo	4011097-905	Sperry	1	5.5	363.0	S
DME-40 (#1)						
Transceiver	622-1233-001	Collins	1	7.3	340.9	S
Indicator (IND-40A)	622-3916-001	Collins	1	0.9	70.1	S
Antenna	935A-9502-1	MAI	1	0.4	73.7	S
DME-40 (#2) Opt-B	960A-8028	MAI	Total Wt.	13.6	109.6	
Transceiver	622-1233-001	Collins	1	7.3	346.5	A
Indicator (IND-40B)	622-3917-001	Collins	1	0.9	70.1	0
Antenna	935A-9502-1	MAI	1	0.4	305.7	A
Wire Harness Cabin	960A-8771-1	MAI	1	4.0	181.5	A
Wire Harness Aft	960A-8772-1	MAI	1	1.0	326.5	A
TDR-90 Transponder (#1)						
Transponder	622-1270-001	Collins	1	4.0	330.1	S
Antenna	935A-9502-1	MAI	1	0.4	358	S
TDR-90 Transponder (#2) Opt-A			Total Wt.	4.4	335.0	
Transponder	622-1270-001	Collins	1	4.0	332.9	S
Antenna	935A-9502-1	MAI	1	0.4	187.9	S
ALT-55 Radio Alt.						
Transceiver	622-2855-001	Collins	1	5.6	346.8	S
Antenna No. 1	4007637-002	Collins	1	1.4	225.8	S
Antenna No. 2	4007637-002	Collins	1	1.4	260.2	S
Indicator DRI-55	622-4160-008	Collins	1	0.7	70.1	S
C-14 Compass #1						
Directional Gyro	2587193-43	Sperry	1	4.7	322.1	S
Flux Detector	2594484	Sperry	1	1.1	196.7	S
Dual Remote Compensator	2593379-001	Sperry	1	1.0	343.7	S

EQUIPMENT NAMES, WEIGHTS AND INSTALLED MOMENT ARM (CONT)

Nomenclature	Part Number	Manufacturer	Qty	Weight (lb)	Arm (in)	Code
AVIONICS EQUIPMENT (cont)						
C-14 Compass #2						
Directional Gyro	2587193-43	Sperry	1	4.7	335.8	S
Flux Detector	2594484	Sperry	1	1.1	196.7	S
Vertical Gyro (VG014A)	7000622	Sperry	1	7.3	336.2	S
Gyro Horizon Indicator	AIM300-14	AIM	1	2.7	70.1	S
Radio Control Panel	G5716	Gables	1	10.3	70.1	S
RMI-30 (Pilot)	622-4938-001	Collins	1	2.6	70.1	S
RMI-30 (Copilot)	622-4938-001	Collins	1	2.6	70.1	S
ELT	D.M.ELT-6	Dorne & Morgolin	1	3.5	353.0	S
Audio Control(#1)	071-2007-00	King	1	3.0	26.5	S
Audio Control(#2)	071-2007-00	King	1	3.0	15.2	S
P-30A W/Radar	960A-8010	MAI	Total Wt.	33.4	35.3	
Opt-B						
Transceiver & Mount	MI-585222	RCA/Sperry	1	13.0	29.1	A
Indicator & Mount	MI-585223-1	RCA/Sperry	1	7.5	67.8	A
Waveguide	936A-8318-7	MAI	1	1.1	17.1	A
Antenna	MI-585224	MAI	1	7.8	10.1	A
Wire Harness Nose	960A-8702-1	MAI	1	2.0	37.5	A
Wire Harness Cabin	960A-8736-1	MAI	1	2.0	47.5	A
P-300 W/Radar	960A-8012	MAI	Total Wt.	39.0	39.3	
Opt B						
Transceiver & Mount	MI-585222	RCA/Sperry	1	13.0	29.1	A
Indicator & Mount	MI-585228-1	RCA/Sperry	1	13.1	67.8	A
Waveguide	936A-8318-7	MAI	1	1.1	17.1	A
Antenna	MI-585224	RCA/Sperry	1	7.8	10.1	A
Wire Harness Nose	960A-8702-1	MAI	1	2.0	37.5	A
Wire Harness Cabin	960A-8736-1	MAI	1	2.0	47.5	A
RDR-1200 W/Radar	960A-8016		Total Wt.	37.3	34.8	
Opt-B						
Transceiver & Mount	4000502-0101	Bendix	1	15.8	29.1	A

EQUIPMENT NAMES, WEIGHTS AND INSTALLED MOMENT ARM (CONT)

Nomenclature	Part Number	Manufacturer	Qty	Weight (lb)	Arm (in)	Code
AVIONICS EQUIPMENT (cont)						
Indicator & Mount	4001291-2101	Bendix	1	8.4	67.8	A
Waveguide	936A-8318-7	MAI	1	1.1	17.1	A
Antenna	4000504-0301	Bendix	1	8.0	10.1	A
Wire Harness Nose	960A-8704-1	MAI	1	2.0	37.5	A
Wire Harness Cabin	960A-8738-1	MAI	1	2.0	47.5	A
P-400 W/Radar Opt-B	960A-8014	MAI	Total Wt.	42.0	37.8	
Transceiver & Mount	MI-585200	RCA/Sperry	1	16.9	29.1	A
Indicator	MI-585201-1	RCA/Sperry	1	12.2	67.8	A
Waveguide	936A-8318-7	MAI	1	1.1	17.1	A
Antenna	MI-585202	RCA/Sperry	1	7.8	10.1	A
Wire Harness Nose	960A-8702-1	MAI	1	2.0	37.5	A
Wire Harness Cabin	960A-8736-1	MAI	1	2.0	47.5	A
KNC-610- RNAV Opt-B	960A-8018	MAI	Total Wt.	7.8	51.8	
Indicator	066-4002-00	King	1	3.3	70.1	A
Relay	831-24C-28-3		1	0.5	16.0	A
Wire Harness Nose	960A-8707-1	MAI	1	2.5	37.5	A
Wire Harness Cabin	960A-8753-1	MAI	1	1.5	47.5	A
RNS-3500 RNAV Opt-B	960A-8020	MAI	Total Wt.	12.6	40.9	
Interface Unit & Mount	4000425-0400	Bendix	1	5.1	23.0	A
Indicator	4000691-0102	Bendix	1	3.0	70.1	A
Wire Harness Nose	960A-8708-1	MAI	1	2.5	37.5	A
Wire Harness Cabin	960A-8744-1	MAI	1	2.0	47.5	A
AD611 RNAV Opt-B	960A-8022	MAI	Total Wt.	14.0	38.3	
Interface Unit & Mount	AD804D0002/D	Foster AirData	1	2.3	17.5	A
Computer	AD804D0006	Foster AirData	1	4.5	23.0	A

EQUIPMENT NAMES, WEIGHTS AND INSTALLED MOMENT ARM (CONT)

Nomenclature	Part Number	Manufacturer	Qty	Weight (lb)	Arm (in)	Code
AVIONICS EQUIPMENT (cont)						
Output Drive Adaptor	804B0045	Foster AirData	1	0.9	17.5	A
Remote Controller	AD804D0004	Foster AirData	1	0.9	70.1	A
Controller	AD804D0005	Foster AirData	2	0.9	70.1	A
Wire Harness Nose	960A-8709-1	MAI	1	2.5	37.5	A
Wire Harness Cabin	960A-8745-1	MAI	1	2.0	47.5	A
Flight Phone Opt-B	960A-8008	MAI	Total Wt.	16.9	297.4	
Transceiver RT-1B	400-0033	Wulfsberg	1	8.0	380.2	A
Antenna AT-270	121-0001	Wulfsberg	1	0.1	325.3	A
Phone (#1)	400-0030	Wulfsberg	1	2.9	78.6	A
Phone (#2)	400-0030	Wulfsberg	1	2.9	244.6	A
Shelf	935A-8119-1	MAI	1	1.5	380.2	A
Wire Harness Aft	960A-8767-1	MAI	1	1.5	346.4	S
ASB-850 HF Comm Opt-B	960A-8026	MAI	Total Wt.	66.8	330.9	
Transceiver	8033-1000	Sunair	1	17.4	355.0	A
Antenna Coupler	8033-3000	Sunair	1	23.6	365.0	A
Antenna	935A-8022-1	MAI	1	2.5	291.3	A
Controller	8033-2000	Sunair	1	1.8	70.1	A
Wire Harness Cabin	960A-8742-1	MAI	1	9.5	231.5	A
Shelf	960A-8411	MAI	1	8.0	360.0	A
Wire Harness Aft	960A-8769-1	MAI	1	4.0	346.5	A
Wire Harness Fus.	960A-8733	MAI	1	69.5		S
Wire Harness Nose (Incl. Mount & Connector)	960A-8701	MAI	1	24.5		S
Wire Harness Aft (Mount Not Included)	960A-8761	MAI	1	9.3		S
RF Wire			1	13.1		S
5V Box	935A-8116	MAI	1	2.25	50.19	S
Pilot Speaker	40-1284	Radio Shack	2	1.9	99.1	S
J-Box	960A-8316	MAI	1	4.4	30.26	S
AC Circuit Breaker Panel	960A-8239	MAI	1	1.6	99.53	S
Avionics Circuit Breaker Panel	936A-8262	MAI	1	2.5	107.9	S

EMPTY WEIGHT AND BALANCE RECORD

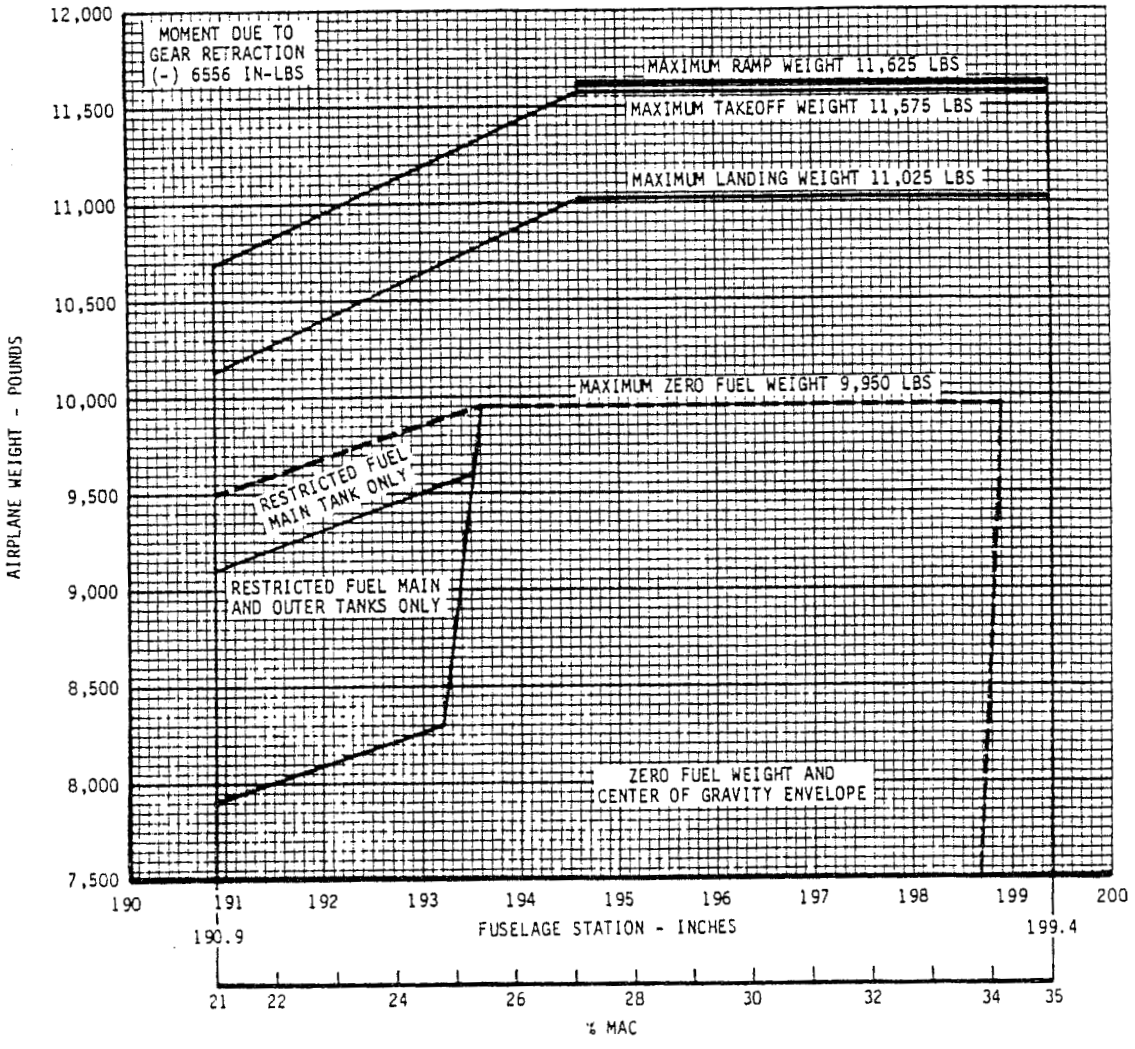
Registration No. _____	Mfr's Serial No. _____	Date of Mfr _____			
Date	Computed by	Description	Weight (lb)	Arm (in)	Moment (lb-in)

WEIGHT AND BALANCE LOADING FORM

Serial No.	Registration No.	Date	Completed By

TOTAL COMPUTED PAYLOAD Compute In Space Below and Enter on Line 4.			REF NO	ITEM	WEIGHT	MOMENT
Pilots/Pass Cargo/Baggage /Carry On	WEIGHT	MOMENT	1	EMPTY WEIGHT		
			2	DRAINABLE OIL (Cross Out if in 1)	30	5,277
			3	EXTRA EQUIPMENT (Not Included in 4)		
			4	TOTAL COMPUTED PAYLOAD		
			5	ZERO FUEL WEIGHT (Subtotal 1 thru 4)		
			6	Compare Weight & Moment to table or Divide Moment by Weight to determine C.G. and plot on graph		
			7	ALLOWABLE FUEL (Reference Only) Max Ramp Wt ZFW (Minus) MAX ALLOWABLE FUEL Main/Outer/Tips	11,625	
				MAX FUEL Main/Outer	1,494	303,865
				MAX FUEL Main Only	1,032	211,003
BAGGAGE				FUEL LOAD		
				MAIN		
				OUTERS		
			8	(Main Full)		
				TIPS (Main/Outers Full)		
			9	RAMP/TAKEOFF WEIGHT (Subtotal 5 & 8)		
			10	FUEL CONSUMED TO REACH LANDING WT (9 Minus 10)	11,025	
CABINET CONTENTS x F. STA				ESTIMATED FUEL TIPS		
			11	CONSUMPTION OUTERS		
				MAIN		
			12	ESTIMATED FUEL CONSUMED (Subtotal)		
TOTAL PAYLOAD (To Line 4)			13	LANDING WT (9 Minus 12)		

AIRCRAFT WEIGHT/ZERO FUEL WEIGHT AND C.G. ENVELOPES (LANDING GEAR EXTENDED)



Datum: 6.69 in. (170 mm) aft of Nose or Forward 220.67 in. (5606 mm) from front plane of wing rear spar-fuselage connecting frame.

MAC : Length is 60.55 in.
(Leading edge of MAC is at + 178.23 in.)

LOADING LIMITATIONS

Airplane loading, exclusive of fuel (ZFW), must remain within the Zero Fuel Weight Envelope. **The order of fuel loading must be Mains, Outers, and Tips.**

LOG OF SUPPLEMENTS

SERIAL NO. _____ REGISTRATION NO. _____

FAA Approved Supplements for installed subject equipment must be attached to the Airplane Flight Manual, MR-0273-1 reissued 09-24-85, and must be aboard the airplane for operation. The installed subject equipment is noted by its SUPPLEMENT NUMBER being encircled. MAI is not responsible for any other approved supplemental information that may be included in Section 8 which is published and maintained by other manufacturers or installers.

SUPPLEMENT NUMBER	SUBJECT	DATE	REVISION DATE
1	AIRCRAFT SERIAL NUMBER 700SA ONLY - CHANGES TO THE BASIC AIRPLANE FLIGHT MANUAL	12-04-78 REISSUED 09-24-85	
4	KING RADIO CORPORATION KNC-610 AREA NAVIGATION COMPUTER	09-05-78 REISSUED 09-24-85	
5	BENDIX RNS 3500 AREA NAVIGATION COMPUTER	12-13-78 REISSUED 09-24-85	
6	FOSTER AIRDATA AD611 AREA NAVIGATION SYSTEM WITH 61DRM RANGE INDICATOR AND 61WPS WAYPOINT SETTER	06-12-80 REISSUED 09-24-85	
7	FOSTER AIRDATA RNAV612 AREA NAVIGATION SYSTEM WITH 612RIU INTERFACE UNIT WITHOUT VN541/A	05-06-83 REISSUED 09-24-85	
8	SMITH'S ENCODING ALTIMETER/ALERTER SYSTEM, SERIES 1400	09-05-78 REISSUED 09-24-85	
9	IDC ENCODING ALTIMETER/ALERTER SYSTEM	12-13-78 REISSUED 09-24-85	
10	IDC RADBAR ENCODING ALTIMETER AND ALTITUDE ALERTING SYSTEM WITH VOICE TERRAIN ADVISORY (WITH KRA-405 RADIO ALTIMETER)	12-18-78 REISSUED 09-24-85	

SUPPLEMENT NUMBER	SUBJECT	DATE	REVISION DATE
11	IDC RADBAR ENCODING ALTIMETER AND ALTITUDE ALERTING SYSTEM WITH VOICE TERRAIN ADVISORY (WITH AA-215 RADIO ALTIMETER)	12-18-78 REISSUED 09-24-85	
12	IDC RADBAR ENCODING ALTIMETER AND ALTITUDE ALERTING SYSTEM WITH VOICE TERRAIN ADVISORY (WITH ALT-50 RADIO ALTIMETER)	09-06-79 REISSUED 09-24-85	
13	COLLINS ALT-55 RADIO ALTIMETER WITH DRI-55 INDICATOR	12-07-79 REISSUED 09-24-85	
14	SPERRY AA-215 RADIO ALTIMETER	09-05-78 REISSUED 09-24-85	
15	KING KRA-405 RADIO ALTIMETER	12-04-78 REISSUED 09-24-85	
16	COLLINS ALT-50 RADIO ALTIMETER	12-13-78 REISSUED 09-24-85	
17			
18	COLLINS FDS-112V FLIGHT DIRECTOR SYSTEM	09-05-78 REISSUED 09-24-85	
19	SPERRY GH-14 FLIGHT DIRECTOR SYSTEM	12-04-78 REISSUED 09-24-85	
20	SPERRY HZ-454 OR HZ-444 ATTITUDE DIRECTOR INDICATOR WITH ZC-200 COMPUTER/CONTROLLER	12-13-78 REISSUED 09-24-85	
21	SPERRY HZ-454 OR HZ-444 ATTITUDE DIRECTOR INDICATOR WITH BENDIX M4D COMPUTER/ CONTROLLER	03-08-79 REISSUED 09-24-85	
22	COLLINS 329B-7R-2 FLIGHT DIRECTOR INDICATOR AND 331A-6R COURSE INDICATOR WITH BENDIX M4D COMPUTER/CONTROLLER	03-30-79 REISSUED 09-24-85	

SUPPLEMENT NUMBER	SUBJECT	DATE	REVISION DATE
23	SPERRY HZ-454 OR HZ-444 ADI & RD-500 HSI WITH BENDIX M4D COMPUTER/CONTROLLER & RNS-3500 RNAV	01-02-80 REISSUED 09-24-85	
24	BENDIX M4D AUTO FLIGHT (AUTOPILOT) SYSTEM WITH BENDIX PITCH TRIM AND AUTOMATIC RUDDER TRIM	09-05-78 REISSUED 09-24-85	Rev.1 03-05-93
25	SPERRY SPZ-500 FLIGHT CONTROL SYSTEM WITH AD-500 SERIES ADI AND RD-500/550 SERIES HSI	04-23-80 REVISED 01-22-81 REISSUED 09-24-85	Rev.1 03-05-93
28	RCA/SPERRY PRIMUS 300 WXD WEATHER RADAR SYSTEM	09-05-78 REISSUED 09-24-85	
29	RCA/SPERRY PRIMUS 40 WXD WEATHER RADAR SYSTEM	12-18-78 REISSUED 09-24-85	
30	RCA/SPERRY PRIMUS 400 WXD WEATHER RADAR SYSTEM	02-14-79 REISSUED 09-24-85	
31			
32	BENDIX RDR-1200B WEATHER RADAR	12-04-78 REISSUED 09-24-85	
33	BENDIX RDR-1200 COLORVISION WEATHER RADAR SYSTEM	03-12-79 REISSUED 09-24-85	
34	RCA/SPERRY PRIMUS 300SL WEATHER RADAR SYSTEM	12-19-80 REISSUED 09-24-85	
35	TELEDYNE NORMALIZED ANGLE OF ATTACK INDICATING SYSTEM	12-18-78 REISSUED 09-24-85	
36	SPERRY SPZ-500 FLIGHT CONTROL SYSTEM WITH AD-500 SERIES ADI, RD-500/550 SERIES HSI AND VN-212 VNAV	04-21-81 REISSUED 09-24-85	Rev.1 03-05-93
37			

SUPPLEMENT NUMBER	SUBJECT	DATE	REVISION DATE
38			
39			
40	HF COMM INTERPHONE SYSTEM	04-17-79 REISSUED 09-24-85	
50	935A-2001 BAR & REFRESHMENT CENTER INSTALLATION	09-24-80 REISSUED 09-24-85	
51	DUAL AC POWER SOURCE WHEN MODIFIED BY SR034/24-002	05-08-81 REISSUED 09-24-85	
52	ROSEMOUNT MODEL 871CT1 SUPPLEMENTARY ICE DETECTION SYSTEM	05-28-92	

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR

AIRCRAFT SERIAL NUMBER 700SA ONLY

CHANGES TO THE BASIC AIRPLANE FLIGHT MANUAL

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 12-04-78

REISSUED DATE: 9-24-85

Don P. Watson

Don P. Watson, Manager
Aircraft Certification Division
Federal Aviation Administration
Southwest Region,
Ft. Worth, Texas 76101

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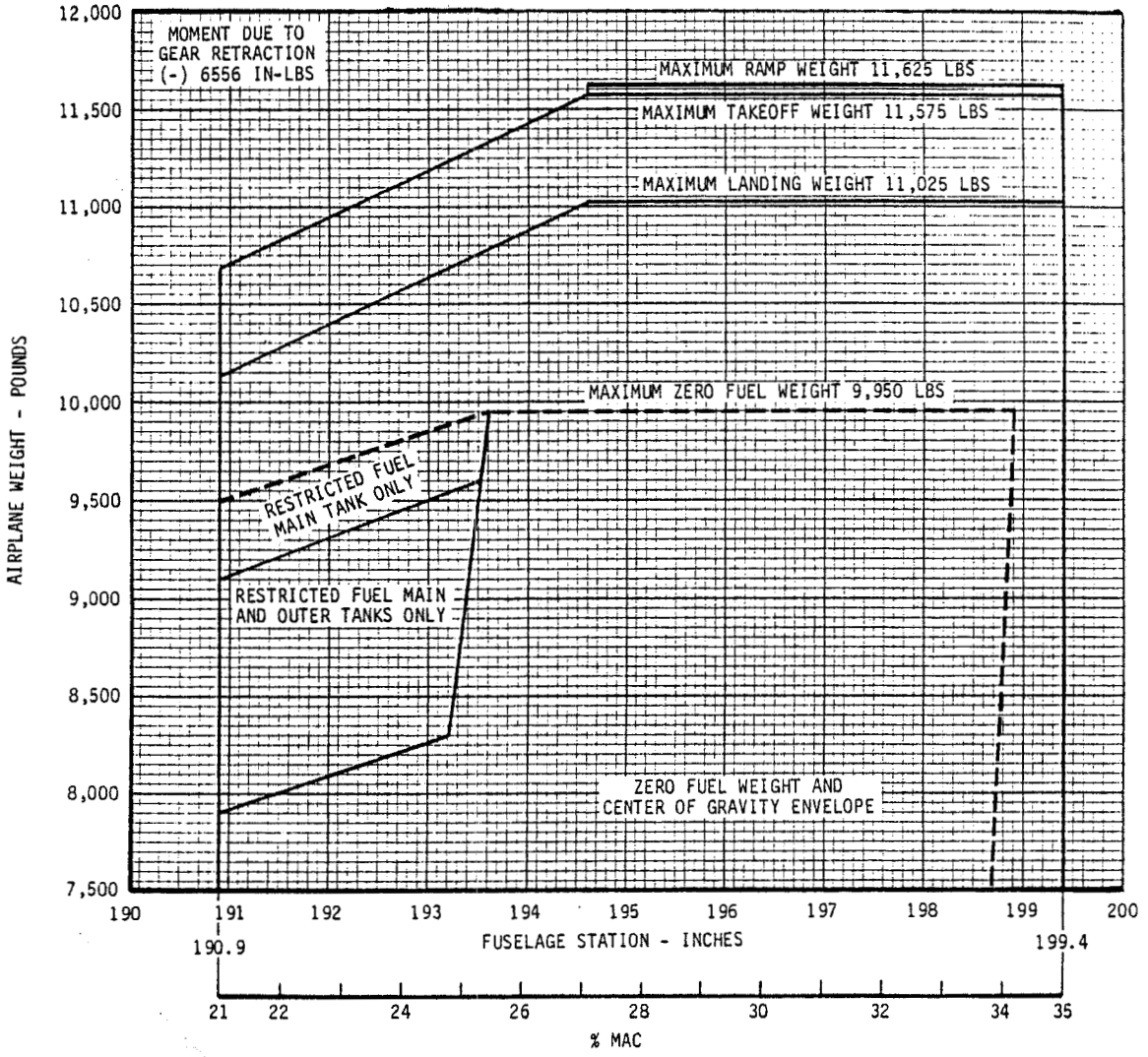
SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual for Aircraft Serial Number 700SA only. The information contained herein supplements or supersedes the information in the FAA Approved Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic FAA Approved Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

AIRCRAFT WEIGHT / ZERO FUEL WEIGHT AND C.G. ENVELOPES (LANDING GEAR EXTENDED)



Datum: 6.69 inches (170.0 mm) aft of Nose or Forward 220.67 inches (5605.0 mm) from front plane of wing rear spar-fuselage connecting frame.

MAC: Length is 60.55 inches (1538.0mm).
(Leading edge of MAC is at +178.23 inches [4527.0 mm].)

LOADING LIMITATIONS

Airplane loading exclusive of fuel (ZFW) must remain within the Zero Fuel Weight Envelope. The order of fuel loading must be Mains, Outers and Tips.

SECTION 2 OPERATING LIMITATIONS (CONT)

POWER PLANT LIMITATIONS

FUEL CAPACITIES

Quantities for Outer Wing Tank (Fuel) are:

		Maximum Capacity (lbs)*	US Gal	Usable Capacity (lbs)*	US Gal
Outer Wing Tank (Fuel)	L	(101)	15.0	(101)	15.0
	R	(101)	15.0	(101)	15.0

* Fuel weight based on 6.7 pounds per U.S. gallon.

FUEL PRESSURE

The following is not applicable:
Outer fuel tanks must not be used during descent.

TAKEOFF AND LANDING LIMITATIONS

LANDING LIMITATIONS

Maximum Tip Tank Fuel Quantity Each Tank .. 65 US Gal

Maximum Demonstrated Fuel Unbalance ..... 40 US Gal
(Tip Tank and Outer Tank combined)

SECTION 3 EMERGENCY PROCEDURES

FUEL BOOST PUMP FAILURE

BOOST PUMP FAIL Annunciator Illuminated:

1. FUEL BOOST PUMP Circuit Breaker (faulty side) ..... DISENGAGE
2. Land as soon as possible.

NOTE

Main wing tank unusable fuel is 9.0 US Gal with one boost pump failed.

SECTION 4 ABNORMAL PROCEDURES

ELECTRICAL FAILURE

L FEEDER OUT Annunciator Illuminates:

1. Inverter Switch ..... STANDBY
2. LH FEEDER CONT Circuit Breaker ..... CHECK, RESET

CAUTION

IF RESET IS UNSUCCESSFUL, POWER WILL BE LOST TO THE FOLLOWING EQUIPMENT:

a. MAIN INVERTER
b. LH WINDSHIELD HEAT
c. LH RADIO MASTER (AUTOPILOT, COMM 1, AUDIO PHONE, RNAV, ATC 1, ADF 1, VOR 1, DME 2)

3. BUS TIE Circuit Breaker ..... CHECK, RESET
   a. If reset is unsuccessful ..... REDUCE LOAD ON LH BUS AND RESET CIRCUIT BREAKER

NOTE

The cabin will remain pressurized and the flaps and landing gear will operate normally if the BUS TIE circuit breaker remains engaged.

4. Electrical Load ..... MONITOR, REDUCE TO ESSENTIAL ITEMS AS REQUIRED AND LIMIT EQUIPMENT OPERATION TO REMAIN WITHIN 50 AMP CAPACITY OF BUS TIE BREAKER

WARNING

THE CABIN WILL DEPRESSURIZE IF BOTH THE BUS TIE AND LH FEED CONT CIRCUIT BREAKERS REMAIN OPEN.

CAUTION

IF BOTH THE BUS TIE AND LH FEED CONT CIRCUIT BREAKER REMAIN OPEN:

a. LANDING GEAR MUST BE EXTENDED MANUALLY.
b. GEAR POSITION INDICATOR LIGHTS WILL BE INOPERATIVE.
c. FLAPS WILL BE INOPERATIVE AND FIXED IN THEIR POSITION AT TIME OF POWER FAILURE.

SECTION 4 ABNORMAL PROCEDURES

ELECTRICAL FAILURE (CONT)

R FEEDER OUT Annunciator Illuminates:

1. Inverter Switch ..... MAIN
2. RH FEEDER CONT Circuit Breaker ..... CHECK, RESET

CAUTION

IF RESET IS UNSUCCESSFUL, LANDING GEAR MUST BE EXTENDED MANUALLY AND POWER WILL BE LOST TO THE FOLLOWING EQUIPMENT:

a. STANDBY INVERTER
b. RH WINDSHIELD HEAT
c. LANDING GEAR (EXCEPT INDICATOR LIGHTS)
d. RH RADIO MASTER (COMM 2, AUDIO SPEAKER, RADAR, ATC 2, ADF 2, DME 1, VOR 2)

3. BUS TIE Circuit Breaker ..... CHECK, RESET
   a. If reset is unsuccessful ..... REDUCE LOAD ON RH BUS AND RESET CIRCUIT BREAKER
4. Electrical Load ..... MONITOR, REDUCE TO ESSENTIAL ITEMS AS REQUIRED AND LIMIT EQUIPMENT OPERATION TO REMAIN WITHIN 50 AMP CAPACITY OF BUS TIE BREAKER

AUTO FUEL TRANSFER FAILURE

TIP TANK MANUAL FUEL TRANSFER

Fuel is not transferring from a tip tank to the main tank with transfer switch in AUTO position:

1. Fuel Transfer Switch ..... TIP MANUAL (FOR TANK NOT TRANSFERRING)
2. Fuel Quantity Indicator ..... MONITOR
3. Fuel Usage ..... MAINTAIN BALANCE BETWEEN TIP TANKS AND/OR OUTER TANKS. (TIP TANK MAXIMUM QUANTITY AT LANDING: 65 US GALS) (MAXIMUM FUEL UNBALANCE AT LANDING: 40 US GALS)

NOTE

When the Fuel Transfer Switch is in the TIP MANUAL position, only the fuel in the tip tank will transfer to the main tank.

Fuel cannot be transferred from either the left or right outer tank with the Fuel Transfer Switch in the AUTO position unless both tips can be emptied.

SECTION 4 ABNORMAL PROCEDURES (CONT)

AUTO FUEL TRANSFER FAILURE (CONT)

OUTER TANK FUEL TRANSFER (EMPTY TIP TANK)

Fuel may be transferred from the left or right outer tank only if the adjacent tip tank is empty.

1. Fuel Transfer Switch ..... OFF
   (Side with remaining fuel in Tip Tank)
2. Fuel Transfer Switch ..... AUTO
   (Empty Tip Tank)
3. L or R **OUTER FUEL EMP** Annunciator Light ..... ILLUMINATES
4. Fuel Transfer Switch ..... OFF

NOTE

The fuel system timer relay will delay actual fuel transfer for approximately 2 minutes after actuation of fuel transfer switch to AUTO.

OUTER FUEL TANK TRANSFER PUMP FAILURE

Outer Fuel Tank Transfer Pump Failure procedures are not applicable: Delete all steps and notes.

SECTION 5 NORMAL PROCEDURES

BEFORE STARTING ENGINES

Replace steps 9 and 10 with the following and delete step 11.

9. Fuel Quantity Test Switch ..... MAIN or TIP (Check pointer moves smoothly to E position)
   a. **FUEL LOW LEVEL** Annunciator ..... ILLUMINATES (When main tank quantity indicator reads below approximately 30 US Gal)
10. Fuel Low Level Test Switches ..... TEST
    a. **FUEL LOW LEVEL** Annunciator ..... ILLUMINATES
11. Delete.

DESCENT

Replace step 2 with the following:

2. Fuel Transfer Control Switches ..... AS REQUIRED

Delete the following CAUTION:

CAUTION

DO NOT USE OUTER FUEL TANKS DURING DESCENT.

SECTION 6 PERFORMANCE

STALL SPEED CHART

Fuel flow for zero thrust is:

ALTITUDE (FEET)	FUEL FLOW/ENGINE US GAL/HR
0	31.8
5,000	28.0
10,000	24.2
15,000	20.4

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

KING RADIO CORPORATION KNC-610
AREA NAVIGATION COMPUTER

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 9-5-78

REISSUED DATE: 9-24-85

Don P. Watson

Don P. Watson, Manager
Aircraft Certification Division
Federal Aviation Administration
Southwest Region,
Ft. Worth, Texas 76101

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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the King KNC-610 RNAV System is installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

1. Individual DME or VOR System used ... TUNE TO COMMON GROUND STATION FACILITY
2. KNC-610 Approach Mode ..... APPROACH OPERATION BELOW 180 KTS
3. IFR Approach ..... CONDUCT IN ACCORDANCE WITH APPROVED INSTRUMENT APPROACH PROCEDURES
4. Final approach segment to be within the minimum length vs. maximum angle per below.

Approach Category	Category Approach Speed Requirements	Maximum Intercept Angle 10°	20°	30°	40°	50°	60°
A	Less than 91 knots	1.0	1.5	2.0	3.0	4.0	5.0
B	91 to 120 knots	1.5	2.0	2.5	3.5	4.5	5.5
C	121 to 140 knots	2.0	2.5	3.0	4.0	5.0	6.0
D	141 to 165 knots	2.5	3.0	3.5	4.5	5.5	6.5

These figures are in accordance with FAA AC 90-45A, Appendix D, guidelines for establishment of IFR approaches.

5. Maximum Distance Display Setting .... 150 NAUT MILES

SECTION 3 EMERGENCY PROCEDURES

No Change

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

PREFLIGHT CHECK

1. Preset area navigation computer
   - a. Mode Switch..... RNAV
   - b. Bearing Control ..... 000 DEGREES
   - c. Distance Control ..... 25.0 NAUTICAL MILES
2. NAV Frequency ..... SET TO VOR STATION WITHIN RANGE
3. Test Button ..... PRESS
   - a. HSI or CDI ..... ADJUST FOR CENTERED LEFT-RIGHT DEVIATION BAR AND "TO" CONDITION
   - b. NAUTICAL MILES Warning Flag .... NOT VISIBLE
   - c. HSI or CDI Flag ..... NOT VISIBLE

NOTE

If VOR ground station is out of range or VOR receiver is inoperative, both warning flags will be visible. Check VOR identification audio for reception of VOR ground station. Change frequency if there is no reception.

   - d. NAUTICAL MILES Display ..... 25.0 ± 1 NAUTICAL MILE
   - e. Course Selector ..... 0 ± 2 DEGREES

NOTE

Should any of the above indications not be within tolerance, the area navigation system is not reliable and should be corrected.

The preflight check does not include the DME system.

SECTION 5 NORMAL PROCEDURES (CONT)

BEFORE TAKEOFF

1. Desired Waypoint ..... OBTAIN COORDINATES
2. Area Navigation Computer
   a. Distance & Bearing ..... SET TO WAYPOINT DISTANCE AND BEARING FROM VOR/DME GROUND STATION
   b. Course Selector Control ..... SET TO WAYPOINT BEARING FROM AIRCRAFT

NOTE

If an ILS channel is selected on the NAV receiver, the area navigation system equipment automatically functions as an ILS localizer. If a VOR channel is selected thereafter, the area navigation system equipment automatically returns to the mode selected on the mode switch. If a DME ground station is frequency paired with the ILS, the VOR/DME mode must be selected to activate the NAUTICAL MILES display.

AFTER TAKEOFF/EN ROUTE

1. Area Navigation Computer
   a. Mode Switch ..... RNAV
   b. NAUTICAL MILES Display ..... INDICATES DISTANCE TO WAYPOINT

NOTE

The RED warning flag should not be visible in the display.

   c. TEST Button ..... DEPRESS. NAUT MILES DISPLAY WILL MATCH PRESET DISTANCE

NOTE

Adjusting course selector for centered left-right deviation bar and TO condition will result in a selected course equal to the set BEARING.

This check does not include the DME system.

CAUTION

DO NOT PRESS RNAV TEST BUTTON WHILE COUPLED TO THE AUTOPILOT.

SECTION 5 NORMAL PROCEDURES (CONT)

AFTER TAKEOFF/EN ROUTE (CONT)

2. HSI or CDI
   a. RED Warning Flag ..... SHOULD NOT BE VISIBLE
   b. Vertical Deviation Bar ..... DEFLECTS LEFT OR RIGHT OF CENTER LINE, CORRESPONDING TO AIRPLANE DISTANCE ACROSS TRACK
   c. TO Pointer Visible ..... INDICATES ON COURSE TO WAYPOINT
   d. FROM Pointer Visible ..... INDICATES WAYPOINT HAS BEEN PASSED
3. Changing Waypoint ..... PERFORM BEFORE TAKEOFF STEPS 1 AND 2

CAUTION

DO NOT ADJUST RNAV WHILE COUPLED TO THE AUTOPILOT.

NOTE

If it is required to observe bearing and distance to the ground station, set the mode switch to the VOR/DME mode and set the course selector for a centered left-right deviation bar and a TO pointer. Bearing to the station is the selected course. Distance to station is the NAUTICAL MILES displayed. Return the mode switch to its previous position after check.

APPROACH

1. Area Navigation Computer
   a. Control Function ..... APPR

NOTE

APPR should not be used for distances greater than 50 nautical miles from the waypoint.

For approaches, the HSI or CDI course select control should be set to magnetic heading of the desired runway, to the nearest degree, as obtained from published data.

SYSTEM DESCRIPTION

GENERAL

The King KNC-610 Area Navigation (RNAV) System allows the pilot to fly cross country by means of establishing electronic waypoints at convenient intervals along a planned flight course. The system informs the pilot of any course deviation which may occur.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

AREA NAVIGATION COMPUTER

MODE SELECTOR SWITCH

This switch selects conventional VOR/DME operation or en route area navigation designated as RNAV or APPR. The VOR/DME mode allows the KNC-610 to function as a conventional OMNI converter while displaying the distance TO or FROM the selected waypoint. The RNAV mode is used for en route navigation with a ± 5 nautical mile course width. The APPR mode is used for approach into an airport when a narrower course width (± 1.25 nautical mile) and faster course correction is required.

WAYPOINT BEARING DISPLAY/CONTROL

The waypoint bearing is set by turning the control to the correct waypoint radial from the VORTAC on the middle display marked BEARING. The bearing may be set to the nearest one-tenth degree by interpolation of the horizontal graduation on the right of the display. The display can be set from 000° clockwise to 360°.

NOTE

The display cannot be set past 360° due to a mechanical stop.

DISTANCE DISPLAY/CONTROL

The waypoint distance is set by turning the control clockwise on the bottom display marked DISTANCE. The waypoint distance can be set up to 150 nautical miles and to the nearest one-tenth nautical mile by interpolation of the horizontal graduations at the right of the display. This is the distance from the VOR/DME ground station to the waypoint.

NOTE

The display cannot be set past 150 nautical miles due to a mechanical stop.

NAUTICAL MILES (NAUT. MILES) DISPLAY

The nautical miles display is located at the top of the RNAV computer and is identified as NAUT. MILES. This display continuously indicates the distance between the airplane and the waypoint up to 250 nautical miles, with interpolation of one-tenth nautical mile of the horizontal gradiants on the right of the display.

When the computer is in the VOR/DME mode, the distance display is to the VORTAC station.

Should a RED warning flag mask the NAUT. MILES display, the data is unreliable. The RED flag will be visible if the DME select switch on the DME indicator is in the HOLD or OMNI 2 mode.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

AREA NAVIGATION COMPUTER (CONT)

TEST BUTTON

The test button is located to the right of the NAUT. MILES display and marked TEST. Pressing the TEST button, when the mode selector is in the RNAV or APPR mode, causes the NAUT. MILES to match the preset waypoint DISTANCE. The course selector may also be set to the waypoint BEARING to obtain a centered left-right deviation indication.

NOTE

An adequate VOR signal is required to perform this test.

LIGHTING

The KNC-610 RNAV computer is internally illuminated. Intensity is controlled by the INSTR LIGHT rheostat located in the overhead console.

HORIZONTAL SITUATION INDICATOR (HSI) OR COURSE DEVIATION INDICATOR (CDI)

COURSE SELECTOR

A magnetic course to the waypoint can be selected when the RNAV selector is in either the RNAV or APPR mode. When the RNAV selector is in the VOR/DME mode a magnetic course may be set to the VOR ground station.

VERTICAL DEVIATION BAR

The deviation bar represents the selected magnetic course. When the bar moves left or right of the center line, the aircraft has deviated from the set magnetic course. The course width varies when the RNAV selector is in one of its three modes: VOR/DME, 20°; RNAV, 10 nautical miles; APPR, 2.5 nautical miles.

TO/FROM POINTER

The pointer indicates the position of the airplane in relationship to the selected magnetic course waypoint, either en route TO or en route FROM.

FLAGS

There are two flags incorporated into the HSI or CDI. A RED warning flag indicates that the course deviation data is unreliable. The BLACK flag indicates the course deviation data is reliable.

LIGHTING

The HSI or CDI is internally illuminated. Intensity is controlled by the PILOT FLT INST rheostat located in the overhead console.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

PERFORMANCE CHECK

The performance of the KNC-610 may be checked, when the receiver is within range of a VOR ground station as indicated by the out of view VOR flag on the course indicator with the KNC-610 in the VOR/DME mode, by changing the mode selector to RNAV and depressing the TEST button. The distance to go display will change to the preset waypoint distance in the lower window.

NOTE

Some error may be expected between the two displays, but generally should not exceed ± 1 nautical mile.

This test should be performed with the waypoint distance greater than 10 nautical miles.

With the TEST button depressed, the OBS setting can be adjusted to match the waypoint bearing window within 3° by rotating the OBS control to produce zero left-right deviation and TO indication.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

BENDIX RNS-3500
AREA NAVIGATION COMPUTER

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 12-13-78 REVISED 05-29-79

REISSUED DATE: 9-24-85

Don P. Watson

Don P. Watson, Manager
Aircraft Certification Division
Federal Aviation Administration
Southwest Region,
Ft. Worth, Texas 76101

SECTION 3 EMERGENCY PROCEDURES

1.	NAV or DME Warning Flag	VISIBLE, SYSTEM UNRELIABLE. USE ALTERNATE NAV AS REQUIRED
2.	Digital Display	DASHED (---), SYSTEM UNRELIABLE. USE ALTERNATE NAV EQUIPMENT AS REQUIRED

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

PREFLIGHT CHECK

1.	Electrical Power	ON (AC AND DC)
	a. RNAV and Associated Circuit Breakers	CHECK ENGAGED
2.	VOR or DME	TUNE TO SAME FREQUENCY
3.	Area Navigation Computer	
	a. DISPLAY Control	ACT
	b. MODE Control	VOR/LOC
	c. Test (T) Button	PRESS AND HOLD
	(1) Digital Displays	INDICATES ALL 8's; APPROXIMATELY 2 SECONDS
	(2) Digital Displays	8's ARE REPLACED BY DASHES (---); APPROXIMATELY 2 SECONDS
	d. Test (T) Button	RELEASE
	(1) Display Control BRG/DST (Bearing/Distance)	ACTIVE W/P BRG/DST DISPLAYED
	(2) Course Deviation Indicator	ADJUST COURSE KNOB TO CENTER L-R NEEDLE WITH A TO INDICATION; COURSE NEEDLE SHOULD POINT TO THE ACTIVE W/P BEARING

NOTE

The computed values should agree with the active W/P BRG/DST. Bearing accuracy should be within ± 2° and distance within ± 1.5% of distance or ± 0.3 nautical miles if the waypoint distance is 10 nautical miles or greater. Accuracy should be within 10° without a signal present.

SECTION 3 EMERGENCY PROCEDURES

1.	NAV or DME Warning Flag	VISIBLE, SYSTEM UNRELIABLE. USE ALTERNATE NAV AS REQUIRED
2.	Digital Display	DASHED (---), SYSTEM UNRELIABLE. USE ALTERNATE NAV EQUIPMENT AS REQUIRED

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

PREFLIGHT CHECK

1.	Electrical Power	ON (AC AND DC)
	a. RNAV and Associated Circuit Breakers	CHECK ENGAGED
2.	VOR or DME	TUNE TO SAME FREQUENCY
3.	Area Navigation Computer	
	a. DISPLAY Control	ACT
	b. MODE Control	VOR/LOC
	c. Test (T) Button	PRESS AND HOLD
	(1) Digital Displays	INDICATES ALL 8's; APPROXIMATELY 2 SECONDS
	(2) Digital Displays	8's ARE REPLACED BY DASHES (---); APPROXIMATELY 2 SECONDS
	d. Test (T) Button	RELEASE
	(1) Display Control BRG/DST (Bearing/Distance)	ACTIVE W/P BRG/DST DISPLAYED
	(2) Course Deviation Indicator	ADJUST COURSE KNOB TO CENTER L-R NEEDLE WITH A TO INDICATION; COURSE NEEDLE SHOULD POINT TO THE ACTIVE W/P BEARING

NOTE

The computed values should agree with the active W/P BRG/DST. Bearing accuracy should be within ± 2° and distance within ± 1.5% of distance or ± 0.3 nautical miles if the waypoint distance is 10 nautical miles or greater. Accuracy should be within 10° without a signal present.

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

(3) Course Deviation Indicator ..... ADJUST COURSE KNOB TO CENTER L-R NEEDLE WITH A FROM INDICATION; COURSE NEEDLE SHOULD POINT TO THE RECIPROCAL OF THE ACTIVE W/P BEARING

NOTE

Accuracy should be within 2° with a signal present or 10° without a signal.

4. Waypoint (WPT) Alert Annunciator Check
   a. Display Control ..... SBY
   b. MODE Control ..... RNAV
   c. Waypoint Distance ..... SET 2 NAUTICAL MILES
   d. Test (T) Button ..... PRESS AND HOLD
   e. Waypoint (WPT) Alert Annunciator ..... ILLUMINATES
   f. Test (T) Button ..... RELEASE
5. RNAV/APPR Mode Annunciator Check
   a. MODE Control ..... RNAV
   b. RNAV Annunciator ..... ILLUMINATES
   c. MODE Control ..... APR
   d. APPR Annunciator ..... ILLUMINATES

CAUTION

SHOULD ANY OF THE ABOVE INDICATIONS NOT BE WITHIN TOLERANCE, THE AREA NAVIGATION SYSTEM IS NOT RELIABLE AND SHOULD NOT BE USED.

BEFORE TAKEOFF

1. Desired Waypoint(s) ..... OBTAIN NECESSARY INFORMATION FROM PUBLISHED DOCUMENTS
2. DISPLAY Control ..... SBY
3. MODE Control ..... VOR/LOC
4. SBY (STANDBY) Address Button ..... PRESS
   a. W/P Paddle Switches ..... PRESS OR LIFT TO SELECT FIRST AVAILABLE W/P MEMORY NUMBER
5. Elevation (EL) Address Button ..... PRESS
   a. W/P Legend ..... EXTINGUISHES
   b. EL Legend ..... FLASHES
   c. Left Paddle Switch ..... PRESS OR LIFT TO SELECT W/P ELEVATION TO NEAREST 1,000 FEET

SECTION 5 NORMAL PROCEDURES (CONT)

BEFORE TAKEOFF (CONT)

6. BRG (BEARING) Address Button ..... PRESS
   a. EL Legend ..... EXTINGUISHES
   b. BRG Legend ..... FLASHES
   c. Paddle Switches ..... PRESS OR LIFT TO SELECT W/P BEARING
7. DST (DISTANCE) Address Button ..... PRESS
   a. BRG Legend ..... EXTINGUISHES
   b. DST Legend ..... FLASHES
   c. Paddle Switches ..... PRESS OR LIFT TO SELECT DISTANCE TO W/P
8. Flights Requiring Multiple Waypoints ..... REPEAT STEPS 4 THROUGH 7 ABOVE FOR EACH WAYPOINT
9. Approach Data Waypoints ..... REPEAT STEPS 4 THROUGH 7 ABOVE

NOTE

The RNAV computer memory is capable of storing 32 waypoints, displayed as 0 through 31.

AFTER TAKEOFF/EN ROUTE

1. NAV Receiver ..... TUNE TO FIRST WAYPOINT FREQUENCY
2. Course Indicator ..... SET TO MAGNETIC COURSE AS REQUIRED
3. MODE Control ..... RNAV
4. DISPLAY Control ..... BRG/DST
5. Fly Inbound ..... TO WAYPOINT
6. Near Waypoint (Approximately 3.5 Nautical Miles) ..... WPT ALERT ANNUNCIATOR ILLUMINATES

NOTE

The TO-FROM indicator will change as the waypoint is crossed.

7. Fly Outbound ..... TO CHANGEOVER POINT

NOTE

The changeover point is approximately 1/2 the distance between the waypoints.

8. Prior to Changeover Point
   a. Waypoint Address Button ..... PRESS
   b. Waypoint Paddle Switch(es) ..... SELECT NEXT W/P NUMBER. ILLUMINATES IN SBY DISPLAY

SECTION 5 NORMAL PROCEDURES (CONT)

AFTER TAKEOFF/EN ROUTE (CONT)

9.	At Changeover Point	
	a. W/P Transfer Button	PRESS. NEXT WAYPOINT NUMBER ILLUMINATES IN THE ACT DISPLAY
	b. NAV Receiver	TUNE THE NEXT WAYPOINT FREQUENCY
	c. Course Indicator	SET NEW MAGNETIC COURSE AS REQUIRED
10.	Fly Inbound	TO NEXT WAYPOINT
11.	Remaining Flight Segments (As Required)	REPEAT STEPS 5 THROUGH 9 ABOVE

TIME/GROUND SPEED CHECK

NOTE

The time/ground speed check may be accomplished at any point during the flight without interrupting the en route data to a waypoint.

1.	DISPLAY Control	KTS/TME
2.	KTS (KNOTS) Display	ILLUMINATES GROUND SPEED IN KNOTS
3.	TME (TIME) Display	ILLUMINATES TIME REMAINING TO WAYPOINT

APPROACH

1.	Approach Data W/P Number	SBY
2.	MODE Control	APR
3.	W/P Transfer Button	PRESS. APPROACH DATA WILL BECOME ACTIVE AND BE DISPLAYED

AFTER LANDING

1.	AUTOPILOT CONT Circuit Breaker Switch	OFF
2.	RNAV and Associated Circuit Breakers	AS REQUIRED

SYSTEM DESCRIPTION

GENERAL

The Bendix RNS-3500 Area Navigation System provides a capability for navigating and flying an airplane on any desired course within the coverage of collocated VOR/DME ground stations. This complements the conventional NAV System.

The system is a station orientated, two dimensional navigation device whose primary position determining data sources are barometric encoded altitude, VOR bearing, and DME distance relative to a selected VORTAC or collocated VOR/DME station.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

GENERAL (CONT)

The system provides storage of 32 waypoints numbered 0 through 31. The waypoint data is retained in memory indefinitely without applied power.

In addition to outputs for flight instruments and flight control systems, the system provides outputs to drive the radio magnetic indicator (RMI) and remote distance indicator. The system also displays ground speed, time, distance and bearing which are relative to the waypoint.

AREA NAVIGATION COMPUTER

MODE CONTROL

The MODE rotary switch selects the mode of operation for the NAV/RNAV system. A test push button labeled T is located on the front of the MODE select knob.

OFF

Selecting the OFF position removes power from the RNAV and configures the navigation system to its normal or conventional status. In the OFF position, the flight instruments and flight control system are connected directly to the NAV receiver and the DME.

VOR/LOC

Selecting the VOR/LOC position also configures the navigation system to its normal status, as in the OFF position, but allows the RNAV system to be programmed. The VOR/LOC mode allows display of distance, bearing, ground speed, and time to the VORTAC station. All 32 waypoints can be preset or verified in this mode for use along the RNAV route. In the VOR/LOC mode, needle sensitivity is that of the conventional NAV system.

RNAV

Selecting the RNAV position connects the flight instruments and flight control system to the RNAV computer which provides guidance information to the active waypoint. In the RNAV mode, left-right needle sensitivity is 5 nautical miles full scale each side of the centerline.

APR

The APR (APPROACH) mode utilizes the RNAV computer as in the RNAV mode and provides needle sensitivity of 1.25 nautical miles full scale each side of centerline. The APR mode is used during departure and approach segments of a RNAV flight.

T (TEST) BUTTON

Pressing the T (TEST) push button initiates a comprehensive system test. The test is effective whether the airplane is in the hangar, on the ramp, or in the air. Any inserted waypoint parameters may be used for this test.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

AREA NAVIGATION COMPUTER (CONT)

DISPLAY CONTROL

The DISPLAY rotary switch selects the information to be shown on the digital display. The push button labeled V on the front of the DISPLAY knob allows the pilot to verify the position relative to the VOR/DME station as explained in paragraph V (VOR/DME/TACAN) BUTTON.

SBY (STANDBY)

The parameters of the Standby Waypoint are displayed.

ACT (ACTIVE)

The parameters of the Active Waypoint are displayed.

BRG/DST (BEARING/DISTANCE)

Displays the bearing and distance to the waypoint, if the MODE selector is in the RNAV or APR position. Displays bearing and distance to the VORTAC station if the MODE selector is in the VOR/LOC position.

KTS/TME (KNOTS/TIME)

Displays the ground speed and time relative to the waypoint in the RNAV or APR mode or to the VORTAC station in the VOR/LOC mode. Ground speed and time in the RNAV and APR modes are developed relative to the active waypoint and are not related to the VORTAC station unless the guiding waypoint parameters are set to zero, which places the waypoint over the station. Allow 6 minutes before utilizing ground speed and time after a new waypoint is activated or course is changed (8 minutes at initial turn ON).

V (VOR/DME/TACAN) BUTTON

Pressing the V push button on the front of the display rotary control will cause the RMI indicator and the remote distance indicator to revert to the VOR/LOC position as long as the V push button is pressed. The RMI and remote distance display are then connected to the NAV receiver and DME system to provide VOR/DME station orientation without interrupting the RNAV guidance to flight instrument (HSI) and flight control system (autopilot/flight director system).

W/P (WAYPOINT) TRANSFER SWITCH

Pressing the W/P transfer switch changes the SBY (STANDBY) waypoint to ACT (ACTIVE), as indicated by the SBY and ACT W/P numbers displayed. The RNAV system provides guidance to the active waypoint. The SBY position is used to call up new waypoint information for verification or alteration and allows transfer of the next desired waypoint to active.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCIPTION (CONT)

AREA NAVIGATION COMPUTER (CONT)

DIGITAL DISPLAY

The DISPLAY rotary switch selects the information to be displayed. The display windows indicate the waypoint parameters as they are being inserted into the RNAV system, BRG/DST to the waypoint, or KTS/TME to the waypoint. Illumination intensity is automatically controlled by an ambient light sensor.

EL (ELEVATION)

The upper display is a single digit inserted by the pilot indicating the station elevation to the nearest 1,000 feet.

BRG (BEARING)

When the DISPLAY control is in the SBY or ACT position, the display indicates bearing from VORTAC to the waypoint down to tenths of a degree as inserted by the pilot. When the DISPLAY control is in BRG/DST position, the display shows computed bearing in degrees from the airplane to the active waypoint.

KTS (KNOTS)

Displays ground speed in nautical miles per hour as computed by the RNAV computer when the DISPLAY control is in the KTS/TME position.

DST (DISTANCE)

When the DISPLAY control is in the SBY or ACT position, the display DST (distance) indicates the distance from the VORTAC to the waypoint in nautical miles and tenths as inserted by the pilot. When the DISPLAY control is in the BRG/DST position, the indication is the computed distance to the active waypoint.

TME (TIME)

The TME display indicates the time to the waypoint in minutes and tenths as computed by the RNAV computer when the DISPLAY control is in the KTS/TME position.

SBY (STANDBY)

This display indicates a waypoint number (0 through 31) in the standby (ready) position.

ACT (ACTIVE)

This display indicates a waypoint number (0 through 31) in the active position.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

AREA NAVIGATION COMPUTER (CONT)

ADDRESS PUSH BUTTONS

The address push buttons are located on the left adjacent to the various displays. The address push button allows access to waypoint data for input or changes. The data input or changes are made with the paddle switches after the address push button is depressed.

SBY W/P (STANDBY WAYPOINT)

When the SBY address button is pressed, the W/P paddle switches are available to select a new waypoint number or to recall one previously inserted.

EL (ELEVATION)

When the EL address button is pressed, the EL annunciator (right side of the display) flashes to alert the pilot the elevation data can be inserted or changed by pressing or lifting the left most paddle switch. The elevation can only be set to the nearest 1,000 feet of the referenced VORTAC station.

BRG (BEARING)

When the BRG address button is pressed, the BRG annunciator (right side of the display) flashes to alert the pilot the bearing data can be inserted or changed by pressing or lifting the 4 paddle switches. The distance can be set to a maximum of 199.9 nautical miles.

LIGHTING

The illumination of all digital displays and amber legends is automatically controlled by the light sensor located on the front of the Control Display Unit panel. The light intensity level is automatically maintained by the sensor to match the cockpit light level. A screwdriver adjustment is provided to increase or decrease the illumination control level to the operators preference. White lighting is controlled by the light sensor on the Control Display Unit. Intensity of the switch legends is controlled by the PILOT FLT INST rheostat on the overhead console.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

FOSTER AIRDATA AD611
AREA NAVIGATION SYSTEM
WITH
61DRM RANGE INDICATOR
AND 61WPS WAYPOINT SETTER

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 06-12-80

REISSUED DATE: 9-24-85

Don P. Watson

Don P. Watson, Manager
Aircraft Certification Division
Federal Aviation Administration
Southwest Region,
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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the Foster AirData AD611 Area Navigation System with 61DRM Range Indicator and 61WPS Waypoint Setter are installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

1. Individual DME or VOR System used ... TUNE TO COLLOCATED GROUND STATION FACILITY
2. Approach Mode ..... APPROACH OPERATION BELOW 180 KTS
3. IFR Approach ..... CONDUCT IN ACCORDANCE WITH APPROVED INSTRUMENT APPROACH PROCEDURES
4. Final approach segment to be within the minimum length vs. maximum angle per below.

Approach Category	Category Approach Speed Requirements	Maximum Intercept Angle 10°	20°	30°	40°	50°	60°
A	Less than 91 knots	1.0	1.5	2.0	3.0	4.0	5.0
B	91 to 120 knots	1.5	2.0	2.5	3.5	4.5	5.5
C	121 to 140 knots	2.0	2.5	3.0	4.0	5.0	6.0
D	141 to 165 knots	2.5	3.0	3.5	4.5	5.5	6.5

These figures are in accordance with FAA AC 90-45A, Appendix D, guidelines for establishment of IFR approaches.

5. Maximum Waypoint Distance Setting ... 199.9 NAUTICAL MILES

SECTION 3 EMERGENCY PROCEDURES

CAUTION

FAILURE OF RANGE MONITOR DURING AN ILS, LOC OR BACK COURSE APPROACH CAUSES LOSS OF HSI COURSE AND GLIDE SLOPE INFORMATION. PILOT MUST THEN SELECT VOR/LOC ON THE MODE SELECTOR.

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

PREFLIGHT CHECK

1. Mode Selector Switch ..... RNAV

NOTE

The area navigation system will not operate with the navigation mode selector in the VOR/LOC position.

Failure of the RNAV system causes the mode selector to become inoperative and HSI information reverts to normal VOR/LOC display.

2. Range Indicator ..... PRESS RNAV ON/OFF SWITCH. SWITCH AND **RNAV** ANNUNCIATOR ILLUMINATE, INDICATING THE SYSTEM IS ON

NOTE

When initially switched ON, the system automatically selects the number 1 waypoint setter. This is denoted by WAYPOINT 1 indicator light illuminating.

3. Preset Waypoint Setter
   a. RADIAL Data ..... SET AS REQUIRED
   b. DISTANCE Data ..... SET AS REQUIRED
4. NAV Frequency ..... SET TO VOR STATION WITHIN RANGE
5. HSI or CDI Course ..... SET TO WAYPOINT BEARING
6. Range Indicator TEST Button ..... PRESS AND HOLD
   a. HSI or CDI ..... LATERAL DEVIATION BAR CENTERS
   b. Screen Display ..... INDICATES SELECTED DISTANCE
   c. **DTW, VOR** and DME Diagnostic Lights ..... ILLUMINATE

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

d.	BRG (Bearing) Button	PRESS. SELECTED RADIAL IS DISPLAYED ON SCREEN
e.	BRG Button	RELEASE
f.	TEST Button	RELEASE

BEFORE TAKEOFF

1.	Desired Waypoint	OBTAIN COORDINATES
2.	Waypoint Setter	
a.	RADIAL and DISTANCE	SET TO WAYPOINT DISTANCE AND BEARING FROM VOR/DME GROUND STATION
b.	Course Selector Control	SET TO WAYPOINT BEARING FROM AIRPLANE

NOTE

The area navigation system VOR diagnostic light flashes and displays a warning flag. If the VOR channel is selected thereafter, the area navigation system equipment returns to the RNAV mode.

AFTER TAKEOFF/IN FLIGHT

1.	Mode Selector Switch	RNAV

NOTE

The area navigation system will not operate with the mode selector in the VOR/LOC position.

With DME in HOLD on number 2 DME position, the appropriate diagnostic lights will flash and the pilot's HSI will flag.

2.	Range Indicator RNAV Switch	PRESS RNAV ON/OFF SWITCH. SWITCH AND **RNAV** ANNUNCIATOR ILLUMINATE, INDICATING THE SYSTEM IS ON

NOTE

Range indicator automatically selects the number 1 waypoint when the system is initally switched ON. This is denoted by WAYPOINT 1 indicator light illumination.

The RMI will not indicate waypoint. RNAV is inoperative if the DME 2 or DME HOLD is selected.

SECTION 5 NORMAL PROCEDURES (CONT)

AFTER TAKEOFF/IN FLIGHT (CONT)

3. HSI or CDI
   - a. Warning Flag ..... SHOULD NOT BE VISIBLE
   - b. Lateral Deviation Bar ..... DEFLECTS LEFT OR RIGHT OF CENTER LINE, CORRESPONDING TO AIRPLANE DISTANCE ACROSS TRACK
   - c. TO Pointer Visible ..... INDICATES ON COURSE TO WAYPOINT
   - d. FROM Pointer Visible ..... INDICATES WAYPOINT HAS BEEN PASSED

4. Next Waypoint Selection
   - a. Waypoint Setter Activate Switch ..... PUSH TO ACTIVATE. WAYPOINT INDICATOR LIGHT ILLUMINATES

APPROACH

NOTE

APPR should not be used for distances greater than 10 nautical miles from the waypoint.

For approaches, the HSI or CDI course select control should be set to nearest magnetic degree heading of the desired runway as obtained from published data.

1. Range Indicator
   - a. APPR (Approach) Switch ..... PRESS. SWITCH ILLUMINATES
   - b. **APPR** Annunciator Light ..... ILLUMINATES

2. ILS Range Monitoring Approach
   - a. Number 1 ILS ..... ON
   - b. Number 2 VOR ..... TUNE TO COLLOCATED VORTAC FREQUENCY
   - c. DME Indicator ..... SELECT NAV 2

NOTE

Range monitor is inoperative with DME 1 or DME HOLD selected.

   - d. Mode Selector Switch ..... TURN TO VOR-R/M POSITION. **R/M** ANNUNCIATOR ILLUMINATES; **RNAV** ANNUNCIATOR EXTINGUISHES

NOTE

The RNAV ON/OFF switch light, APPR switch light, and **APPR** annunciator remains illuminated.

The system is not in the RANGE MONITORING mode of operation during illumination of the **VOR** and/or **DME** diagnostic light(s) and/or nonillumination of the **R/M** annunciator. The RNAV system is disabled.

SECTION 5 NORMAL PROCEDURES (CONT)

APPROACH (CONT)

CAUTION

FAILURE OF RANGE MONITOR DURING AN ILS, LOC OR BACK COURSE APPROACH CAUSES LOSS OF HSI COURSE AND GLIDE SLOPE INFORMATION. PILOT MUST THEN SELECT VOR/LOC ON MODE SELECTOR.

SYSTEM DESCRIPTION

GENERAL

The Foster AirData AD611 Area Navigation (RNAV) System with 61DRM Range Indicator and 61WPS Waypoint Setter allows the pilot to fly cross country by means of establishing electronic waypoints at convenient intervals along a planned flight course. The system informs the pilot of any course deviation which may occur. With the RNAV system inoperative or removed from the airplane, VOR/ILS information is displayed on the pilot's HSI.

WAYPOINT BEARING DISPLAY/CONTROL

The waypoint setter allows the pilot to select the required RADIAL and DISTANCE to the waypoint from a VOR station.

RADIAL SELECTION

The RADIAL selection is accomplished by rotating the thumbwheels, in either direction, to select the desired radial from the VOR stations within 0.1°

NOTE

The largest radial number which will be accepted by the computer is 359.9°. RADIAL 360° or greater will cause the Range Indicator (61DRM) screen to blank out and the **DTW** light to flash.

DISTANCE SELECTION

The DISTANCE selection is accomplished by rotating the thumbwheels, in either direction, to select the desired distance from the VOR station within 0.1 NAUTICAL MILE.

NOTE

The largest distance which will be accepted by the computer is 199.9 nautical miles. Distances greater than 199.9 nautical miles from the airplane's position will cause the Range Indicator (61DRM) screen to blank out and the **DTW** light to flash.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

WAYPOINT BEARING DISPLAY/CONTROL (CONT)

ACTIVATE SWITCH

The activate switch is located on the upper left side of each waypoint setter. When pressed, the preset radial and distance waypoint information transfers to the computer for positioning.

INDICATOR LIGHT

The indicator light is located on the upper right side of the waypoint setter. When the waypoint setter activate switch is pressed, the indicator light illuminates, indicating that the RADIAL and DISTANCE of the selected waypoint has been activated.

MODE SELECTOR SWITCH

The mode selector switch is located on the pilot's sub-panel. The selector switch is a three position rotary switch: VOR/LOC, RNAV, and VOR-R/M. When the selector switch is in the RNAV or VOR-R/M position, the area navigation system may be turned ON with the range indicator RNAV ON/OFF switch. When the selector switch is in the VOR/LOC position, the area navigation system is inoperable.

RANGE INDICATOR

RNAV ON/OFF SWITCH

The RNAV ON/OFF switch is located on the upper right side of the range indicator. This is an alternate action switch. When pushed in with the Navigation Mode Selector in the RNAV position, the area navigation system is ON and the switch and **RNAV** annunciator illuminates. When pushed again, the switch is in the out position and the area navigation system is OFF.

APPR (APPROACH) SWITCH

The APPR switch is located on the lower right side of the range indicator. This alternate action switch, when pressed, places the system into the approach mode.

The approach range may be monitored by turning the number 1 ILS ON, tuning the VOR 2 to a collocated VORTAC frequency, selecting NAV 2 on the DME indicator and turning the Navigation Mode Selector switch to the VOR-R/M position. The **R/M** annunciator in the upper left side of the pilot's panel illuminates and the R-**NAV** annunciator extinguishes.

DIGITAL DISPLAY

The digital display normally indicates the distance to the waypoint in nautical miles. The display can be changed to indicate bearing and time (in minutes) to the waypoint and ground speed (in knots) to the waypoint by pressing the BRG, MIN or KTS switches below the display.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

RANGE INDICATOR (CONT)

BRG (BEARING) SWITCH

The BRG switch is located along the bottom of the range indicator. When pressed, the airplane bearing to the waypoint replaces the distance on the display screen. As long as the switch is depressed, the bearing remains displayed on the screen.

MIN (MINUTES) SWITCH

The MIN switch is located along the bottom of the range indicator. When pressed, the airplane time to the waypoint replaces the distance on the display screen. As long as the switch is depressed, the time remains displayed on the screen.

KTS (KNOTS) SWITCH

The KTS switch is located along the bottom of the range indicator. When pressed, the ground speed to the waypoint replaces the distance on the display screen. As long as the switch is depressed, the ground speed to the waypoint remains displayed on the screen.

DIAGNOSTIC DISPLAY

The diagnostic display is located immediately below the display screen. Three legends, DTW (distance to waypoint), VOR (very high frequency OMNI Range), and DME (distance measuring equipment) comprise the diagnostic display. The diagnostic display acts as a warning flag when any of the three flash.

1. DTW Diagnostic Display
   When the **DTW** flashes, the waypoint setter radial is greater than 359.9°, the distance is greater than 199.9 nautical miles, or the RNAV system malfunctions.

2. VOR Diagnostic Display
   When the **VOR** flashes, the system is not receiving a valid NAV signal.

3. DME Diagnostic Display
   When the **DME** flashes, the system is not receiving a valid DME signal or the DME is in the DME 2 or DME HOLD positions.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

RANGE INDICATOR (CONT)

TEST SWITCH

The test switch, when pressed, will display on the screen the distance selected by the active waypoint setter and cause the CDI or HSI needle to center when the HSI or CDI course is set to the waypoint bearing. All three diagnostic displays will be illuminated, indicating functional diagnostic circuitry. If the BRG switch is pressed while the test switch is depressed, the selected radial of the active waypoint setter will be displayed on the screen.

NOTE

An adequate VOR signal is required to perform this test.

LIGHTING

The range indicator is internally illuminated. Intensity is controlled by means of a light sensitive photocell, which automatically adjusts to the cockpit lighting condition.

The waypoint setter is internally illuminated. The navigation mode selector switch is illuminated by pillar lights. Intensity is controlled by the PILOT FLT INST rheostat located in the overhead console.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

FOSTER AIRDATA RNAV612 AREA NAVIGATION SYSTEM
WITH
612RIU REMOTE INTERFACE UNIT
WITHOUT
VNAV 541/A

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 05-06-83

REISSUED DATE: 9-24-85

Don P. Watson

Don P. Watson, Manager
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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the Foster AirData RNAV612 Area Navigation System with 612RIU Remote Interface Unit without VNAV 541/A is installed in accordance with MA1 Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

1. Individual DME or VOR System Used ... TUNE TO COLLOCATED GROUND STATION FACILITY
2. Approach Mode ..... APPROACH OPERATION BELOW 180 KTS
3. IFR Approach ..... CONDUCT IN ACCORDANCE WITH APPROVED INSTRUMENT APPROACH PROCEDURES
4. Final approach segment to be within the minimum length vs. maximum angle per below.

Approach Category	Category Approach Speed Requirements	Maximum Intercept Angle 10°	20°	30°	40°	50°	60°
A	Less than 91 knots	1.0	1.5	2.0	3.0	4.0	5.0
B	91 to 120 knots	1.5	2.0	2.5	3.5	4.5	5.5
C	121 to 140 knots	2.0	2.5	3.0	4.0	5.0	6.0
D	141 to 165 Knots	2.5	3.0	3.5	4.5	5.5	6.5

These figures are in accordance with FAA AC 90-45A, Appendix D, guidelines for establishment of IFR approaches.

SECTION 2 OPERATING LIMITATIONS (CONT)

5. Maximum Waypoint Distance Setting ... 299.9 NAUTICAL MILES

NOTE

No IFR operation is to be based on information from the R/M (Range Monitor).

SECTION 3 EMERGENCY PROCEDURES

CAUTION

IF A FLAG CONDITION OCCURS AS INDICATED BY NAV FLAG IN HSI OR CDI AND/OR BLANKING OF DASHES (---) IN DIGITAL DISPLAYS, PILOT SHALL DISCONTINUE AREA NAVIGATION MODE.

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

PREFLIGHT CHECK

CAUTION

DO NOT PERFORM SELF-TEST PROCEDURE IN RNAV MODE WITH THE AUTOPILOT COUPLED.

1. RNAV NORMAL/RNG MON Switch ..... RNAV NORMAL
2. Mode Selector Switch ..... VOR/LOC
3. T (Test) Button ..... PRESS AND HOLD
   a. Digital Display ..... READS ALL 8'S
   b. T (Test) Button ..... RELEASE
4. Mode Selector Switch ..... CRS/XTK
   a. Left Digital Display ..... INDICATES COURSE SETTING OF PILOTS HSI
5. Mode Selector Switch ..... ROTATE THROUGH ALL POSITIONS, ANNUNCIATORS ILLUMINATE TO AGREE WITH EACH MODE
6. Program Waypoint
   a. NAV1 Frequency ..... SET TO VALID VOR STATION FREQUENCY
   b. Mode Selector Switch ..... RAD/DIST
   c. Waypoint Button 1 ..... PRESS. BLINKS CONTINUOUSLY
   d. Data Knobs ..... ENTER DESIRED RADIAL
   e. Waypoint Button 1 ..... PRESS. BLINKS CONTINUOUSLY
   f. Data Knobs ..... ENTER DESIRED DISTANCE

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

7.	Mode Selector Switch	RNAV
8.	T (Test) Button	PRESS AND HOLD
a.	Digital Display	DISPLAYS ACTIVE WAYPOINT ADDRESS
b.	**BRG** and **RNG** Annunciators	ILLUMINATE
c.	HSI	NEEDLE CENTERED ON PROPER BEARING WITH TO FLAG
d.	Pilot's RMI 1 Needle	POINTS TO PROPER BEARING
e.	T (Test) Button	RELEASE

CAUTION

Should any of the above indications not be within tolerance, the area navigation system is not reliable and should not be used.

BEFORE TAKEOFF

1.	Program Waypoints	
a.	Mode Selector	RAD/DIST
b.	Press Desired Waypoint Button	LIGHT BLINKS
c.	DATA Knobs	ENTER DESIRED RADIAL
d.	Press Waypoint Button	LIGHT BLINKS
e.	DATA Knobs	ENTER DESIRED DISTANCE
f.	Other Waypoint Selection	REPEAT STEPS b THROUGH e
2.	VORTAC Frequency/Elevation Storage	
a.	Mode Selector Switch	FREQ/ELEV
b.	Press Desired Button	LIGHT BLINKS
c.	Data Knobs	ENTER DESIRED VOR FREQUENCY
d.	Press Same Button	LIGHT BLINKS
e.	Data Knobs	ENTER DESIRED VOR MSL ELEVATION TO THE NEAREST THOUSAND FEET
f.	Other VORTAC Frequency/Elevation	REPEAT STEPS b THROUGH e
3.	NAV1 Frequency	SET TO FIRST VORTAC STATION TO BE FLOWN
4.	Course Selector	SET TO FIRST WAYPOINT BEARING

AFTER TAKEOFF/IN FLIGHT

1.	Mode Select Switch	RNAV
2.	RNAV NORMAL/RNG MON Switch	RNAV NORMAL
3.	Steering Selector	ENR
4.	First Waypoint	PRESS FIRST WAYPOINT BUTTON TO ACTIVATE SELECTED WAYPOINT. LIGHT ILLUMINATES.
5.	HSI	
a.	Warning Flag	OUT OF VIEW
b.	Lateral Deviation Bar	DEFLECTS LEFT OR RIGHT OF CENTER, CORRESPONDING TO AIRPLANE DISTANCE ACROSS TRACK

SECTION 5 NORMAL PROCEDURES (CONT)

AFTER TAKEOFF/IN FLIGHT (CONT)

5. HSI (CONT)
   - c. TO Pointer Waypoint ..... INDICATES ON COURSE TO WAYPOINT
   - d. FROM Pointer Visible ..... INDICATES WAYPOINT HAS BEEN PASSED

6. Next Waypoint Selection ..... PRESS BUTTON DESIRED TO ACTIVATE NEXT WAYPOINT. LIGHT ILLUMINATES.

APPROACH

NOTE

APP should not be used for distances greater than 10 nautical miles from waypoint.

For approaches, the HSI course select control should be set to magnetic course of the desired runway, to the nearest degree, as obtained from published data.

CAUTION

IF FAILURE OF THE RNAV612 OCCURS DURING APPROACH, THE UNIT SHOULD BE TURNED OFF AND APPROACH EXECUTED IN STANDARD ILS MODE. IN THIS CASE, THE DME TUNING SELECTOR IS IN THE MANUAL MODE AND THE DME **TUNE MANUAL** ANNUNCIATOR WILL BE ILLUMINATED.

1. ILS APPROACH (RANGE MONITOR)
   - a. Mode Selector Switch ..... RNAV
   - b. Steering Selector Switch ..... APP
   - c. RNAV NORMAL/RNG MON Switch ..... RNG MON
   - d. NAV2 Frequency ..... SET TO REFERENCE VORTAC
   - e. NAV1 Frequency ..... SET TO TERMINAL ILS

NOTE

The RNAV612's **BRG**, **RNG**, and **R/M** annunciators will be illuminated, with the digital bearing and distance displayed. The remote **DME NAV2**, **RNAV**, **RNG MON** and **APPR** annunciators will be illuminated.

In range monitor mode, the DME channeling switch can be in any position. The active waypoint number is illuminated. The left digital window on RNAV shows bearing to waypoint. The right digital window shows distance in nautical miles to the waypoint. The right window of the HSI shows distance to the selected VOR. The remote DME **NAV2** annunciator is illuminated. RMI No. 1 needle will point to the waypoint.

The HSI will provide normal localizer steering from the NAV1 receiver via the RNAV612.

XTK is not operational while in the range monitor mode.

SECTION 5 NORMAL PROCEDURES (CONT)

APPROACH (CONT)

2. VOR APPROACH WITH RANGE MONITOR
   a. Mode Selector Switch ..... RNAV
   b. Steering Selector Switch ..... APP
   c. RNAV NORMAL/RNG MON Switch ..... RNG MON
   d. NAV2 Frequency ..... SET TO REFERENCE VORTAC
   e. NAV1 Frequency ..... SET TO TERMINAL VOR

NOTE

The RNAV612's **BRG**, **RNG**, and **R/M** annunciators will be illuminated, with the digital bearing and distance displayed. The remote **DME NAV2**, **RNAV**, **RNG MON** and **APPR** annunciators will be illuminated.

In range monitor mode, the DME channeling switch can be in any position. The active waypoint number is illuminated. The left digital window on the RNAV shows bearing to the waypoint. The right digital window shows the distance in nautical miles to the waypoint. Also right window of the HSI shows distance to the VOR. The remote DME **NAV2** annunciator is illuminated.

The HSI will provide normal VOR steering from the NAV1 receiver via the RNAV612.

XTK is not operational while in the range monitor mode.

3. RNAV APPROACH
   a. Mode Selector Switch ..... RNAV
   b. Steering Selector Switch ..... APP
   c. RNAV NORMAL/RNG MON Switch ..... RNAV NORMAL
   d. NAV2 Frequency ..... NOT APPLICABLE
   e. NAV1 Frequency ..... SET TO DESIRED VOR

NOTE

The RNAV612's **BRG** and **RNG** annunciators will be illuminated, with the digital bearing and distance displayed. The remote **DME NAV2**, **RNAV**, and **APPR** annunciators will be illuminated.

In RNAV mode, the DME channeling switch can be in any position. The active waypoint number is illuminated. The left digital window on the RNAV shows distance in nautical miles to the waypoint. Also, the right window of the HSI shows distance to the waypoint. The remote DME **NAV1** annunciator is illuminated.

The HSI will provide RNAV STEERING from the RNAV computer.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION

GENERAL

The Foster AirData RNAV612 Area Navigation (RNAV) System with 612RIU allows the pilot to fly crosscountry by means of establishing electronic waypoints at convenient intervals along a planned flight course. With the system inoperative or removed from the airplane, VOR/ILS information is displayed on the pilot's HSI.

CONTROL AND DISPLAY

The control and display unit incorporates four controls, four control/indicators, three indicator/displays, and a test button. The four controls are the mode select knob, steering selector switch, and two data programming knobs. The four control/indicators are the programmable waypoint push button/indicators (1, 2, 3, and 4), waypoint number 5 push button/indicator, groundspeed and time display push button, and present position display push button. The three indicator/displays are the left digital display, right digital display, and the annunciators.

CONTROLS

1. Mode Select Knob

   The mode select knob is a seven position rotary switch.

   a. OFF

      The OFF position removes power to RNAV612 system.

   b. VOR/LOC

      When the VOR/LOC position is selected and the NAV is tuned to a valid VOR frequency, bearing and distance information to the VORTAC is displayed. Should the NAV be tuned to a LOC frequency both displays become dashes (-----) and no annunciator is illuminated. The HSI displays VOR or LOC information according to the frequency being received.

   c. CRS/XTK (Course/Crosstrack)

      The CRS/XTK position, when selected following VOR/LOC, displays the OBS resolver setting on the left display; the right digital display is blank. When CRS/XTK is selected from the RNAV position, the left displays the OBS resolver setting and the right displays the parallel crosstrack offset.

   d. RNAV

      When RNAV is selected, the bearing is displayed on the left and the range is displayed on the right. The HSI indicates the RNAV steering information.

   e. RAD/DIST (Radial/Distance)

      When RAD/DIST position is selected for a specific waypoint, the radial is displayed on the left and the distance on the right. These values may be programmed in this position.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

CONTROL AND DISPLAY (CONT)

CONTROLS (CONT)

f. FREQ/ELEV (Frequency/Elevation)
The VORTAC frequency and field elevation are displayed in the left and right digital displays respectively when FREQ/ELEV is programmed and selected. This capability is for prestored pilot advisory information.

g. SET-AUTO WPT
The system displays the selected AUTO WPT radial of 0°, 90°, 180°, or 270° in the left digital display. The right display indicates the distance which is a computed value based on the airplane's current position, course setting, and selected AUTO WPT radial. Should the distance computation be invalid, the right display will be dashes (------). This mode becomes non-functional when the range monitor mode is selected.

2. Steering Selector
The steering selector is a three position switch for the selection of APP (approach), ENR (en route), or XTK (parallel offset crosstrack) as required.

3. Data Programming Knobs
The data programming knobs are dual concentric rotary switches which generate digital data for programming waypoint addresses, VORTAC frequency and elevation, and crosstrack offset. The outer knob controls the coarse data entries and the inner knob controls the fine data entries.

CONTROL/INDICATORS

1. Programmable Waypoint Push Button/Indicators
There are four push button/indicators corresponding to each of the four programmable waypoints. Selection of a waypoint is noted by the steady illumination of the push button. The push button blinks when an inactive waypoint has been selected or during the programming mode of that waypoint.

2. Waypoint Number 5 Push Button/Indicator
This push button is labeled AUTO WPT and illuminates when pressed to indicate an automatic cardinal waypoint is in use or being programmed.

3. Groundspeed and Time Display Push Button
The groundspeed and time display push button is identified as KTS-MIN (knots-minutes). When pressed, the left digital display shows groundspeed in KTS to the waypoint when in RNAV mode, and to the VORTAC when in VOR/LOC mode. The right digital display shows the minutes to the waypoint when in RNAV mode or to the VORTAC when in VOR/LOC mode.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

CONTROL AND DISPLAY (CONT)

CONTROL/INDICATORS (CONT)

4. Present Position Display Push Button
   This push button is identified as VOR-DME. When pressed it displays the VOR radial and DME distance of the present position from the VORTAC on the left and right digital displays respectively.
5. Range Monitor (R/M)
   The **R/M** annunciator is located between the left and right digital displays. It illuminates when the remote RNAV NORMAL/RNG MON switch is in the RNG MON position.

   Range Monitor, when used as a navigation backup in the terminal area, permits VOR or localizer steering on the pilot's HSI/CDI, while the RNAV612 panel unit simultaneously displays digital bearing and range to a waypoint (and the RMI indicator displays RMI to this waypoint) via the NAV2/DME receiver.

   Range monitor operation is activated by simply selecting the NAV2 receiver as the RNAV data source and rotating the RNAV612 MODE SELECT knob to the RNAV position. The RNAV612's **BRG, RNG** and **R/M** annunciators will illuminate. The digital bearing and distance to waypoint are displayed.

INDICATORS/DISPLAYS

1. Left Digital Display
   The left digital display is a four digit numerical display. It displays data for eight modes of operation when selected. When a mode is selected, a corresponding annunciator will illuminate. The modes are magnetic bearing to the waypoint, magnetic bearing to a VORTAC, present position radial from the VORTAC, groundspeed to the waypoint, groundspeed to the VORTAC, HSI course setting, VOR frequency, and waypoint address radial.
2. Right Digital Display
   The right digital display is a four digital numerical display. It displays data for eight modes of operation when selected. When a mode is selected, a corresponding annunciator will illuminate. The modes are distance (NM) to the waypoint, DME distance (NM) from the VORTAC, present position distance (NM) from the VORTAC, waypoint address distance (NM), time (MIN) to the waypoint, time (MIN) to the VORTAC, crosstrack offset, and the VORTAC MSL elevation.
3. Annunciators
   There are fourteen annunciators located around the digital display indicators. Each corresponds to one of six modes and illuminates when selected. Those annunciations are KTS (knots), **BRG** (bearing), **VOR, MIN** (minutes), **RNG** (range), **DME** (distance measuring equipment), **FRQ** (frequency), **RAD** (radial), **CRS** (course), L or R **XTK** (left or

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

CONTROL AND DISPLAY (CONT)

INDICATORS/DISPLAYS (CONT)

right crosstrack), DST (distance), ELV (elevation) and RM (range monitor). The R/M annunciator is located between the left and right digital displays and illuminates when RNG MON is selected by the remote RNAV NORMAL/RNG MON switch.

TEST PUSH BUTTON

The test (T) push button is located in the center of the mode selector. When VOR/LOC has been selected and the test button is pressed, 8's will appear in all positions of the left and right digital displays.

LIGHTING

The RNAV612 is internally illuminated. Intensity of the digital displays and annunciators is controlled by a light sensitive photocell, which automatically adjusts to the cockpit lighting condition. The legends on the edge lighted panel are controlled by the PILOT FLT INST rheostat located in the overhead console.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

SMITH'S ENCODING ALTIMETER/ALERTER SYSTEM,
SERIES 1400

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 09-05-78

REISSUED DATE: 9-24-85

Don P. Watson

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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the Smith's Encoding Altimeter/Alerter System, Series 1400 is installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

PRIOR TO IFR FLIGHT

1. Pilot's Encoding Altimeter ..... OPERABLE
2. Alternate Barometric Altimeter ..... REQUIRED AND OPERABLE

SECTION 3 EMERGENCY PROCEDURES

ENCODING ALTIMETER

1. Power Failure ..... RED/BLACK FLAG VISIBLE OVER DISPLAY. SYSTEM UNRELIABLE
   a. Altimeter Circuit Breaker ..... DISENGAGE. USE ALTERNATE ALTIMETER
2. Malfunction ..... RED/BLACK FLAG VISIBLE OVER DISPLAY. SYSTEM UNRELIABLE
   a. Altimeter Circuit Breaker ..... DISENGAGE. USE ALTERNATE ALTIMETER

ALTITUDE ALERTER (If Installed)

1. Power Failure ..... RED WARNING FLAG REPLACES TEN'S DIGITS. SYSTEM UNRELIABLE
2. Absence of Altitude Valid Signal .... RED WARNING FLAG REPLACES TEN'S DIGITS. SYSTEM UNRELIABLE

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

NOTE

The following describes normal procedures for the encoding altimeter and altitude alerter system. Should the encoding altimeter be installed without the altitude alerter, omit procedural items pertaining to the alerter.

PREFLIGHT CHECK

CAUTION

DO NOT ADJUST ENCODING ALTIMETER WITHOUT AIRPLANE ELECTRICAL POWER ON LINE. OPENING OF A SAFETY SWITCH MAY RESULT, WHICH WILL CAUSE THE ENCODING ALTIMETER TO BE INOPERATIVE.

1. Airplane 28VDC Power ..... OFF
   a. Encoding Altimeter RED/BLACK Flag ..... VISIBLE, COVERING ALTITUDE DISPLAY
   b. Altitude Alerter RED Flag ..... VISIBLE, COVERING TEN'S DIGIT DISPLAY
2. Airplane 28VDC Power ..... ON
   a. Altimeter Circuit Breaker ..... CHECK ENGAGED
   b. Encoding Altimeter Flag ..... NOT IN VIEW. ALTITUDE DISPLAY VISIBLE
   c. Altitude Alerter Flag ..... NOT IN VIEW. TEN'S DIGITS VISIBLE
3. Alerting System (if installed), check as follows with airplane power ON.
   a. Encoding Altimeter ..... SET TO 1,000 FEET ABOVE AIRPORT ELEVATION
   b. Altitude Alerter ..... SET TO 1,000 FEET ABOVE AIRPORT ELEVATION
   c. Change Altitude Alerter to airport elevation plus 2,000 feet. Check the following during altitude change:
      At 300 feet difference
      (1) ALT Light ..... ILLUMINATES
      (2) Alerting Tone ..... AUDIBLE FOR APPROXIMATELY 2 SECONDS
      At 900 feet difference
      (3) ALT Light ..... EXTINGUISHES

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

d. Return Altitude Alerter to airport elevation plus 1,000 feet, noting the following during altitude change:
At 900 feet difference
(1) **ALT** Light ..... ILLUMINATES
(2) Alerting Tone ..... AUDIBLE FOR APPROXIMATELY 2 SECONDS
At 300 feet difference
(3) **ALT** Light ..... EXTINGUISHES

e. Change Altitude Alerter to airport elevation. Check the following during altitude change:
At 300 feet difference
(1) **ALT** Light ..... ILLUMINATES
(2) Alerting Tone ..... AUDIBLE FOR APPROXIMATELY 2 SECONDS
At 900 feet difference
(3) **ALT** Light ..... EXTINGUISHES

4. Encoding Altimeter
a. Barometric Pressure ..... SET TO AMBIENT PRESSURE
b. Altitude Reading ..... INDICATES AIRPORT ELEVATION ± 30 FEET

BEFORE TAKEOFF

1. ALT RPTG (Altitude Reporting) Switch ..... AS REQUIRED

NOTE

The altitude encoding function is inoperative with the transponder ALT RPTG switch in the OFF position.

2. Altitude Alerter (If Installed) ..... SET TO DESIRED ALTITUDE
3. Encoding Altimeter ..... CHECK AMBIENT BAROMETRIC PRESSURE

AFTER TAKEOFF - DURING CLIMB (IF ALERTER INSTALLED)

1. Approximately 900 feet below preselected altitude
a. **ALT** Light ..... ILLUMINATES
b. Alerting Tone ..... AUDIBLE FOR APPROXIMATELY 2 SECONDS
2. Approximately 300 feet below preselected altitude ..... **ALT** LIGHT EXTINGUISHES
3. Airplane Altitude deviation approximately ± 300 feet
a. **ALT** Light ..... ILLUMINATES
b. Alerting Tone ..... AUDIBLE FOR APPROXIMATELY 2 SECONDS

SECTION 5 NORMAL PROCEDURES (CONT)

DESCENT (IF ALTERTER INSTALLED)

Approximately 900 feet above preselected altitude

1. **ALT** Light ..... ILLUMINATES
2. Alerting Tone ..... AUDIBLE FOR APPROXIMATELY 2 SECONDS

Descent to approximately 300 feet above preselected altitude

3. **ALT** Light ..... EXTINGUISHES
4. Airplane Altitude Deviation Approximately ± 300 feet
   a. **ALT** Light ..... ILLUMINATES
   b. Alerting Tone ..... AUDIBLE FOR APPROXIMATELY 2 SECONDS

AFTER LANDING

1. ALT RPTG Switch ..... AS REQUIRED
2. Altimeter Circuit Breaker ..... AS REQUIRED

SYSTEM DESCRIPTION

GENERAL

The Smith's Encoding Altimeter/Alerter System, Series 1400, provides the pilot with direct indication of altitude with respect to the barometric pressure while alerting him of the airplane's preselected flight altitude and deviations (±300 feet) after attaining that altitude.

ENCODING ALTIMETER

The encoding altimeter display is a five digit readout in increments of 20 feet with single pointer completing one revolution for each 1,000 feet change in altitude. Black and white cross hatching is provided in place of the first zero to command attention to altitudes below 10,000 feet.

The encoding altimeter includes two barometric pressure scales permitting pressure settings in millibars and inches of mercury by turning the adjusting knob on the lower left of the indicator.

The altimeter incorporates output signals for connection with an altitude alerting system. There is an altitude alert warning lamp (yellow) in the upper left of the indicator which is illuminated in conjunction with the alerting system.

ENCODING ALTIMETER

The encoding altimeter is capable of reporting the airplane's altitude to a ground station when connected to the transponder.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

ALTITUDE ALERTING SYSTEM (IF INSTALLED)

The altitude alerting system allows the pilot to select an altitude by means of thumb wheel counters. The maximum altitude which may be selected is the same as the maximum altitude indication of the encoding altimeter. The final two zeros (0's) are fixed. A red warning flag replaces these last two zeros (0's) should a malfunction occur.

The altitude alerter receives altitude signals from the encoding altimeter. Upon nearing the preselected altitude (± 900 feet), the alerter sends an electrical output to an alerter tone and light. The ALT light remains illuminated to approximately 300 feet from the selected altitude and the tone is audible for approximately two seconds. The alerter activates the audio and visual advisories should the airplane deviate ± 300 feet from the selected altitude.

LIGHTING

The encoding altimeter and altitude alerter are internally illuminated. Intensity is controlled by the PILOT FLT INST rheostat located in the overhead console.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

IDC ENCODING ALTIMETER/ALERTER SYSTEM

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 12-13-78

REISSUED DATE: 9-24-85

Don P. Watson

Don P. Watson, Manager
Aircraft Certification Division
Federal Aviation Administration
Southwest Region,
Ft. Worth, Texas 76101

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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the IDC Encoding Altimeter/Alerter System is installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

PRIOR TO IFR FLIGHT

1. Pilot's Encoding Altimeter ..... OPERABLE
2. Alternate Barometric Altimeter ..... REQUIRED AND OPERABLE

SECTION 3 EMERGENCY PROCEDURES

ENCODING ALTIMETER

1. Power Failure ..... RED OFF FLAG REPLACES 0 DIGIT OF DIAL. SYSTEM UNRELIABLE
   a. Altimeter Circuit Breaker ..... DISENGAGE. USE ALTERNATE ALTIMETER
2. Malfunction ..... RED OFF FLAG REPLACES 0 DIGIT OF DIAL. SYSTEM UNRELIABLE
   a. Altimeter Circuit Breaker ..... DISENGAGE. USE ALTERNATE ALTIMETER

ALTITUDE ALERTER (IF INSTALLED)

1. Power Failure ..... RED OFF WARNING FLAG APPEARS. SYSTEM UNRELIABLE
2. Absence of Altitude Valid Signal .... RED OFF WARNING FLAG APPEARS. SYSTEM UNRELIABLE

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

NOTE

The following describes normal procedures for the encoding altimeter and altitude alerter system. Should the encoding altimeter be installed without the altitude alerter, omit procedural items pertaining to the alerter.

PREFLIGHT CHECK

1.	Airplane 28VDC Power	OFF
a.	Altimeter Circuit Breaker	CHECK ENGAGED
b.	Encoding Altimeter OFF Flag	VISIBLE, REPLACING 0 ON DIAL
c.	Altitude Alerter OFF Flag	VISIBLE
2.	Airplane 28VDC Power	ON
a.	Altimeter Circuit Breaker	CHECK ENGAGED
b.	Encoding Altimeter OFF Flag	OUT OF VIEW
c.	Altitude Alerter OFF Flag	OUT OF VIEW. 0 VISIBLE ON DIAL
3.	Encoding Altimeter	
a.	Barometric Pressure	SET TO AMBIENT PRESSURE
b.	Altitude Reading	INDICATES AIRPORT ELEVATION ± 30 FEET
c.	Test Button	PRESS AND HOLD
d.	Dial Pointer	INCREASES APPROXIMATELY 300 FEET ABOVE AIRPORT ELEVATION; ALERTING TONE MAY BE AUDIBLE
e.	Altimeter OFF Flag	REPLACES 0 ON DIAL
f.	Alerter OFF Flag	VISIBLE
g.	Test Button	RELEASE
h.	Dial Pointer	RETURNS TO AIRPORT ELEVATION ± 30 FEET
i.	Altimeter OFF Flag	REPLACED BY 0 ON DIAL
j.	Alerter OFF Flag	OUT OF VIEW

CAUTION

DO NOT USE ANY PORTION OF THE SYSTEM THAT TESTS UNSATISFACTORY.

BEFORE TAKEOFF

1. ALT RPTG (Altitude Reporting) Switch ..... AS REQUIRED

NOTE

The altitude encoding function is inoperative with the transponder ALT RPTG switch in the OFF position.

SECTION 5 NORMAL PROCEDURES (CONT)

BEFORE TAKEOFF (CONT)

2. Altitude Alerter (If Installed) ..... SET DESIRED ALTITUDE
3. Encoding Altimeter ..... CHECK AMBIENT BAROMETRIC PRESSURE

AFTER TAKEOFF - DURING CLIMB (IF ALERTER INSTALLED)

1. Altitude approximately 1,000 feet less than preselected
   a. ALT Light ..... ILLUMINATES
   b. Alerting Tone ..... AUDIBLE FOR APPROXIMATELY 2 SECONDS
2. Approximately 300 feet below preselected altitude ..... ALT LIGHT EXTINGUISHES
3. Airplane Altitude deviation approximately ± 300 feet
   a. ALT Light ..... ILLUMINATES
   b. Alerting Tone ..... AUDIBLE FOR APPROXIMATELY 2 SECONDS

NOTE

ALT light will remain illuminated until the airplane is within • 300 feet of the selected altitude or a new altitude is selected on the alerter.

DESCENT (IF ALERTER INSTALLED)

Descent to a preselected altitude plus approximately 1,000 feet

1. ALT Light ..... ILLUMINATES
2. Alerting Tone ..... AUDIBLE FOR APPROXIMATELY 2 SECONDS

Descent to approximately 300 feet above preselected altitude

3. ALT Light ..... EXTINGUISHES
4. Airplane Altitude Deviation Approximately ± 300 feet
   a. ALT Light ..... ILLUMINATES
   b. Alerting Tone ..... AUDIBLE FOR APPROXIMATELY 2 SECONDS

NOTE

ALT light will remain illuminated until the airplane is within ± 300 feet of selected altitude or a new altitude is selected on the alerter.

AFTER LANDING

1. ALT RPTG Switch ..... AS REQUIRED
2. Altimeter Circuit Breaker ..... AS REQUIRED

SYSTEM DESCRIPTION

GENERAL

The IDC Encoding Altimeter/Alerter System provides the pilot with direct indication of altitude with respect to the barometric pressure while alerting him of the airplane's preselected flight altitude and deviations (± 300 feet) after attaining that altitude.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

ENCODING ALTIMETER

The encoding altimeter display is a five digit readout in 20 foot increments and a single pointer completing one revolution for each 1,000 foot change in altitude. Black and white cross hatching is provided in place of the first zero to command attention to altitudes below 10,000 feet.

The encoding altimeter includes two barometric pressure scales permitting pressure settings in millibars and inches of mercury by turning the adjusting knob on the lower right of the indicator.

The encoding altimeter is capable of reporting the airplane's altitude to a ground station when connected to the transponder.

ALTITUDE ALERTING SYSTEM (IF INSTALLED)

The altitude alerting system allows the pilot to select an altitude by means of a control knob. The maximum altitude which may be selected is the same as the maximum altitude indication of the encoding altimeter. Selection is made in 100 foot increments. The final two zeros (0's) are fixed. A red OFF warning flag comes into view should a malfunction occur.

The altitude alerter receives altitude signals from the encoding altimeter. Upon nearing the preselected altitude (± 1,000 feet), the alerter sends an electrical output to an alerting tone and ALT light. The ALT light, on the alerter, remains illuminated to approximately 300 feet from the selected altitude. The alerter activates the audio and visual advisories should the airplane deviate ± 300 feet from the selected altitude.

LIGHTING

The encoding altimeter and altitude alerter are internally illuminated. Intensity is controlled by the PILOT FLT INST rheostat located in the overhead console.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

IDC RADBAR ENCODING ALTIMETER AND ALTITUDE ALERTING SYSTEM WITH VOICE TERRAIN ADVISORY (WITH KRA-405 RADIO ALTIMETER)

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 12-18-78

REISSUED DATE: 9-24-85

Don P. Watson

Don P. Watson, Manager
Aircraft Certification Division
Federal Aviation Administration
Southwest Region,
Ft. Worth, Texas 76101

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SECTION 1 INTRODUCTION

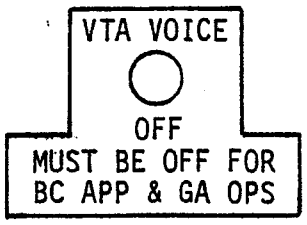
This supplement must be attached to the FAA Approved Airplane Flight Manual when the IDC RADBAR Encoding Altimeter and Altitude Alerting System with Voice Terrain Advisory (with KRA-405 Radio Altimeter) are installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

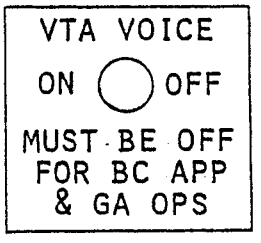
PRIOR TO IFR FLIGHT

1. Pilot's Encoding Altimeter ..... OPERABLE
2. Alternate Barometric Altimeter ..... REQUIRED AND OPERABLE
3. During Back Course Approach
   Operation Mode ..... VTA VOICE - OFF
4. During GO AROUND Operation Mode ..... VTA VOICE - OFF

REQUIRED PLACARD



ALTERNATE
PLACARD



SECTION 3 EMERGENCY PROCEDURES

ENCODING ALTIMETER

1.	Power Failure	RED OFF FLAG REPLACES 0 DIGIT ON DIAL. SYSTEM UNRELIABLE
	a. Altimeter Circuit Breaker	DISENGAGE. USE ALTERNATE ALTIMETER
	b. Radio Altimeter Circuit Breaker.	DISENGAGE
2.	Malfunction	RED OFF FLAG REPLACES 0 DIGIT ON DIAL. SYSTEM UNRELIABLE
	a. Altimeter Circuit Breaker	DISENGAGE. USE ALTERNATE ALTIMETER
	b. Radio Altimeter Circuit Breaker.	DISENGAGE

ALTITUDE ALERTER

1.	Power Failure	RED OFF FLAG APPEARS. SYSTEM UNRELIABLE
2.	Absence of Altitude Valid Signal	RED OFF FLAG APPEARS. SYSTEM UNRELIABLE

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

NOTE

The following describes normal procedures for the encoding altimeter and altitude alerter system with Voice Terrain Advisory (VTA). Should the altimeter/alerter system be installed without the VTA, omit items pertaining to the VTA.

The audio and visual indications of the RADBAR are powered by the radio altimeter receiver/transmitter. Therefore, the Above Ground Level (AGL) indications are limited to 2,000 feet.

PREFLIGHT CHECK

1.	Airplane 28VDC Power	OFF
	a. Encoding Altimeter OFF FLAG	VISIBLE, REPLACING 0 DIAL
	b. Encoding Altimeter RAD/OFF Flag	VISIBLE
	c. Altitude Alerter OFF Flag	VISIBLE

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

2. Airplane 28VDC Power ..... ON
   a. RADIO MASTER Switches ..... ON
   b. Altimeter Circuit Breaker ..... CHECK ENGAGED
   c. Radio Altimeter Circuit Breaker. CHECK ENGAGED
   d. ALT RPTG (Altitude Reporting) Switch ..... AS REQUIRED
   e. VTA VOICE Switch ..... ON

NOTE

VTA announcements will not be audible with VTA VOICE switch in the OFF position.

   f. Encoding Altimeter OFF Flag .... OUT OF VIEW. REPLACED BY 0 ON DIAL
   g. Altitude Alerter OFF Flag ..... OUT OF VIEW
   h. Encoding Altimeter Radio ALT Annunciator ..... ILLUMINATES
   i. VTA Announces ..... MINIMUM
   j. **RADBAR ALT** Annunciator ..... ILLUMINATES (DH SETTING MUST BE ABOVE 0 FEET)

3. Encoding Altimeter
   a. Barometric Pressure ..... SET TO AMBIENT PRESSURE
   b. Altitude Indication ..... AIRPORT ELEVATION ± 30 FEET
   c. Altitude Alerter ..... SET TO NEAREST 100 FEET OF AIRPORT ELEVATION
   d. Red Test Button (Lower LH Corner of Altimeter) ..... PRESS AND HOLD
   e. Dial Pointer ..... INCREASES APPROXIMATELY 300 FEET ABOVE AIRPORT ELEVATION. ALERTING TONE MAY BE AUDIBLE
   f. Radio Altitude Display ..... ILLUMINATES DIGITS 888
   g. Altimeter OFF Flag ..... REPLACES 0 ON DIAL
   h. Alerter OFF Flag ..... VISIBLE
   i. Red Test Button ..... RELEASE
   j. VTA Announces ..... MINIMUM. (IF DECISION HEIGHT [DH] IS SET LESS THAN 30 FEET)
   k. Dial Pointer ..... RETURNS TO AIRPORT ELEVATION ± 30 FEET
   l. Radio Altitude Display ..... 888 DIGITS REPLACED BY 50 THEN 0
   m. DH Knob ..... PRESS. RADIO ALTITUDE DISPLAYS DH (IF PREVIOUS SETTING WAS NOT 0 FEET)
   n. DH Knob ..... RELEASE. RADIO ALTITUDE DISPLAY RETURNS TO 0 FEET

SECTION 5 NORMAL PROCEDURES (CONT)

BEFORE TAKEOFF

1. Altitude Reporting (ALT RPTG) Switch ..... AS REQUIRED

NOTE

The altitude encoding function is inoperative with the transponder ALT RPTG switch in the OFF position.

2. Encoding Altimeter ..... CHECK AMBIENT BAROMETRIC PRESSURE
   a. Altitude Indication ..... CHECK AIRPORT ELEVATION ± 30 FEET
   b. Radio Altitude Display ..... 0 FEET INDICATION
   c. Radio ALT Annunciator ..... ILLUMINATED
   d. Decision Height Setting ..... PRESS KNOB AND ROTATE TO DESIRED DH

NOTE

The DH knob may be pressed to check the decision height as illuminated in the radio altitude digital display.

Momentary power interruption does not affect the DH setting.

3. Altitude Alerter ..... SET TO DESIRED ALTITUDE
4. VTA VOICE Switch ..... CHECK. (ON REQUIRED FOR VTA ANNOUNCEMENT)

AFTER TAKEOFF/IN FLIGHT

RADBAR ALTIMETER

1. Radio Altitude Display ..... INDICATED HEIGHT ABOVE TERRAIN UP TO APPROXIMATELY 990 FEET

NOTE

Above approximately 990 feet, the display has no indication.

2. Radio ALT Annunciator ..... ILLUMINATED UP TO 2,000 FEET AGL; EXTINGUISHES ABOVE 2,000 FEET AGL

NOTE

Radio ALT annunciator will flash at flight altitude of 2,000 feet AGL if the terrain is rugged.

SECTION 5 NORMAL PROCEDURES (CONT)

CLIMB AND LEVEL-OFF

ALTITUDE ALERTER

1. Altitude Approximately 1,000 Feet Below Preselected
   a. **ALT** Light ..... ILLUMINATES
   b. Alerting Tone ..... AUDIBLE FOR APPROXIMATELY 2 SECONDS
2. Altitude Approximately 300 Feet Below Preselected
   a. **ALT** Light ..... EXTINGUISHES
3. Airplane Altitude Deviation Approximately ± 300 Feet
   a. **ALT** Light ..... ILLUMINATES
   b. Alerting Tone ..... AUDIBLE APPROXIMATELY 2 SECONDS

NOTE

ALT light will remain illuminated until the airplane is within ± 300 feet of selected altitude or a new altitude is selected on the alerter.

DESCENT/APPROACH

ALTITUDE ALERTER

1. Altitude Approximately 1,000 Feet Above Preselected
   a. **ALT** Light ..... ILLUMINATES
   b. Alerting Tone ..... AUDIBLE FOR APPROXIMATELY 2 SECONDS
2. Descent to Approximately 300 Feet Above Preselected Altitude
   a. **ALT** Light ..... EXTINGUISHES
3. Airplane Deviation Approximately ± 300 Feet
   a. **ALT** Light ..... ILLUMINATES
   b. Alerting Tone ..... AUDIBLE FOR APPROXIMATELY 2 SECONDS

NOTE

ALT light will remain illuminated until the airplane is within ± 300 feet of selected altitude or a new altitude is selected on the alerter.

RADBAR ALTIMETER

1. At and Below 2,000 Feet AGL ..... RADIO **ALT** ANNUNCIATOR ILLUMINATED
2. At 1,700 ± 100 Feet and 1,000 Feet AGL ..... VTA ANNOUNCES "TERRAIN"

NOTE

Upon descending to approximately 1,000 feet AGL, the VTA glide slope warning is automatically armed.

3. At Approximately 990 Feet Height Above Terrain ..... RADIO ALTITUDE DISPLAY ILLUMINATES

SECTION 5 NORMAL PROCEDURES (CONT)

DESCENT/APPROACH (CONT)

RADBAR ALTIMETER (CONT)

4. At 900 Feet Down to 100 Feet ..... VTA ANNOUNCES EACH 100 FOOT INCREMENT (i.e. 900, 800, ETC.)
5. At DH Setting ..... VTA ANNOUNCES "MINIMUM"

NOTE

VTA MINIMUM announcement has priority over any other voice announcement.

6. Glide Slope
   a. On or Above Glide Slope ..... VTA GLIDE SLOPE VOICE SILENT
   b. Below Glide Slope at a Preset Level (1 Dot) ..... VTA ANNOUNCES "GLIDE SLOPE-GLIDE SLOPE" AT 2 SECOND INTERVALS
   c. Below Preset Glide Slope Level (2 Dots) ..... VTA ANNOUNCES "GLIDE SLOPE-GLIDE SLOPE" AT 1 SECOND INTERVALS
   d. At DH Setting ..... VTA "GLIDE SLOPE-GLIDE SLOPE" ANNOUNCEMENT IS TERMINATED

NOTE

VTA altitude announcements will interrupt GLIDE SLOPE-GLIDE SLOPE announcements.

AFTER LANDING

1. ALT RPTG Switch ..... AS REQUIRED
2. VTA VOICE Switch ..... AS REQUIRED
3. Altimeter Circuit Breaker ..... AS REQUIRED
4. Radio Altimeter Circuit Breaker ..... AS REQUIRED
5. RADIO MASTER Switches ..... AS REQUIRED
6. Airplane 28 VDC Power ..... OFF

SYSTEM DESCRIPTION

GENERAL

The IDC RADBAR Encoding Altimeter/Altitude Alerter with Voice Terrain Advisory (VTA) System provides the pilot with direct indication of altitude with respect to the barometric pressure while alerting him of the airplane's preselected flight altitude and deviations (± 300 feet) after attaining that altitude. The system also indicates digitally and verbally Height Above Terrain up to 990 feet and with visible RADIO ALT flag at altitudes up to 2,000 feet AGL.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

ENCODING ALTIMETER

The encoding altimeter display is a five digit readout in increments of 20 feet with a single pointer completing one revolution for each 1,000 foot change in altitude. Black and white cross hatching is provided in place of the first zero to command attention to altitudes below 10,000 feet.

The encoding altimeter includes two barometric pressure scales permitting pressure settings, in millibars and inches of mercury, by turning the adjusting knob on the lower left of the indicator.

The altimeter electrical output signals interface with an altitude alerting system.

The encoding altimeter is capable of reporting the airplane's altitude to a ground station when connected to the transponder.

VOICE TERRAIN ADVISORY (VTA) (IF INSTALLED)

The VTA informs the pilot of the vertical flight position with particular attention to altitudes within 1,700 ± 100 feet above ground level by means of voice announcements.

ALTITUDE ALERTING SYSTEM (IF INSTALLED)

The altitude alerting system allows the pilot to select a flight altitude using a control knob. The maximum altitude which may be selected is the same as the maximum altitude indication of the RADBAR encoding altimeter. Selection is made in 100 foot increments. The final two zeros (0's) are fixed. A red OFF flag comes into view should a malfunction occur.

The altitude alerter receives altitude signals from the encoding altimeter. Upon nearing the preselected altitude (± 1,000 feet), the alerter sends an electrical signal to a warning horn and light. The warning horn will be audible for approximately two seconds. The ALT warning light remains illuminated to approximately 300 feet from the selected altitude. The alerter activates the audio and visual warnings should the airplane deviate ± 300 feet from the selected altitude.

LIGHTING

The encoding altimeter and altitude alerter are internally illuminated. Intensity is controlled by the PILOT FLT INST rheostat located in the overhead console. The radio altimeter display brightness is controlled by a rheostat located in the lower left of the instrument.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

IDC ENCODING ALTIMETER/ALERTER SYSTEM WITH VOICE TERRAIN ADVISORY (WITH AA-215 RADIO ALTIMETER)

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 12-18-78

REISSUED DATE: 9-24-85

Don P. Watson

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Aircraft Certification Division
Federal Aviation Administration
Southwest Region,
Ft. Worth, Texas 76101

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SECTION 1 INTRODUCTION

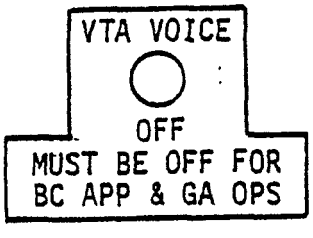
This supplement must be attached to the FAA Approved Airplane Flight Manual when the IDC Encoding Altimeter/Alerter System with Voice Terrain Advisory (with AA-215 Radio Altimeter) is installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

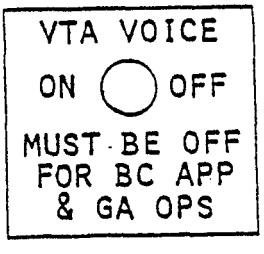
PRIOR TO IFR FLIGHT

1. Pilot's Encoding Altimeter ..... OPERABLE
2. Alternate Barometric Altimeter ..... REQUIRED AND OPERABLE
3. During Back Course Approach
   Operation Mode ..... VTA VOICE - OFF
4. During GO AROUND Operation Mode ..... VTA VOICE - OFF

REQUIRED PLACARD



ALTERNATE
PLACARD



SECTION 3 EMERGENCY PROCEDURES

ENCODING ALTIMETER

1.	Power Failure	RED OFF FLAG REPLACES 0 DIGIT ON DIAL. SYSTEM UNRELIABLE
	a. Altimeter Circuit Breaker	DISENGAGE. USE ALTERNATE ALTIMETER
	b. Radio Altimeter Circuit Breaker	DISENGAGE
2.	Malfunction	RED OFF FLAG REPLACES 0 DIGIT ON DIAL. SYSTEM UNRELIABLE
	a. Altimeter Circuit Breaker	DISENGAGE. USE ALTERNATE ALTIMETER
	b. Radio Altimeter Circuit Breaker	DISENGAGE

ALTITUDE ALERTER

1.	Power Failure	RED OFF WARNING FLAG APPEARS. SYSTEM UNRELIABLE
2.	Absence of Altitude Valid Signal	RED OFF WARNING FLAG APPEARS. SYSTEM UNRELIABLE

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

NOTE

The following describes normal procedures for the encoding altimeter and altitude alerter system with voice terrain advisory (VTA). Should the altimeter/alerter system be installed without the VTA, omit items pertaining to the VTA system.

The audio and visual indications of the RADBAR are powered by the radio altimeter receiver/transmitter. Therefore, the above ground level AGL indications are limited to 2,500 feet.

PREFLIGHT CHECK

1.	Airplane Power	OFF (AC AND DC)
	a. Encoding Altimeter OFF Flag	VISIBLE. REPLACES 0 DIAL
	b. Encoding Altimeter RAD/ALT OFF Flag	VISIBLE
	c. Altitude Alerter OFF Flag	VISIBLE
2.	Airplane Power	ON (AC AND DC)
	a. RADIO MASTER Switches	ON
	b. Altimeter Circuit Breaker	CHECK ENGAGED

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

c. Radio Altimeter Circuit Breaker ..... CHECK ENGAGED
d. ALT RPTG (Altitude Reporting) Switch ..... AS REQUIRED
e. VTA VOICE Switch ..... ON

NOTE

VTA announcements will not be audible with VTA VOICE switch in the OFF position.

f. Encoding Altimeter OFF Flag .... OUT OF VIEW. REPLACED BY 0 ON DIAL
g. Altitude Alerter OFF Flag ..... OUT OF VIEW
h. Encoding Altimeter **RADIO ALT** Annunciator ..... ILLUMINATES
i. VTA Announces ..... MINIMUM
j. **RADBAR ALT** Annunciator ..... ILLUMINATES (DH SETTING MUST BE ABOVE 0 FEET)

3. Encoding Altimeter
a. Barometric Pressure ..... SET TO AMBIENT PRESSURE
b. Altitude Indication ..... AIRPORT ELEVATION ± 30 FEET
c. Altitude Alerter ..... SET TO NEAREST 100 FEET OF AIRPORT ELEVATION
d. Red Test Button (Lower LH Corner of Altimeter) ..... PRESS AND HOLD
e. Dial Pointer ..... INCREASES APPROXIMATELY 300 FEET ABOVE AIRPORT ELEVATION. ALERTING TONE MAY BE AUDIBLE
f. VTA Announces ..... MINIMUM
g. Radio Altitude Display ..... ILLUMINATES DIGITS 888
h. Altimeter OFF Flag ..... REPLACED BY 0 ON DIAL
i. Alerter OFF Flag ..... VISIBLE
j. Red Test Button ..... RELEASE
k. Dial Pointer ..... RETURNS TO AIRPORT ELEVATION ± 30 FEET
l. Radio Altitude Display ..... 888 DIGITS REPLACED BY 100 THEN 0
m. VTA Announces ..... MINIMUM; IF DH IS SET LESS THAN 30 FEET
n. DH Knob ..... PRESS. RADIO ALTITUDE DISPLAYS DH (IF PREVIOUS SETTING WAS NOT 0 FEET)
o. DH Knob ..... RELEASE. RADIO ALTITUDE DISPLAY RETURNS TO 0 FEET

SECTION 5 NORMAL PROCEDURES (CONT)

BEFORE TAKEOFF

1. Altitude Reporting (ALT RPTG) Switch ..... AS REQUIRED

NOTE

The altitude encoding function is inoperative with the transponder ALT RPTG switch in the OFF position.

2. Encoding Altimeter ..... CHECK AMBIENT BAROMETRIC PRESSURE
   a. Altitude Indication ..... CHECK AIRPORT ELEVATION ± 30 FEET
   b. Radio Altitude Display ..... 0 FEET INDICATION
   c. **RADIO ALT** Annunciator ..... ILLUMINATED
   d. Decision Height (DH) Setting ... PRESS KNOB AND ROTATE TO DESIRED DH

NOTE

The DH knob may be pressed to check the decision height as illuminated in the radio altitude digital display.

Momentary power interruption does not affect the DH setting.

3. Altitude Alerter ..... SET DESIRED ALTITUDE
4. VTA VOICE Switch ..... AS REQUIRED. ON FOR VTA ANNOUNCEMENT

CAUTION

DO NOT USE ANY PORTION OF THE SYSTEM THAT TESTS UNSATISFACTORY.

AFTER TAKEOFF/IN FLIGHT

RADBAR ALTIMETER

1. Radio Altitude Display ..... INDICATES HEIGHT ABOVE TERRAIN UP TO APPROXIMATELY 990 FEET

NOTE

Above approximately 990 feet, the display has no indication.

2. **RADIO ALT** Annunciator ..... ILLUMINATED UP TO 2,500 FEET AGL EXTINGUISHES ABOVE 2,500 FEET AGL

NOTE

RADIO ALT annunciator will flash at flight altitude of 2,500 feet AGL if the terrain is rugged.

SECTION 5 NORMAL PROCEDURES (CONT)

CLIMB AND LEVEL OFF

ALTITUDE ALERTER

1. Altitude Approximately 1,000 Feet Below Preselected
   a. **ALT** Light ..... ILLUMINATES
   b. Alerting Tone ..... AUDIBLE FOR APPROXIMATELY 2 SECONDS
2. Approximately 300 Feet below Preselected Altitude
   a. **ALT** Light ..... EXTINGUISHES
3. Airplane Altitude Deviation Approximately ± 300 Feet
   a. **ALT** Light ..... ILLUMINATES
   b. Alerting Tone ..... AUDIBLE FOR APPROXIMATELY 2 SECONDS

NOTE

ALT light will remain illuminated until the airplane is within ± 300 feet of selected altitude or a new altitude is selected on the alerter.

DESCENT/APPROACH

ALTITUDE ALERTER

1. Altitude Approximately 1,000 Feet Above Preselected
   a. **ALT** Light ..... ILLUMINATES
   b. Alerting Tone ..... AUDIBLE FOR APPROXIMATELY 2 SECONDS
2. Descent to Approximately 300 Feet Above Preselected Altitude
   a. **ALT** Light ..... EXTINGUISHES
3. Airplane Deviation Approximately ± 300 Feet
   a. **ALT** Light ..... ILLUMINATES
   b. Alerting Tone ..... AUDIBLE FOR APPROXIMATELY 2 SECONDS

NOTE

ALT light will remain illuminated until the airplane is within • 300 feet of the selected altitude or a new altitude is selected on the alerter.

RADBAR ALTIMETER

1. At And Below 2,500 Feet AGL ..... **RADIO ALT** ANNUNCIATOR ILLUMINATED
2. At 2,000 ± 100 Feet and 1,000 Feet AGL ..... VTA ANNOUNCES "TERRAIN"

NOTE

Upon descending to approximately 1,000 feet AGL, the VTA glide slope warning is armed.

3. At Approximately 990 Feet Height Above Terrain ..... RADIO ALTITUDE DISPLAY ILLUMINATES

SECTION 5 NORMAL PROCEDURES (CONT)

DESCENT/APPROACH (CONT)

RADBAR ALTIMETER (CONT)

4. At 900 Feet Down to 100 Feet ..... VTA ANNOUNCES EACH 100 FOOT INCREMENT, I.E. (900, 800, ETC.)
5. At DH Setting ..... VTA ANNOUNCES "MINIMUM"

NOTE

VTA MINIMUM announcement has priority over any other voice announcement.

6. Glide Slope
   a. On or Above Glide Slope ..... VTA GLIDE SLOPE VOICE SILENT
   b. Below Glide Slope at a Preset Level (1 Dot) ..... VTA ANNOUNCES GLIDE SLOPE-GLIDE SLOPE AT 2 SECOND INTERVALS
   c. Below Preset Glide Slope Level (2 Dots) ..... VTA ANNOUNCES GLIDE SLOPE-GLIDE SLOPE AT 1 SECOND INTERVALS
   d. At DH Setting ..... VTA GLIDE SLOPE-GLIDE SLOPE IS TERMINATED

NOTE

VTA altitude announcements will interrupt GLIDE SLOPE-GLIDE SLOPE announcements.

AFTER LANDING

1. ALT RPTG Switch ..... AS REQUIRED
2. VTA VOICE Switch ..... AS REQUIRED
3. Altimeter Circuit Breaker ..... AS REQUIRED
4. Radio Altimeter Circuit Breaker ..... AS REQUIRED
5. RADIO MASTER Switches ..... AS REQUIRED
6. Airplane 28VDC Power ..... OFF

SYSTEM DESCRIPTION

GENERAL

The IDC RADBAR Encoding Altimeter/Altitude Alerter with Voice Terrain Advisory (VTA) System provides the pilot with direct indication of altitude with respect to the barometric pressure while alerting him of the airplane's preselected flight altitude and deviations (± 300 feet) after attaining that altitude. The system also indicates digitally and verbally height above terrain up to 990 feet with visible RADIO ALT flag at altitudes up to 2,500 feet AGL.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

ENCODING ALTIMETER

The encoding altimeter display is a five digit readout in increments of 20 feet and a single pointer completing one revolution for each 1,000 feet change in altitude. Black and white cross hatching is provided in place of the first zero to command attention to altitudes below 10,000 feet.

The encoding altimeter includes two barometric pressure scales permitting pressure settings in millibars and inches of mercury, by turning the adjusting knob on the lower right of the indicator.

The altimeter incorporates output signals for connection with an altitude alerting system.

The encoding altimeter is capable of reporting the airplane's altitude to a ground station when connected to the transponder.

VOICE TERRAIN ADVISORY (VTA) (IF INSTALLED)

The VTA informs the pilot of the vertical flight position with particular attention to altitudes within 2,500 feet above ground level by means of voice announcements.

ALTITUDE ALERTING SYSTEM (IF INSTALLED)

The altitude alerting system allows the selection of a flight altitude by means of a control knob. The maximum altitude which may be selected is the same as the maximum altitude indication of the RADBAR encoding altimeter. Selection is made in 100 foot increments. The final two zeros (0's) are fixed. A red OFF flag comes into view should a malfunction occur.

The altitude alerter receives altitude signals from the encoding altimeter. Upon nearing the preselected altitude (± 1,000 feet), the alerter sends an electrical signal to a warning horn and light. The warning horn is audible for approximately 2 seconds. The ALT warning light remains illuminated to approximately 300 feet from the selected altitude. The alerter activates the audio and visual warnings should the airplane deviate ±300 feet from the selected altitude.

LIGHTING

The encoding altimeter and altitude alerter are internally illuminated. Intensity is controlled by the PILOT FLT INST rheostat located in the overhead console. The RADIO ALT display intensity is controlled by the rheostat located in the lower left of the instrument.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

IDC RADBAR ENCODING ALTIMETER AND ALTITUDE ALERTING SYSTEM WITH VOICE TERRAIN ADVISORY (WITH ALT-50 RADIO ALTIMETER)

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 09-06-78

REISSUED DATE: 9-24-85

Don P. Watson

Don P. Watson, Manager
Aircraft Certification Division
Federal Aviation Administration
Southwest Region,
Ft. Worth, Texas 76101

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SECTION 1 INTRODUCTION

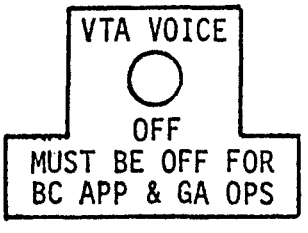
This supplement must be attached to the FAA Approved Airplane Flight Manual when the IDC Radbar Encoding Altimeter and Altitude Alerting System with Voice Terrain Advisory (with ALT-50 Radio Altimeter) are installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

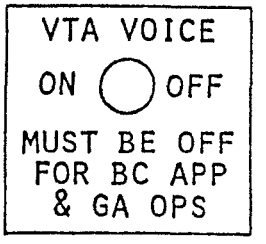
PRIOR TO IFR FLIGHT

1. Pilot's Encoding Altimeter ..... OPERABLE
2. Alternate Barometric Altimeter ..... REQUIRED AND OPERABLE
3. During Back Course Approach
   Operation Mode ..... VTA VOICE OFF
4. During GO AROUND Operation Mode ..... VTA VOICE OFF

REQUIRED PLACARD



ALTERNATE
PLACARD



SECTION 3 EMERGENCY PROCEDURES

ENCODING ALTIMETER

1.	Power Failure	RED OFF FLAG REPLACES 0 DIGIT ON DIAL. SYSTEM UNRELIABLE
	a. Altimeter Circuit Breaker	DISENGAGE. USE ALTERNATE ALTIMETER
	b. Radio Altimeter Circuit Breaker	DISENGAGE
2.	Malfunction	RED OFF FLAG REPLACES 0 DIGIT ON DIAL. SYSTEM UNRELIABLE
	a. Altimeter Circuit Breaker	DISENGAGE. USE ALTERNATE ALTIMETER
	b. Radio Altimeter Circuit Breaker.	DISENGAGE

ALTITUDE ALERTER

1.	Power Failure	RED OFF FLAG APPEARS. SYSTEM UNRELIABLE
2.	Absence of Altitude Valid Signal	RED OFF FLAG APPEARS. SYSTEM UNRELIABLE

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

NOTE

The following describes normal procedures for the encoding altimeter and altitude alerter system with Voice Terrain Advisory (VTA). Should the altimeter/alerter system be installed without the VTA, omit items pertaining to the VTA system.

The audio and visual indications of the RADBAR are powered by the radio altimeter receiver/transmitter. Therefore, the Above Ground Level (AGL) indications are limited to 2,000 feet.

PREFLIGHT CHECK

1.	Airplane Power	OFF (AC AND DC)
	a. Encoding Altimeter OFF Flag	VISIBLE. REPLACING 0 DIAL
	b. Encoding Altimeter RAD/OFF Flag.	VISIBLE
	c. Altitude Alerter OFF Flag	VISIBLE
2.	Airplane Power	ON (AC AND DC)
	a. RADIO MASTER Switches	ON
	b. Altimeter Circuit Breaker	CHECK ENGAGED
	c. Radio Altimeter Circuit Breaker.	CHECK ENGAGED
	d. ALT RPTG (Altitude Reporting) Switch	AS REQUIRED

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (Cont)

e. VTA VOICE Switch ..... ON

NOTE

VTA announcements will not be audible with VTA VOICE switch in the OFF position.

f. Encoding Altimeter OFF Flag .... OUT OF VIEW. REPLACED BY 0 ON DIAL
g. Altitude Alerter OFF Flag ..... OUT OF VIEW
h. Encoding Altimeter Radio ALT Annunciator ..... ILLUMINATES
i. VTA Announces ..... MINIMUM
j. **RADBAR ALT** Annunciator ..... ILLUMINATES (DECISION HEIGHT [DH] SETTING MUST BE ABOVE 0 FEET)

3. Encoding Altimeter
   a. Barometric Pressure ..... SET TO AMBIENT PRESSURE
   b. Altitude Indication ..... AIRPORT ELEVATION ± 30 FEET
   c. Altitude Alerter ..... SET TO NEAREST 100 FEET OF AIRPORT ELEVATION
   d. Red Test Button (Lower LH Corner of Altimeter) ..... PRESS AND HOLD
   e. Dial Pointer ..... INCREASES APPROXIMATELY 300 FEET ABOVE AIRPORT ELEVATION, ALERTING TONE MAY BE AUDIBLE
   f. VTA Announces ..... MINIMUM
   g. Radio Altitude Display ..... ILLUMINATES DIGITS 888
   h. Altimeter OFF Flag ..... REPLACES 0 ON DIAL
   i. Alerter OFF Flag ..... VISIBLE
   j. Red Test Button ..... RELEASE
   k. Dial Pointer ..... RETURNS TO AIRPORT ELEVATION ± 30 FEET
   l. Radio Altitude Display ..... 888 DIGITS REPLACED BY 50 THEN 0
   m. VTA Announces ..... MINIMUM (IF DH IS SET LESS THAN 30 FEET)
   n. DH Knob ..... PRESS. RADIO ALTITUDE DISPLAYS DH (IF PREVIOUS SETTING WAS NOT 0 FEET)
   o. DH Knob ..... RELEASE. RADIO ALTITUDE DISPLAY RETURNS TO 0 FEET

BEFORE TAKEOFF

1. Altitude Reporting (ALT RPTG) Switch ..... AS REQUIRED

NOTE

The altitude encoding function is inoperative with the transponder ALT RPTG switch in the OFF position.

SECTION 5 NORMAL PROCEDURES (CONT)

BEFORE TAKEOFF (CONT)

2. Encoding Altimeter ..... CHECK AMBIENT BAROMETRIC PRESSURE
   a. Altitude Indication ..... CHECK AIRPORT ELEVATION ± 30 FEET
   b. Radio Altitude Display ..... 0 FEET INDICATION
   c. Radio ALT Annunciator ..... ILLUMINATED
   d. Decision Height (DH) Setting ... PRESS KNOB AND ROTATE TO DESIRED DH

NOTE

The DH knob may be pressed to check the decision height as illuminated in the radio altitude digital display.

Momentary power interruption does not affect the DH setting.

3. Altitude Alerter ..... SET TO DESIRED ALTITUDE
4. VTA VOICE Switch ..... CHECK. (ON REQUIRED FOR VTA ANNOUNCEMENT)

AFTER TAKEOFF/IN FLIGHT

RADBAR ALTIMETER

1. Radio Altitude Display ..... INDICATED HEIGHT ABOVE TERRAIN UP TO APPROXIMATELY 990 FEET

NOTE

Above approximately 990 feet, the display has no indication.

2. Radio ALT Annunciator ..... ILLUMINATED UP TO 2,000 FEET AGL. EXTINGUISHES ABOVE 2,000 FEET AGL

NOTE

Radio ALT annunciator will flash at flight altitude of 2,000 feet AGL if the terrain is rugged.

3. RAD/ALT OFF Flag ..... VISIBLE ABOVE ABOUT 2,500 FEET AGL. REMAINS IN VIEW UNTIL DESCENT BELOW ABOUT 2,500 FEET AGL

CLIMB AND LEVEL-OFF

ALTITUDE ALERTER

1. Altitude Approximately 1,000 Feet Below Preselected
   a. ALT Light ..... ILLUMINATES
   b. Alerting Tone ..... AUDIBLE FOR APPROXIMATELY 2 SECONDS

SECTION 5 NORMAL PROCEDURES (CONT)

CLIMB AND LEVEL-OFF (CONT)

ALTITUDE ALERTER (CONT)

2. Altitude Approximately 300 Feet Below Preselected
   a. **ALT** Light ..... EXTINGUISHES
3. Airplane Altitude Deviation Approximately ± 300 Feet
   a. ALT Light ..... ILLUMINATES
   b. Alerting Tone ..... AUDIBLE FOR APPROXIMATELY 2 SECONDS

NOTE

ALT light will remain illuminated until the airplane is within ± 300 feet of selected altitude or a new altitude is selected on the alerter.

DESCENT/APPROACH

ALTITUDE ALERTER

1. Altitude Approximately 1,000 Feet Above Preselected
   a. **ALT** Light ..... ILLUMINATES
   b. Alerting Tone ..... AUDIBLE FOR APPROXIMATELY 2 SECONDS
2. Descent to Approximately 300 Feet Above Preselected Altitude
   a. **ALT** Light ..... EXTINGUISHES
3. Airplane Deviation Approximately ± 300 Feet
   a. **ALT** Light ..... ILLUMINATES
   b. Alerting Tone ..... AUDIBLE FOR APPROXIMATELY 2 SECONDS

NOTE

ALT light will remain illuminated until the airplane is within ± 300 feet of the selected altitude or a new altitude is selected on the alerter.

RADBAR ALTIMETER

1. At and Below 2,000 Feet AGL ..... **RADIO ALT** ANNUNCIATOR ILLUMINATED
2. At Approximately 1,700 Feet and 1,000 Feet AGL ..... VTA ANNOUNCES "TERRAIN"

NOTE

Upon descending to approximately 1,000 feet AGL, the VTA glide slope warning is automatically armed.

3. At Approximately 990 Feet Height Above Terrain ..... RADIO ALTITUDE DISPLAY ILLUMINATES
4. At 900 Feet Down to 100 Feet ..... VTA ANNOUNCES EACH 100 FOOT INCREMENT (i.e. 900, 800, ETC.)

SECTION 5 NORMAL PROCEDURES (CONT)

DESCENT/APPROACH (CONT)

RADBAR ALTIMETER (CONT)

5. At DH Setting ..... VTA ANNOUNCES "MINIMUM"

NOTE

VTA MINIMUM announcements have priority over any other voice announcement.

6. Glide Slope
   a. On or Above Glide Slope ..... VTA GLIDE SLOPE VOICE SILENT
   b. Below Glide Slope at a Preset Level (1 Dot) ..... VTA ANNOUNCES "GLIDE SLOPE-GLIDE SLOPE" AT 2 SECOND INTERVALS
   c. Below Preset Glide Slope Level (2 Dots) ..... VTA ANNOUNCES "GLIDE SLOPE-GLIDE SLOPE" AT 1 SECOND INTERVALS
   d. At DH Setting ..... VTA "GLIDE SLOPE-GLIDE SLOPE" ANNOUNCEMENT IS TERMINATED

NOTE

VTA altitude announcements will interrupt GLIDE SLOPE-GLIDE SLOPE announcements.

AFTER LANDING

1. ALT RPTG Switch ..... AS REQUIRED
2. VTA VOICE Switch ..... AS REQUIRED

SYSTEM DESCRIPTION

GENERAL

The IDC RADBAR Encoding Altimeter/Altitude Alerter with Voice Terrain Advisory (VTA) System provides the pilot with direct indication of altitude with respect to the barometric pressure while alerting him of the airplane's preselected flight altitude and deviations (± 300 feet) after attaining that altitude. The system also indicates digitally and verbally Height Above Terrain up to 900 feet and with visible RADIO ALT flag at altitudes up to 2,000 feet AGL.

ENCODING ALTIMETER

The encoding altimeter display is a five digit readout in increments of 20 feet with a single pointer completing one revolution for each 1,000 foot change in altitude. Black and white cross hatching is provided in place of the first zero to command attention to altitudes below 10,000 feet.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

ENCODING ALTIMETER (CONT)

The encoding altimeter includes two barometric pressure scales permitting pressure settings, in millibars and inches of mercury, by turning the adjusting knob on the lower right of the indicator.

The altimeter incorporates electrical output signals to interface with the altitude alerting system.

The encoding altimeter is capable of reporting the airplane's altitude to a ground station when connected to the transponder.

VOICE TERRAIN ADVISORY (VTA) (IF INSTALLED)

The VTA informs the pilot of the vertical flight position with particular attention to altitudes within 1,700 feet above ground level using voice announcements.

ALTITUDE ALERTING SYSTEM (IF INSTALLED)

The altitude alerting system allows the pilot to select a flight altitude using a control knob. The maximum altitude which may be selected is the same as the maximum altitude indication of the RADBAR encoding altimeter. Selection is made in 100 foot increments. The final two zeros (0's) are fixed. A red OFF flag comes into view should a malfunction occur.

The altitude alerter receives altitude signals from the encoding altimeter. Upon nearing the preselected altitude (± 1,000 feet), the alerter sends an electrical output signal to a warning horn and light. The warning horn is audible for approximately two seconds. The ALT warning light remains illuminated to approximately 300 feet from the selected altitude. The alerter activates the audio and visual warnings should the airplane deviate ± 300 feet from the selected altitude.

LIGHTING

The encoding altimeter and altitude alerter are internally illuminated. Intensity is controlled by the PILOT FLT INST rheostat located in the overhead console. The radio altimeter display brightness is controlled by the rheostat located in the lower left of the instrument.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

COLLINS ALT-55 RADIO ALTIMETER
WITH
DRI-55 INDICATOR

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 12-07-79

REISSUED DATE: 9-24-85

Don P. Watson

Don P. Watson, Manager
Aircraft Certification Division
Federal Aviation Administration
Southwest Region,
Ft. Worth, Texas 76101

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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the Collins ALT-55 Radio Altimeter with DRI-55 Indicator is installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

The use of the Collins ALT-55 Radio Altimeter System with DRI-55 Indicator is approved for Category I Operation only.

SECTION 3 EMERGENCY PROCEDURES

No Change

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

PREFLIGHT CHECK

CAUTION

DO NOT APPLY POWER TO RADIO ALTIMETER WITH THE TRANSMITTING ANTENNA DISCONNECTED FROM TRANSMITTER.

1.	Airplane Power	OFF (AC AND DC)
	a. DH Flag Bar	IN VIEW
	b. Altitude Display	BLANK
2.	Airplane Power	ON (AC AND DC)
	a. DH Flag Bar	OUT OF VIEW
	b. Altitude Display	INDICATES AIRPLANE ALTITUDE
3.	DH (Decision Height)/PUSH TEST Selector	SET DH TO 50 FEET OR ABOVE
4.	System Test	
	a. DH/PUSH TEST Selector	PRESS AND HOLD
	b. Altitude Display	DISPLAYS EXACT DH FOR 2 SECONDS; THEN DISPLAYS TEST ALTITUDE OF 50 FEET FOR 2 SECONDS; THEN 8888 IS DISPLAYED
	c. DH Annunciator	ILLUMINATES
	d. DH/PUSH TEST Selector	RELEASE
	e. Altitude Display	INDICATES AIRPLANE ALTITUDE

CAUTION

DO NOT USE IF TEST IS UNSATISFACTORY.

BEFORE TAKEOFF

1.	Decision Height	SET TO DESIRED HEIGHT (0 TO 980 FEET)

AFTER TAKEOFF - IN FLIGHT

1.	DH Annunciator	ILLUMINATED UNTIL AIRPLANE IS ABOVE SELECTED DH
2.	Altitude Display	INDICATES ALTITUDE INCREASE UP TO 2,500 FEET AGL, THEN BLANKS OUT
3.	In Flight Check	
	a. DH Flag Bar	OUT OF VIEW
	b. Altitude Display	BLANKED OUT, IF ABOVE 2,500 FEET AGL
	c. Decision Height	SET TO 50 FEET OR ABOVE
	d. DH/PUSH TEST Selector	PRESS AND HOLD
	e. Altitude Display	DISPLAYS EXACT DH FOR 2 SECONDS; THEN DISPLAYS 50 FEET FOR 2 SECONDS; THEN 8888 IS DISPLAYED
	f. DH Annunciator	ILLUMINATES
	g. DH/PUSH TEST Selector	RELEASE
	h. DH Annunciator	EXTINGUISHES

SECTION 5 NORMAL PROCEDURES (CONT)

AFTER TAKEOFF - IN FLIGHT (CONT)

i. Altitude Display ..... INDICATES PREVIOUS ALTITUDE (BLANKS OUT IF ABOVE 2,500 FEET AGL)

j. Decision Height ..... SET TO DESIRED HEIGHT

DESCENT

1. Altitude Display ..... INDICATES HEIGHT ABOVE GROUND LEVEL BELOW 2,500 FEET AGL

NOTE

The display increment is 10 feet below 1,000 feet AGL and 50 feet from 1,000 feet to 2,500 feet AGL.

2. DH Annunciator ..... ILLUMINATES AT SELECTED HEIGHT

SYSTEM DESCRIPTION

GENERAL

The Collins ALT-55 Radio Altimeter System with DRI-55 Indicator is a height resolution radio altitude system with detection of the earliest return signals to establish the altitude.

The system consists of a transmitter/receiver unit, an indicator and dual antennas which provide an accurate indication of the height above ground level from 0 to 2,500 feet within the limits of pitch and roll for Category I operation.

OPERATION

To operate the system, apply power and adjust the decision height as required. The decision height is selected by rotating the DH/PUSH TEST selector knob clockwise or counterclockwise until the desired decision height is displayed in the DH Display (right hand group of digits). The decision height may be selected from 0 to 980 feet in 10 foot increments and between 10 foot increments by interpolation. The exact decision height can be set by pressing and rotating the DH/PUSH TEST selector knob within the first 2 seconds it is pressed. During this time, the decision height is indicated in the Altitude Display (left hand group of digits) to the nearest foot.

The **DH** (decision height) annunciator illuminates when the airplane descends to the selected decision height.

The red DH Flag Bar comes into view over the DH display if radio altitude computations stop or power is lost to the system.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

LIGHTING

The DRI-55 Indicator is internally illuminated. Intensity is controlled by the PILOT FLT INST rheostat in the overhead switch panel. Integral **DH** light is dimmed with the ANN NORM-DIM switch on the upper left instrument panel. The altitude display is dimmed by R-ALT DIM rheostat adjacent to the pilot's control column.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

SPERRY AA-215 RADIO ALTIMETER

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 09-05-78

REISSUED DATE: 9-24-85

Don P. Watson

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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the Sperry AA-215 Radio Altimeter is installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

The use of the Sperry AA-215 Radio Altimeter System is approved for Category I Operation only.

SECTION 3 EMERGENCY PROCEDURES

No Change

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

PREFLIGHT CHECK

CAUTION

DO NOT APPLY POWER TO THE RADIO ALTIMETER WITH THE TRANSMITTING ANTENNA DISCONNECTED FROM THE TRANSMITTER.

1.	System Power	ON
	a. Indicator Needle	MOVES BEHIND MASK
	b. Red OFF Flag	DISAPPEARS FROM VIEW AFTER APPROXIMATELY 35 SECONDS
	c. Indicator Needle	INDICATES 0 ± 5 FEET AFTER APPROXIMATELY 35 SECONDS
	d. DH Annunciator	ILLUMINATES
2.	Decision Height (DH) Selector	SET REFERENCE INDICATOR (BUG) TO 50 FEET
3.	System Test	
	a. TEST Button	PRESS AND HOLD
	b. Indicator Needle	INDICATES 100 ± 20 FEET
	c. DH Annunciator	EXTINGUISHES
	d. Red OFF Flag	VISIBLE
	e. TEST Button	RELEASE
	f. Indicator Needle	RETURNS TO 0 ± 5 FEET
	g. DH Annunciator	ILLUMINATES
	h. Red OFF Flag	OUT OF VIEW

NOTE

The DH selector may be set to 0 feet or below to deactivate the DH function and annunciator.

BEFORE TAKEOFF

1.	Decision Height (DH)	SET TO DESIRED HEIGHT

AFTER TAKEOFF/IN FLIGHT

1.	DH Annunciator	ILLUMINATED UNTIL AIRPLANE IS ABOVE SELECTED DH
2.	Indicator Needle	INDICATES ALTITUDE INCREASE UP TO 2,500 FEET AGL; THEN OUT OF VIEW BEHIND MASK

IN FLIGHT CHECK

1.	Red OFF Flag	OUT OF VIEW
2.	Indicator Needle	OUT OF VIEW IF ABOVE 2,500 FEET AGL
3.	Decision Height	SET TO 200 FEET
4.	TEST Button	PRESS AND HOLD
5.	Indicator Needle	100 ± 20 FEET
6.	DH Annunciator	ILLUMINATES
7.	Red OFF Flag	VISIBLE

SECTION 5 NORMAL PROCEDURES (CONT)

AFTER TAKEOFF - IN FLIGHT (CONT)

IN FLIGHT CHECK (CONT)

8.	TEST Button	RELEASE
9.	Indicator Needle	RETURNS TO PREVIOUS INDICATION (OUT OF VIEW IF ABOVE 2,500 FEET AGL)
10.	DH Annunciator	EXTINGUISHES
11.	Red OFF Flag	OUT OF VIEW
12.	Decision Height	SET TO DESIRED HEIGHT

DESCENT

1.	Indicator Needle	INDICATES HEIGHT ABOVE GROUND SURFACE BELOW 2,500 FEET AGL
2.	DH Annunciator	ILLUMINATES AT SELECTED DECISION HEIGHT

SYSTEM DESCRIPTION

The Sperry AA-215 Radio Altimeter System is a height resolution, short pulse radio altitude system which detects the earliest returned/ground signals to establish a lock on. Any signal loss places a range tracker in a search sweep mode until the track is reestablished and a new lock on signal is restored.

The system consists of a transmitter/receiver unit, an indicator, and dual antennas which provide accurate indications of the height above ground level from 0 to 2,500 feet within the limits of pitch and roll for Category I operation.

To operate the Sperry AA-215 Radio Altimeter System, apply power to the system. Adjust the decision height (DH) as desired. The system may be tested by pressing the TEST button.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

KING KRA-405 RADIO ALTIMETER

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

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Don P. Watson

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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the King KRA-405 Radio Altimeter is installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

The use of the King KRA-405 Radio Altimeter System is approved for Category I Operation only.

SECTION 3 EMERGENCY PROCEDURES

No Change

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

PREFLIGHT CHECK

CAUTION

DO NOT APPLY POWER TO THE RADIO ALTIMETER WITH THE TRANSMITING ANTENNA DISCONNECTED FROM THE TRANSMITTER. DAMAGE MAY RESULT TO THE SYSTEM.

1. Decision Height (DH) Selector ..... SET REFERENCE INDICATOR (BUG) TO 25 FEET
2. System Power ..... ON
   a. Indicator Needle ..... MOVES BEHIND MASK
   b. RED Warning Flag ..... DISAPPEARS FROM VIEW (AFTER WARM-UP)
   c. Indicator Needle ..... INDICATES 0 ± 5 FEET (AFTER WARM-UP)
   d. DH Annunciator ..... ILLUMINATES
3. System Test
   a. TEST Button ..... PRESS AND HOLD
   b. Indicator Needle ..... 50 ± 5 FEET

WARNING

IF THE INDICATOR NEEDLE DOES NOT POINT TO 50 ± 5 FEET, DO NOT USE THE SYSTEM.

c. DH Annunciator ..... EXTINGUISHES

NOTE

If the DH annunciator light does not illuminate, the pilot must observe the indicator for the decision height.

d. RED Warning Flag ..... VISIBLE

NOTE

If the warning flag is not visible but the altitude indicates 50 ± 5 feet, the system may be used. Should a subsequent failure of the system occur, it will not be indicated by the warning flag.

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

e. Slowly Increase Altitude Setting To 50 ± 5 Feet ..... DH ANNUNCIATOR LIGHT ILLUMINATES AT 50 ± 5 FEET

NOTE

The **DH** annunciator light should remain illuminated at altitudes above 50 ± 5 feet with the TEST Button depressed.

f. TEST Button ..... RELEASE
g. Indicator Needle ..... RETURNS TO 0 ± 5 FEET
h. **DH** Annunciator ..... REMAINS ILLUMINATED

NOTE

The **DH** annunciator may be pressed to deactivate. Once extinguished, the light may be illuminated by pressing the TEST Button on the annunciator (if the **DH** setting is above 50 feet) again.

BEFORE TAKEOFF

1. Decision Height (DH Bug) ..... SET AS DESIRED

AFTER TAKEOFF/IN FLIGHT

1. DH Annunciator Light ..... ILLUMINATED UNTIL AIRPLANE IS ABOVE SELECTED DH (DECISION HEIGHT)

NOTE

The **DH** annunciator light may be deactivated by pressing the light. The **DH** annunciator light is automatically armed upon reaching and ascending above selected DH altitude.

2. Indicator Needle ..... INDICATES ALTITUDE INCREASE UP TO 2,000 FEET AGL, THEN OUT OF VIEW BEHIND MASK
3. In Flight Check Above 2,000 Feet AGL
   a. RED Warning Flag ..... OUT OF VIEW
   b. Indicator Needle ..... OUT OF VIEW (IF ABOVE 2,000 FEET AGL)
   c. TEST Button ..... PRESS AND HOLD
   d. Indicator Needle ..... 50 ± 5 FEET
   e. **DH** Annunciator Light ..... ILLUMINATES (IF DH SETTING IS ABOVE 50 FEET)
   f. RED Warning Flag ..... VISIBLE
   g. TEST Button ..... RELEASE

SECTION 5 NORMAL PROCEDURES (CONT)

AFTER TAKEOFF/IN FLIGHT (CONT)

h.	Indicator Needle	RETURNS TO PREVIOUS INDICATION (OUT OF VIEW ABOVE 2,000 FEET AGL)
i.	DH Annunciator Light	EXTINGUISHES
j.	RED Warning Flag	OUT OF VIEW
4.	RED Warning Flag Visible	
a.	Primary Power Source Lost	DO NOT USE SYSTEM
b.	Indicated Altitude in Error	SYSTEM UNRELIABLE
5.	Indicator Pointer Not Visible Below 2,000 Feet AGL	SYSTEM UNRELIABLE

DESCENT

1.	Indicator Needle	INDICATES HEIGHT ABOVE TERRAIN BELOW 2,000 FEET AGL
2.	DH Annunciator Light	ILLUMINATES AT SELECTED DECISION HEIGHT

NOTE

The DH annunciator light may be pressed to deactivate. Once extinguished, the light may be illuminated by pressing the TEST Button on the annunciator (if the DH setting is above 50 feet) again.

SYSTEM DESCRIPTION

The King KRA-405 Radio Altimeter System is a height resolution system to detect the earliest return signals to establish a lock on. Any signal loss places a range tracker in search sweep mode until the track is restablished and a new lock on signal is restored.

The system consists of a transmitter/receiver unit, an indicator, and dual antennas which provide an accurate indication of height above the ground surface from 0 to 2,000 feet within the limits of pitch and roll for Category I Operation.

To operate the King KRA-405 Radio Altimeter System, apply power to the system and adjust the Decision Height (DH) as desired. The system may be tested by pressing the TEST button.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

COLLINS ALT-50 RADIO ALTIMETER

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the Collins ALT-50 Radio Altimeter is installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

The use of the Collins ALT-50 Radio Altimeter System is approved for Category I Operation only.

SECTION 3 EMERGENCY PROCEDURES

No Change

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

PREFLIGHT CHECK

CAUTION

DO NOT APPLY POWER TO RADIO ALTIMETER WITH THE TRANSMITTING ANTENNA DISCONNECTED FROM TRANSMITTER.

1. Decision Height (DH) Selector ..... SET REFERENCE INDICATOR TO 70 FEET
2. System Power ..... ON
   a. Indicator Needle ..... MOVES BEHIND MASK
   b. RED Warning Flag ..... DISAPPEARS FROM VIEW AFTER WARM UP
   c. Indicator Needle ..... INDICATES 0 ± 5 FEET AFTER WARM UP
   d. DH Annunciator ..... ILLUMINATES
3. System Test
   a. TEST Button ..... PRESS AND HOLD
   b. Indicator Needle ..... 50 ± 5 FEET

CAUTION

IF THE INDICATOR NEEDLE DOES NOT POINT TO 50 ± 5 FEET, DO NOT USE THE SYSTEM.

c. DH Annunciator ..... ILLUMINATES

NOTE

If the DH annunciator does not illuminate above 50 ± 5 feet, the pilot must observe the indicator for the decision height.

d. RED Warning Flag ..... VISIBLE

NOTE

If the warning flag is not visible but the altitude indicates 50 ± 5 feet, the system may be used. Should a subsequent failure of the system occur, it will not be indicated by the warning flag.

e. Slowly Decrease Altitude Setting to 0 ± 5 Feet ..... DH ANNUNCIATOR EXTINGUISHES BETWEEN 20 AND 40 FEET
f. TEST Button ..... RELEASE
g. Indicator Needle ..... RETURN TO 0 ± 5 FEET
h. RED Warning Flag ..... DISAPPEARS FROM VIEW
i. DH Annunciator ..... ILLUMINATES

SECTION 5 NORMAL PROCEDURES CONT)

BEFORE TAKEOFF

1.	Decision Height (DH) Selector	SET AS DESIRED

AFTER TAKEOFF/IN FLIGHT

1.	DH Annunciator	ILLUMINATED UNTIL AIRPLANE IS ABOVE SELECTED DH
2.	Indicator Needle	INDICATES ALTITUDE INCREASE UP TO 2,000 FEET AGL, THEN OUT OF VIEW BEHIND MASK

IN FLIGHT CHECK ABOVE 2,000 FEET AGL

1.	Red Warning Flag	OUT OF VIEW
2.	Indicator Needle	OUT OF VIEW, IF ABOVE 2,000 FEET AGL
3.	TEST Button	PRESS AND HOLD
4.	Indicator Needle	50 ± 5 FEET
5.	DH Annunciator	ILLUMINATES (IF DH SETTING IS ABOVE 50 FEET)
6.	Red Warning Flag	VISIBLE
7.	TEST Button	RELEASE
8.	Indicator Needle	RETURNS TO PREVIOUS INDICATION (OUT OF VIEW ABOVE 2,000 FEET AGL)
9.	DH Annunciator	EXTINGUISHES
10.	Red Warning Flag	OUT OF VIEW

RED WARNING FLAG VISIBLE

1.	Primary Power Source Lost	DO NOT USE SYSTEM
2.	Indicated Altitude In Error	SYSTEM UNRELIABLE

INDICATOR POINTER NOT VISIBLE BELOW 2,000 FEET AGL

1.	System Unreliable	DO NOT USE

DESCENT

1.	Indicator Needle	INDICATES HEIGHT ABOVE GROUND LEVEL (AGL) BELOW 2,000 FEET
2.	DH Annunciator	ILLUMINATES AT SELECTED DECISION HEIGHT

SYSTEM DESCRIPTION

The Collins ALT-50 Radio Altimeter System is a height resolution system which detects the earliest returned signals to establish a lock on. Any signal loss places a range tracker in a search sweep mode until the track is reestablished and a new lock on is restored.

The system consists of a transmitter/receiver unit, an indicator, and dual antennas which provide an accurate indication of the height above ground level from 0 to 2,000 feet within the limits of pitch and roll for Category I operation.

SECTION 5 NORMAL PROCEDURES CONT)

SYSTEM DESCRIPTION (CONT)

To operate the Collins ALT-50 Radio Altimeter System, apply power to the system and adjust the decision height (DH) as desired. The system may be tested by pressing the TEST button.

The radio altimeter indicator is internally illuminated and controlled by the pilot instrument light rheostat located in the overhead switch console. The **DH** annunciator may be dimmed by the ANN (annunciator) DIM switch located on the left side of the pilot's instrument panel.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

COLLINS FDS-112V FLIGHT DIRECTOR SYSTEM

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the Collins FDS-112V Flight Director System is installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

The use of the Collins FDS-112V Flight Director System is approved for Category I Operation only.

SECTION 3 EMERGENCY PROCEDURES

1. HEADING Flag Visible ..... COMPASS SYSTEM FAILURE. HEADING DISPLAY AND COMMAND INFORMATION UNUSABLE. PRESS AP DISC SWITCH OR ANOTHER MODE CONTROLLER BUTTON

NOTE

The VOR/LOC and glide slope deviation displays remain correct for terminal operation.

SECTION 3 EMERGENCY PROCEDURES (CONT)

2. ATT (Attitude) Flag Visible ..... ATTITUDE REFERENCE SYSTEM FAILURE. ATTITUDE AND COMMAND INFORMATION UNUSABLE

NOTE

Radio and heading information remains reliable.

a. Autopilot (If Installed) ..... WILL NOT ENGAGE

3. NAV Flag Visible ..... LATERAL DEVIATION BAR INFORMATION SOURCE MALFUNCTION. ROLL STEERING UNRELIABLE

4. GS Flag Visible ..... GLIDE SLOPE RECEIVER MALFUNCTION OR UNRELIABLE GLIDE SLOPE SIGNAL. VERTICAL COMMANDS IN APPR MODE UNRELIABLE

NOTE

Remaining operational modes will be correct.

5. CMPTR (Computer) Flag Visible ..... INPUT SIGNAL MALFUNCTION. COMMAND INFORMATION UNUSABLE

NOTE

Altitude, heading, radio position, and glide slope information may be correct.

6. RAD ALT (Radio Altimeter) Flag Visible ..... RADIO ALTIMETER MALFUNCTION

NOTE

Remaining information will be correct.

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

PREFLIGHT CHECK

1. Electrical Power ..... ON
2. Radio Master Switches ..... ON
3. FLT DIR and Associated Circuit Breakers ..... ENGAGE
4. AUTOPILOT CONT Breaker Switch ..... ON. CMPTR FLAG MOVES OUT OF VIEW
5. F/D Switch ..... ON. COMMAND BARS MOVE INTO VIEW
6. Flight Director Indicator
   a. TEST Button ..... PRESS AND HOLD
   b. Attitude Display
      (1) Roll ..... 10° LEFT
      (2) Pitch ..... 10° DOWN
      (3) ATT Flag ..... VISIBLE
   c. Remaining Warning Flags ..... OUT OF VIEW
   d. TEST Button ..... RELEASE

CAUTION

DO NOT USE FLIGHT DIRECTOR IF TEST IS UNSATISFACTORY.

BEFORE TAKEOFF

1. AUTOPILOT CONT Breaker Switch ..... ON
2. F/D Switch ..... ON
3. COURSE ..... AS REQUIRED
4. Heading (HDG) ..... AS REQUIRED

NOTE

The flight director presents normal attitude and horizontal situation displays with the F/D switch in the OFF position.

CLIMB

NOTE

The flight director commands should be satisfied before engaging the autopilot. Accomplish this by manually flying to align the command bars with the fixed reference.

1. F/D Switch ..... CHECK ON

SECTION 5 NORMAL PROCEDURES (CONT)

CLIMB (CONT)

2. PITCH SYNC Button ..... MOMENTARILY PRESS TO SYNCHRONIZE FLIGHT DIRECTOR ATTITUDE

NOTE

Pressing PITCH SYNC button cancels glide slope, altitude hold, and go around modes.

3. Autopilot Heading (HDG) Button ..... PRESS. FLIGHT DIRECTOR COMMANDS A FLY TO THE PRESET HEADING. BANK ANGLE IS LIMITED TO APPROXIMATELY 22°

4. At Cruise Altitude ..... PRESS AUTOPILOT ALT BUTTON. ADJUST ENGINE POWER AS REQUIRED TO MAINTAIN DESIRED AIRSPEED

NOTE

The ALT button may be pressed at any time.

CRUISE

1. Heading Change (If Required) ..... CHANGE HDG SELECTOR AS REQUIRED. FLIGHT DIRECTOR COMMANDS A FLY TO THE NEW HEADING. BANK ANGLE IS LIMITED TO APPROXIMATELY 22°

2. NAV VOR Variable Intercept and Track - Angle Greater Than 45°
   a. VOR Course ..... SET AS REQUIRED
   b. HDG and NAV Buttons ..... PRESS SIMULTANEOUSLY. FLIGHT DIRECTORS COMMAND A TURN TO THE SELECTED HEADING.
   c. Deviation Needle Decreases One Dot From Full Deflection ..... HEADING ON ANNUNCIATOR EXTINGUISHES. FLIGHT DIRECTOR COMMANDS A 45° INTERCEPT ANGLE.

3. NAV VOR Fixed Intercept and Track
   a. VOR Course ..... SET AS REQUIRED
   b. NAV Button ..... PRESS. FLIGHT DIRECTOR ASSUMES AN INTERCEPT ANGLE OF APPROXIMATELY 45°

NOTE

Crosswind correction is automatic after course capture.

SECTION 5 NORMAL PROCEDURES (CONT)

APPROACH

1. Variable Intercept - Angle Greater Than 45°
   a. LOC Course ..... SET TO INBOUND
   b. Heading (HDG) ..... SET TO ESTABLISH DESIRED INTERCEPT ANGLE

NOTE

The number of degrees between the selected COURSE and HDG is the intercept angle. If intercept angle is less than 45°, the Fixed Intercept Approach method is recommended.

   c. HDG and APPR Buttons ..... PRESS SIMULTANEOUSLY
   d. Flight Director ..... COMMANDS A FLY TO THE SELECTED HEADING UNTIL THE DEVIATION NEEDLE IS ONE DOT FROM FULL DEFLECTION
   e. HDG ON Annunciator ..... EXTINGUISHES. FLIGHT DIRECTOR COMMANDS LOC COURSE INTERCEPT ANGLE OF APPROXIMATELY 45°

2. Fixed Intercept
   a. LOC Course ..... SET TO INBOUND
   b. APPR Button ..... PRESS. FLIGHT DIRECTOR COMMANDS A LOC COURSE INTERCEPT ANGLE OF APPROXIMATELY 45°

3. Glide Slope Automatic Mode
   The glide slope is automatically armed when the following conditions are satisfied:
   a. NAV Receiver ..... TUNED TO LOC FREQUENCY AND TRACKING
   b. Glide Slope Beam ..... BELOW BEAM 20 SECONDS (MINIMUM) BEFORE INTERCEPTION
   c. Area Navigation ..... OFF
   d. APPR Mode Button ..... ENGAGE
   e. Glide Slope Pointer Centers .... GS ARM ANNUNCIATOR EXTINGUISHES. FLIGHT DIRECTOR COMMANDS THE RATE OF DESCENT

NOTE

Glide slope may be disengaged by 1) pressing the ALT hold button, 2) adjusting the pitch command, 3) pressing the go around (GA) switch or, 4) pressing the PITCH SYNC button.

4. Glide Slope Manual Mode
   a. When GS Pointer Centers ..... PRESS GS BUTTON

NOTE

Manual glide slope may be activiated during any mode except go around.

SECTION 5 NORMAL PROCEDURES (CONT)

APPROACH (CONT)

5. Back Course Variable Intercept - Angle greater Than 45°
   a. LOC Course ..... SET FRONT INBOUND COURSE
   b. Heading (HDG) ..... SET TO ESTABLISH DESIRED INTERCEPT ANGLE

NOTE

The number of degrees between the selected COURSE and HDG is the intercept angle. If intercept angle is less than 45°, Back Course Fixed Intercept method is recommended.

   c. HDG and REV Buttons ..... PRESS SIMULTANEOUSLY
   d. Flight Director ..... COMMANDS A TURN TO SELECTED HEADING UNTIL DEVIATION NEEDLE IS APPROXIMATELY ONE DOT FROM FULL DEFLECTION
   e. HDG ON Annunciator ..... EXTINGUISHES. FLIGHT DIRECTOR COMMANDS AUTOMATIC 45° INTERCEPT ANGLE TO REVERSE LOC

6. Back Course - Fixed Intercept
   a. LOC Course ..... SET TO FRONT INBOUND COURSE
   b. REV Button ..... PRESS
   c. Flight Director ..... COMMANDS INTERCEPT CAPTURE OF APPROXIMATELY 45° AND TRACK OUTBOUND ON FRONT COURSE

AFTER SHUTDOWN

1. F/D Switch ..... OFF
2. AUTOPILOT CONT Breaker Switch ..... OFF
3. FLT DIR and Associated Circuit Breakers ..... AS DESIRED

SYSTEM DESCRIPTION

GENERAL

The Collins FDS-112V Flight Director System is an instrument panel mounted unit that displays symbolic, forward looking information derived from the automatic flight (autopilot) system control components. The system combines a flight director and course indicator into one instrument. The indicator displays attitude, heading, radio deviation and steering commands for the pilot and the autopilot system controller.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

FLIGHT DIRECTOR

The flight director indicator (top half) is similar in appearance to the conventional gyro that displays the airplane's attitude. The flight director also incorporates flight control system commands by means of bars and pointers.

The pitch attitude display is straight and completely linear from 0° to 90° up or down. The roll display has an additional bank indicator pointer at the bottom and a full 360° capability with earth and sky indication for any attitude. The glide slope deviation pointer and scale is located in the left side of the indicator.

COURSE INDICATOR

The course indicator replaces the separate OBS and compass indicators with a combined course display.

RADAR ALTIMETER POINTER (OPTIONAL)

The radar altimeter pointer is located to the right of the flight director section. This pointer duplicates the radar altimeter indicator presentation.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

SPERRY GH-14 FLIGHT DIRECTOR SYSTEM

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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the Sperry GH-14 Flight Director System is installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

The use of the Sperry GH-14 Flight Director System is approved for Category I Operation only.

SECTION 3 EMERGENCY PROCEDURES

1. GS Flag Visible ..... GLIDE SLOPE RECEIVER MALFUNCTION OR UNRELIABLE GLIDE SLOPE SIGNAL. VERTICAL COMMANDS IN APPR MODE UNRELIABLE

NOTE

Remaining operational modes will be correct.

SECTION 3 EMERGENCY PROCEDURES (CONT)

2. CMPTR (Computer) Flag Visible ..... INPUT SIGNAL MALFUNCTION. COMMAND INFORMATION UNUSABLE

NOTE

Altitude, heading, radio position, and glide slope information may be correct.

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

PREFLIGHT CHECK

1. Electrical Power ..... OFF (AC and DC)
   - a. Command Bars ..... VISIBLE
   - b. FD Flag ..... VISIBLE
   - c. G (Gyro) Flag ..... VISIBLE
   - d. Radio Altitude Bar ..... VISIBLE
2. Electrical Power ..... ON (AC and DC)
   - a. ATT (Attitude) and Associated Circuit Breakers ..... ENGAGE
   - b. G (Gyro) Flag ..... OUT OF VIEW
   - c. Radio Altitude Rising Runway ... OUT OF VIEW
3. Radio Master Switches ..... ON
   - a. Command Bars ..... OUT OF VIEW
4. AUTOPILOT CONT Breaker Switch ..... ON
   - a. FD Flag ..... OUT OF VIEW
5. F/D Switch ..... ON
   - a. Command Bars ..... OUT OF VIEW

NOTE

DH (Decision Height) annunciator may illuminate.

BEFORE TAKEOFF

1. AUTOPILOT CONT Breaker Switch ..... CHECK ON
2. F/D Switch ..... CHECK ON
3. Course ..... SET AS REQUIRED

SECTION 5 NORMAL PROCEDURES (CONT)

BEFORE TAKEOFF (CONT)

4. Heading ..... AS REQUIRED

NOTE

The flight director presents normal attitude and horizontal situation displays with the F/D switch in the OFF position.

CLIMB

NOTE

The flight director commands should be satisfied before engaging the autopilot. Accomplish this by manually flying to align the command bars with the fixed reference.

1. F/D Switch ..... CHECK ON
2. PITCH SYNC Button ..... PRESS AND HOLD TO SYNCHRONIZE FLIGHT ATTITUDE; THEN RELEASE

NOTE

Pressing PITCH SYNC button cancels glide slope, altitude hold, and go around modes.

3. Heading (HDG) Button ..... PRESS. FLIGHT DIRECTOR COMMANDS A FLY TO THE PRESET HEADING. BANK ANGLE IS LIMITED TO APPROXIMATELY 22°
4. At Cruise Altitude ..... PRESS AUTOPILOT ALT BUTTON. ADJUST ENGINE POWER AS REQUIRED TO MAINTAIN DESIRED AIRSPEED

NOTE

The ALT button may be pressed at any time.

CRUISE

1. Heading Change (If Required) ..... CHANGE HDG SELECTOR AS REQUIRED. FLIGHT DIRECTOR COMMANDS A FLY TO THE NEW HEADING. BANK ANGLE IS LIMITED TO APPROXIMATELY 22°
2. NAV VOR Variable Intercept and Track - Angle Greater Than 45°
   a. VOR Course ..... SET AS REQUIRED
   b. HDG and NAV Buttons ..... PRESS SIMULTANEOUSLY. FLIGHT DIRECTOR COMMANDS A TURN TO THE SELECTED HEADING FOR INTERCEPT

SECTION 5 NORMAL PROCEDURES (CONT)

CRUISE (CONT)

c. Deviation Needle Decreases One Dot From Full Deflection ..... HEADING **ON** ANNUNCIATOR EXTINGUISHES. FLIGHT DIRECTOR COMMANDS A 45° INTERCEPT ANGLE AND TRACK

3. NAV VOR Fixed Intercept and Track
   a. VOR Course ..... SET AS REQUIRED
   b. NAV Button ..... PRESS. FLIGHT DIRECTOR ASSUMES INTERCEPT ANGLE OF APPROXIMATELY 45°

NOTE

Crosswind correction is automatic after course capture.

APPROACH

1. Variable Intercept - Angle Greater Than 45°
   a. LOC Course ..... SET INBOUND
   b. Heading (HDG) ..... SET TO ESTABLISH DESIRED INTERCEPT ANGLE

NOTE

The number of degrees between the selected COURSE and HDG is the intercept angle. If intercept angle is less than 45°, Fixed Intercept Approach method is recommended.

   c. HDG and APPR Buttons ..... PRESS SIMULTANEOUSLY
   d. Flight Director ..... COMMANDS A FLY TO THE SELECTED HEADING UNTIL DEVIATION NEEDLE IS ONE DOT FROM FULL DEFLECTION
   e. HDG **ON** Annunciator ..... EXTINGUISHES. FLIGHT DIRECTOR COMMANDS LOC CRS INTERCEPT ANGLE OF APPROXIMATELY 45°

2. Fixed Intercept
   a. LOC Course ..... SET INBOUND
   b. APPR Button ..... PRESS. FLIGHT DIRECTOR COMMANDS LOC COURSE INTERCEPT ANGLE OF APPROXIMATELY 45°

3. Back Course Variable Intercept - Angle Greater Than 45°
   a. LOC Course ..... SET FRONT INBOUND
   b. Heading ..... SET TO ESTABLISH DESIRED INTERCEPT ANGLE

NOTE

The number of degrees between the selected COURSE and HDG is the intercept angle. If intercept angle is less than 45°, Back Course Fixed Intercept method is recommended.

SECTION 5 NORMAL PROCEDURES (CONT)

APPROACH (CONT)

c. HDG and REV Buttons ..... PRESS SIMULTANEOUSLY
d. Flight Director ..... COMMANDS A TURN TO THE SELECTED HEADING UNTIL DEVIATION NEEDLE IS APPROXIMATELY ONE DOT FROM FULL DEFLECTION
e. HDG **ON** Annunciator ..... EXTINGUISHES. FLIGHT DIRECTOR COMMANDS AN AUTOMATIC 45° INTERCEPT ANGLE TO REVERSE LOC

4. Back Course - Fixed Intercept
   a. LOC Course ..... SET TO FRONT INBOUND
   b. REV Button ..... PRESS. REV **ON** AND **APPR** ANNUNCIATORS ILLUMINATE
   c. Flight Director ..... COMMANDS AN INTERCEPT CAPTURE OF APPROXIMATELY 45° AND TRACK OUTBOUND ON THE FRONT COURSE.

5. Glide Slope Automatic Mode
   The glide slope is automatically armed when the following conditions are satisfied:
   a. NAV Receiver ..... TUNED TO LOCALIZER FREQUENCY AND TRACKING
   b. Glide Slope Beam ..... BELOW BEAM 20 SECONDS (MINIMUM) BEFORE INTERCEPTION
   c. Area Navigation ..... OFF
   d. APPR Mode Button ..... ENGAGE
   e. Glide Slope Pointer Centers .... GS **ARM** ANNUNCIATOR EXTINGUISHES. FLIGHT DIRECTOR COMMANDS THE RATE OF DESCENT

NOTE

Glide slope may be disengaged by 1) pressing the ALT hold button, 2) adjusting the pitch command, 3) pressing the go around (GA) switch or, 4) pressing the PITCH SYNC button.

6. Glide Slope Manual Mode
   a. When GS Pointer Centers ..... PRESS GS BUTTON

NOTE

Manual glide slope may be activiated during any mode except go around.

7. Radio Altimeter Rising Runway ..... BECOMES VISIBLE AT 200 FEET ABOVE GROUND LEVEL. CONTINUES TO INDICATE ALTITUDE ABOVE RUNWAY UNTIL TOUCHDOWN

SECTION 5 NORMAL PROCEDURES (CONT)

APPROACH (CONT)

8. DH (Decision Height) Annunciator .... ILLUMINATES IN CONJUNCTION WITH RADIO ALTIMETER DH ANNUNCIATOR

NOTE

The DH annunciator is connected to the radio altimeter and operates separately from the flight director.

9. GA (Go Around) Annunciator ..... ILLUMINATES WHEN GA SWITCH IS DEPRESSED

NOTE

The GA annunciator is connected to the autopilot go around mode and operates separately from the flight director.

AFTER SHUTDOWN

1. F/D Switch ..... OFF
2. AUTOPILOT CONT Breaker Switch ..... OFF
3. ATT (Attitude) and Circuit Breakers ..... AS DESIRED

SYSTEM DESCRIPTION

GENERAL

The Sperry GH-14 Flight Director System is an instrument panel mounted unit that displays symbolic, forward looking information derived from the automatic flight (autopilot) system control components. The indicator displays roll and pitch attitude and provides steering commands for the pilot and the autopilot system controller.

FLIGHT DIRECTOR

The flight director indicator is similar in appearance to the conventional gyro that displays the airplane's attitude. The flight director also incorporates flight control system commands by means of vertical and horizontal command bars.

The pitch attitude display is straight and completely linear up or down. The roll display has an additional bank indicator at the top and a 180° capability with earth and sky indication at any attitude.

RADAR ALTIMETER RISING RUNWAY (OPTIONAL)

The radar altimeter rising runway is located in the center of the flight director. The rising runway duplicates the radar altimeter indicator presentation.

The rising runway comes into view as the airplane descends to approximately 200 feet above ground level and continues to move up toward the airplane reference.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

DH (DECISION HEIGHT) ANNUNCIATOR (IF INSTALLED)

The **DH** annunciator is connected to the encoding altimeter and illuminates when the airplane's height above ground level is that which is set on the encoding altimeter.

GA (GO AROUND) ANNUNCIATOR (IF INSTALLED)

The **GA** annunciator is connected to the autopilot go around (GA) mode. When the GA switch is pressed, the **GA** annunciator illuminates.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

SPERRY HZ-454 OR HZ-444 ATTITUDE DIRECTOR INDICATOR
WITH
ZC-200 COMPUTER/CONTROLLER

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 12-13-78 REVISED 06-19-80

REISSUED DATE: 9-24-85

Don P. Watson

Don P. Watson, Manager
Aircraft Certification Division
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Southwest Region,
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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the Sperry HZ-454 or HZ-444 Attitude Director Indicator with ZC-200 Computer/Controller is installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

The use of the Sperry HZ-454 or HZ-444 Attitude Director Indicator and HSI with the ZC-200 Computer/Controller is approved for Category I Operation only.

SECTION 3 EMERGENCY PROCEDURES

1. ATT (Attitude) Flag Visible ..... ATTITUDE REFERENCE SYSTEM FAILURE. ATTITUDE AND COMMAND INFORMATION UNUSABLE
2. FD (Flight Director) Flag Visible ... ABSENCE OF POWER OR COMPUTER/CONTROLLER INOPERATIVE. COMMAND CUE PRESENTATION UNRELIABLE

NOTE

Radio and heading information remains reliable.

3. COMP (Computer) Flag Visible ..... INPUT SIGNAL MALFUNCTION. HEADING INFORMATION UNUSABLE

SECTION 3 EMERGENCY PROCEDURES (CONT)

4. NAV (Navigation) Flag Visible ..... ABSENCE OF POWER, NAV RECEIVER MALFUNCTION OR UNRELIABLE NAV SIGNAL. VOR OR LOC DEVIATION INFORMATION UNUSABLE
5. GS (Glide Slope) Flag Visible ..... GLIDE SLOPE RECEIVER MALFUNCTION OR UNRELIABLE GS SIGNAL. VERTICAL COMMANDS IN APPR MODE UNRELIABLE

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

PREFLIGHT CHECK

1. Electrical Power ..... ON (AC AND DC)
2. Radio Master Switches ..... ON
3. Flight Director and Associated Circuit Breakers ..... ENGAGED

NOTE

The autopilot circuit breaker must be engaged for the remote (control wheel) PITCH SYNC switch to operate.

4. Flight Director Computer/Controller . SBY ANNUNCIATOR ILLUMINATES
5. Flight Director Indicator (ADI)
   a. Attitude Presentation ..... CHECK ATT FLAG OUT OF VIEW WITH PRESENT ROLL AND PITCH ATTITUDE DISPLAYED
   b. ATT TEST Switch ..... PRESS AND HOLD
   c. Attitude Display
      (1) Roll ..... 20° RIGHT
      (2) Pitch ..... 10° UP
      (3) ATT Flag ..... VISIBLE
   d. Remaining Warning Flags ..... OUT OF VIEW
   e. ATT TEST Switch ..... RELEASE

CAUTION

DO NOT USE FLIGHT DIRECTOR IF TEST IS UNSATISFACTORY.

6. Flight Director Computer/Controller
   a. SBY (Standby) Mode Switch ..... PRESS. ALL MODE SELECT SWITCH/ANNUNCIATORS ILLUMINATE, F/D COMMAND CUE IS OUT OF VIEW, AND FD FLAG IS VISIBLE

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

b. HSI Heading Reference Indicator ..... CENTER ON LUBBER LINE

c. HDG (Heading) and ALT (Altitude) Mode Switches ..... PRESS. COMMAND CUE VISIBLE WITH WINGS LEVEL AND LEVEL PITCH ATTITUDE

d. HSI Heading Reference Indicator ..... SELECT NEW HEADING. COMMAND CUE ROLLS TO RESPOND TO NEW HEADING

e. GO AROUND Mode Switch ..... PRESS. GA ANNUNCIATOR ILLUMINATES. COMMAND CUE INDICATES A WING LEVEL FLY UP; ALL OTHER COMMANDS ARE CANCELLED

f. SBY (Standby) Mode Switch ..... PRESS. ALL ANNUNCIATORS ILLUMINATE, ALL COMMANDS CANCELLED. SBY REMAINS ILLUMINATED WHEN RELEASED

CAUTION

DO NOT USE FLIGHT DIRECTOR IF TEST IS UNSATISFACTORY.

BEFORE TAKEOFF

NOTE

Do not taxi if the ATT flag is visible.

1. Course ..... SET AS REQUIRED
2. Heading ..... SET AS REQUIRED

NOTE

The ADI and HSI present normal attitude and horizontal situation displays when no modes are selected.

CLIMB

1. Pitch Attitude Trim
   a. PAT (Pitch Attitude Trim) Mode Switch ..... PRESS. PAT ANNUNCIATOR ILLUMINATES

NOTE

Any previous vertical mode selected will be cancelled. No other vertical mode can be used in conjunction with the PAT mode selected.

SECTION 5 NORMAL PROCEDURES (CONT)

CLIMB (CONT)

b. HZ-454 ADI or Control Wheel PITCH SYNC Button ..... MOMENTARILY PRESS TO SYNCHRONIZE FLIGHT DIRECTOR ATTITUDE

c. HZ-444 ADI Pitch Attitude Trim Control ..... ADJUST TO DESIRED PITCH ANGLE

2. Heading Change ..... ADJUST REFERENCE INDICATOR AS REQUIRED

3. At Cruise Altitude ..... PRESS ALT MODE SWITCH. ADJUST ENGINE POWER AS REQUIRED TO MAINTAIN DESIRED AIRSPEED

NOTE

The ALT mode switch may be pressed at any time.

CRUISE

1. Heading Change (If Required) ..... CHANGE HEADING SELECTOR INDICATOR AS REQUIRED

2. NAV VOR/LOC Variable Intercept and Track

a. NAV Receiver ..... TUNE DESIRED VOR STATION

b. VOR Course ..... SELECT COURSE AS REQUIRED

c. Heading Selector Indicator ..... SET DESIRED INTERCEPT ANGLE

d. HDG Mode Switch ..... PRESS. CUE COMMANDS A TURN TO SELECTED HEADING FOR TRACKING

e. Deviation Needle Decreases to One Dot (5°) Deflection ..... PRESS V/L (VOR/LOC) MODE SWITCH

NOTE

Maintain command cue centered for VOR tracking. Monitor VOR deviation information from HSI. Maintain track with the HDG (heading) select mode. There is no crosswind washout in the V/L mode during VOR navigation.

APPROACH AND GLIDE SLOPE

FRONT COURSE

1. NAV Receiver ..... TUNE DESIRED LOCALIZER FREQUENCY

NOTE

LOC frequency may be selected prior to final vector while in the V/L mode.

2. HSI Course ..... SET REFERENCE INDICATOR TO INBOUND COURSE

SECTION 5 NORMAL PROCEDURES (CONT)

APPROACH AND GLIDE SLOPE (CONT)

FRONT COURSE (CONT)

3.	GS (Glide Slope) Mode Select	PRESS. **GS ARM** AND **V/L** ANNUNCIATORS ILLUMINATE; **HDG** ANNUNCIATOR EXTINGUISHES
4.	HSI Heading Selector Indicator	SET TO MISSED APPROACH HEADING
5.	Glide Slope Captured	**GS ARM** ANNUNCIATOR EXTINGUISHES; **GS** ANNUNCIATOR ILLUMINATES

NOTE

Any previous vertical mode selected will automatically be cancelled when the glide slope is captured.

6.	Command Cue	MANEUVER TO SATISFY COMMANDS
7.	**GS EXT** Annunciator	ILLUMINATES AT 250 FEET RADIO ALTITUDE OR MIDDLE MARKER

BACK COURSE

1.	NAV Receiver	TUNE DESIRED LOCALIZER FREQUENCY
2.	HSI Course	SET REFERENCE INDICATOR TO INBOUND COURSE
3.	HSI Heading	SET REFERENCE INDICATOR TO DESIRED INTERCEPT HEADING
4.	Course Deviation Bar Moves Inside Second Dot	PRESS REV MODE SWITCH AND MANEUVER TO SATISFY ROLL COMMANDS
5.	PAT (Pitch Attitude Trim) Mode Switch	PRESS. **PAT** ANNUNCIATOR ILLUMINATES; MANEUVER TO SATISFY STEERING COMMANDS

NOTE

The PAT mode assists the pilot in maintaining a selected vertical flight path.

GO AROUND

Should a GO AROUND be required due to missed approach or other reasons, proceed as follows:

1.	GO AROUND Mode Switch	PRESS. **GA** ANNUNCIATOR ILLUMINATES
2.	Command Cue	COMMANDS A WINGS LEVEL PITCH UP ATTITUDE
3.	HDG and PAT Mode Switches	PRESS SIMULTANEOUSLY TO FOLLOW STEERING COMMANDS FOR CAPTURE OF PRESELECTED MISSED APPROACH HEADING AND CLIMB ATTITUDE

SECTION 5 NORMAL PROCEDURES (CONT)

APPROACH AND GLIDE SLOPE (CONT)

AFTER SHUTDOWN

1. Flight Director and Associated
   Circuit Breakers ..... AS REQUIRED

SYSTEM DESCRIPTION

GENERAL

The Sperry HZ-454 or HZ-444 Attitude Director Indicator with ZC-200 Computer/Controller is an instrument panel mounted unit that displays symbolic, forward looking information. The system is comprised of three units: Attitude Director Indicator (ADI), Horizontal Situation Indicator (HSI), and a flight director computer/controller. The ADI displays roll and pitch steering commands while the HSI displays heading and radio deviation for the pilot's use.

ATTITUDE DIRECTOR INDICATOR

The attitude director indicator is similar in appearance to the conventional gyro that displays the airplane's attitude. The ADI also incorporates flight control system commands by means of a single cue inverted V bar (HZ-454) or cross pointers (HZ-444).

The pitch attitude display is straight and completely linear from 0° to 80° up or down. The roll display has a full 360° capability with earth and sky indication for any attitude. Pitch presentation is controlled by a PITCH SYNC switch (HZ-454) or pitch attitude trim potentiometer (HZ-444) when the PAT mode has been selected on the ZC-200 Computer/Controller.

The glide slope deviation pointer and scale is located in the right side of the indicator and presents glide slope deviation only when tuned to an ILS frequency and a valid glide slope signal is present.

The radio altitude bar presents height above ground level below 200 feet and moves toward the symbolic airplane during descent toward the runway, contacting the bottom of the symbolic airplane at touchdown.

The expanded localizer display presents an amplified localizer signal for use during a final ILS approach.

HORIZONTAL SITUATION INDICATOR

The HSI replaces the separate OBS and compass indicator with a combined course and heading display.

FLIGHT DIRECTOR COMPUTER/CONTROLLER

The computer portion of the flight director computer/controller receives compass heading, attitude, and navigation receiver data and then converts the data into pitch and roll command signals which are sent to the ADI.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

FLIGHT DIRECTOR COMPUTER/CONTROLLER (CONT)

The controller portion of the flight director computer/controller allows the pilot to select a desired mode of operation by pressing any of the nine mode select switches located on its front panel.

NOTE

Except for the GO AROUND mode, no commands are available unless a horizontal mode and a vertical mode have been selected. The GO AROUND mode commands a pitch up/wings level attitude.

The nine mode select switches and the GS EXT annunciator provide the following features when illuminated:

SBY (Standby) Mode Switch

The SBY mode switch has a dual function. It places the system in a standby (ready) attitude and also functions as an annunciator lamp test when pressed.

GO AROUND Mode Switch

The GO AROUND mode switch cancels all other operation modes when pressed. It also provides a pitch up attitude of approximately 8.5° and a wings level attitude through the command cue.

HDG (Heading) Mode Switch

The HDG mode switch provides for interception of a desired flight heading. The HSI reference indicator may be selected to the desired heading (preferably not over 170° from the airplane heading).

ALT (Altitude Hold) Mode Switch

The ALT mode switch provides for accurately maintaining a desired altitude. Adjustment of power setting may be required to maintain a safe airspeed.

PAT (Pitch Attitude Trim) Mode Switch/Annunciator

The PAT mode switch allows the pilot to select and fly a desired pitch attitude. The desired pitch angle is selected by adjusting the pitch attitude trim knob on the face of the attitude director indicator.

V/L (VOR/Localizer) Mode Switch

The V/L mode switch provides for a fixed angle capture of a selected VOR or LOC. There is no crosswind wash-out in VOR operation. Track must be maintained with HDG. During LOC operation, crosswind wash-out is provided.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

FLIGHT DIRECTOR COMPUTER/CONTROLLER (CONT)

GS ARM (Glide Slope Arm) Mode Switch

The GS ARM mode switch arms the vertical beam sensor for automatic glide slope beam capture when the airplane approaches the beam center from below. If the airplane is above the beam, the **GS ARM** annunciator will extinguish and the computer immediately engages the manual GS mode (**GS** annunciator illuminates).

GS (GLide Slope) Mode Switch

The GS mode switch provides for manual glide slope engagement. When pressed, the pilot may manually capture the glide slope from above or below the beam.

GS EXT (Glide Slope Extension) Annunciator

The **GS EXT** annunciator, when illuminated, provides automatic computer gain adjustment to compensate for the narrowing of the glide slope beam when the airplane is 250 feet above ground level (signal from the radio altimeter) or the middle marker is sensed.

REV (Reverse Course) Mode Switch

The REV mode switch provides for LOC back course inbound or front course outbound tracking.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

SPERRY HZ-454 OR HZ-444 ATTITUDE DIRECTOR INDICATOR
WITH
BENDIX M4D COMPUTER/CONTROLLER

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 03-08-79

REISSUED DATE: 9-24-85

Don P. Watson

Don P. Watson, Manager
Aircraft Certification Division
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Southwest Region,
Ft. Worth, Texas 76101

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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the Sperry HZ-454 or HZ-444 Attitude Director Indicator with Bendix M4D Computer/Controller is installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

The use of the Sperry HZ-454 or HZ-444 Attitude Director Indicator and HSI with the Bendix M4D Computer/Controller is approved for Category I Operation only.

SECTION 3 EMERGENCY PROCEDURES

1. FD Flag Visible ..... ABSENCE OF POWER OR COMPUTER/CONTROLLER INOPERATIVE. COMMAND PRESENTATION UNRELIABLE
2. ATT Flag Visible ..... ATTITUDE REFERENCE SYSTEM FAILURE. ATTITUDE AND COMMAND INFORMATION UNUSABLE

NOTE

Radio and heading information remains reliable.

3. NAV Flag Visible ..... LATERAL DEVIATION BAR INFORMATION SOURCE MALFUNCTION. ROLL STEERING UNRELIABLE

SECTION 3 EMERGENCY PROCEDURES (CONT)

4. GS Flag Visible ..... GLIDE SLOPE RECEIVER MALFUNCTION OR UNRELIABLE GLIDE SLOPE SIGNAL. VERTICAL COMMANDS IN APPR MODE UNRELIABLE

NOTE

Remaining operational modes will be correct.

5. COMP Flag Visible ..... INPUT SIGNAL MALFUNCTION. COMMAND INFORMATION UNUSABLE

NOTE

Attitude, heading, radio position, and glide slope information may be correct.

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

PREFLIGHT CHECK

1. Electrical Power ..... ON (AC AND DC)
   - a. Radio Master Switches ..... ON
   - b. AUTO PILOT CONT Breaker Switch . ON
   - c. F/D Switch ..... ON
2. Flight Director Indicator (ADI)
   - a. Attitude Presentation ..... CHECK. ATT AND FD FLAGS OUT OF VIEW. ADI SHOULD REFLECT PRESENT ROLL AND PITCH ATTITUDE
   - b. ATT TEST Switch ..... PRESS AND HOLD
   - c. Attitude Display
     - (1) Roll ..... 20° RIGHT
     - (2) Pitch ..... 10° UP
     - (3) ATT Flag ..... VISIBLE
   - d. Remaining Warning Flags ..... OUT OF VIEW
   - e. ATT TEST Switch ..... RELEASE

CAUTION

DO NOT USE FLIGHT DIRECTOR IF TEST IS UNSATISFACTORY.

SECTION 5 NORMAL PROCEDURES (CONT)

BEFORE TAKEOFF

NOTE

Do not taxi with the ATT flag in view.

1. AUTO PILOT CONT Breaker Switch ..... ON
2. F/D Switch ..... AS DESIRED
3. Course ..... AS REQUIRED
4. Heading ..... AS REQUIRED

NOTE

The flight director presents normal attitude and horizontal situation displays with the F/D switch in the OFF position.

CLIMB

NOTE

The flight director commands should be satisfied before engaging the autopilot. Accomplish this by manually flying to align the command cue with the fixed reference.

1. F/D Switch ..... CHECK. ON IF DESIRED
2. PITCH SYNC Button ..... MOMENTARILY PUSH TO SYNCHRONIZE FLIGHT DIRECTOR ATTITUDE

NOTE

Pressing the PITCH SYNC button cancels the glide slope, altitude hold, and go around modes.

3. Autopilot Heading (HDG) Button ..... PRESS. FLIGHT DIRECTOR COMMANDS A FLY TO THE PRESET HEADING. BANK ANGLE IS LIMITED TO APPROXIMATELY 22°
4. At Cruise Altitude ..... PRESS A/P ALT BUTTON; ADJUST ENGINE POWER AS REQUIRED TO MAINTAIN DESIRED AIRSPEED

NOTE

The ALT button may be pressed at any time.

SECTION 5 NORMAL PROCEDURES (CONT)

CRUISE

1. Heading Change (If Required) ..... SET HDG SELECTOR AS REQUIRED. FLIGHT DIRECTOR COMMANDS A FLY TO THE NEW HDG. BANK ANGLE IS LIMITED TO APPROXIMATELY 22°
2. NAV VOR Variable Intercept and Track - Angle Greater Than 45°
   a. VOR Course ..... SELECT COURSE AS REQUIRED
   b. HDG and NAV Buttons ..... PRESS SIMULTANEOUSLY. FLIGHT DIRECTOR COMMANDS A TURN TO THE SELECTED HDG FOR TRACKING
   c. Deviation Needle Decreases One Dot From Full Deflection ..... HDG **ON** LIGHT EXTINGUISHES. FLIGHT DIRECTOR COMMANDS A 45° INTERCEPT ANGLE AND TRACK
3. NAV VOR Fixed Intercept and Track
   a. VOR Course ..... SELECT COURSE AS REQUIRED
   b. NAV Button ..... PRESS. FLIGHT DIRECTOR ASSUMES AN INTERCEPT ANGLE OF APPROXIMATELY 45°

NOTE

Crosswind correction is automatic after course capture.

APPROACH

1. Variable Intercept - Angle Greater Than 45°
   a. LOC Course ..... SET INBOUND
   b. Heading ..... SET TO ESTABLISH DESIRED INTERCEPT ANGLE

NOTE

The number of degrees between the selected course and HDG is the intercept angle. If intercept angle is less than 45°, the Fixed Intercept Approach method is recommended.

   c. HDG and APPR Buttons ..... PRESS SIMULTANEOUSLY
   d. Flight Director ..... COMMANDS A FLY TO THE SELECTED HDG UNTIL THE DEVIATION NEEDLE IS ONE DOT FROM FULL DEFLECTION
   e. HDG **ON** Annunciator ..... EXTINGUISHES. FLIGHT DIRECTOR COMMAND CUE COMMANDS A LOC COURSE INTERCEPT ANGLE OF APPROXIMATELY 45°
2. Fixed Intercept
   a. LOC Course ..... SET INBOUND
   b. APPR Button ..... PRESS. FLIGHT DIRECTOR COMMANDS A LOC COURSE INTERCEPT ANGLE OF APPROXIMATELY 45°

SECTION 5 NORMAL PROCEDURES (CONT)

APPROACH (CONT)

3. Glide Slope Automatic Mode
The glide slope is automatically armed when the following conditions are satisfied:

a.	NAV Receiver	TUNED TO LOC FREQUENCY AND TRACKING
b.	Glide Slope Beam	BELOW BEAM 20 SECONDS (MINIMUM) BEFORE INTERCEPTION
c.	Area Navigation	OFF
d.	APPR Mode Button	ENGAGE
e.	Glide Slope Pointer Centers	GS **ARM** ANNUNCIATOR EXTINGUISHES. FLIGHT DIRECTOR COMMANDS RATE OF DESCENT

NOTE

Glide slope may be disengaged by pressing the ALT hold button, adjusting pitch command, pressing the go around (GA) switch or pressing the PITCH SYNC button.

4. Glide Slope - Manual Mode
a. When GS Pointer Centers ..... PRESS GS BUTTON

NOTE

Manual glide slope may be activated during any mode except go around.

5. Radio Altimeter Rising Runway ..... BECOMES VISIBLE APPROXIMATELY 200 FEET ABOVE GROUND LEVEL AND CONTINUES TO INDICATE AIRPLANE ALTITUDE ABOVE RUNWAY UNTIL TOUCHDOWN

NOTE

The radio altitude rising runway bar is connected to the radio altimeter and operates separately from the flight director system.

6. Back Course Variable Intercept - Angle Greater Than 45°
a. LOC Course ..... SET FRONT INBOUND COURSE
b. Heading ..... SET TO DESIRED INTERCEPT ANGLE

NOTE

The number of degrees between the selected course and HDG is the intercept angle. If intercept angle is less than 45°, the Back Course Fixed Intercept method is recommended.

SECTION 5 NORMAL PROCEDURES (CONT)

APPROACH (CONT)

c.	HDG and REV Buttons	PRESS SIMULTANEOUSLY
d.	Flight Director	COMMANDS TURN TO THE SELECTED HDG UNTIL DEVIATION NEEDLE IS APPROXIMATELY ONE DOT FROM FULL DEFLECTION
e.	HDG ON Annunciator	EXTINGUISHED. FLIGHT DIRECTOR COMMANDS AN AUTOMATIC 45° INTERCEPT ANGLE TO THE REVERSE LOC

7. Back Course - Fixed Intercept

a.	LOC Course	SET FRONT INBOUND COURSE
b.	REV Button	PRESS
c.	Flight Director	COMMANDS AN INTERCEPT CAPTURE OF APPROXIMATELY 45° AND TRACK OUTBOUND ON THE FRONT COURSE

AFTER SHUTDOWN

1.	F/D Switch	OFF
2.	AUTO PILOT CONT Circuit Breaker Switch	OFF

SYSTEM DESCRIPTION

GENERAL

The Sperry HZ-454 or HZ-444 Attitude Director Indicator with Bendix M4D Computer/Controller is an instrument panel mounted system that displays symbolic, forward looking information. The system is comprised of two units: Attitude director indicator (ADI) and horizontal situation indicator (HSI). The ADI displays roll and pitch steering commands while the HSI displays heading and radio deviation.

ATTITUDE DIRECTOR INDICATOR (ADI)

The attitude director indicator is similar in appearance to the conventional gyro that displays the airplane's attitude. The ADI also incorporates flight control system commands by means of a single cue inverted Vbar (HZ-454) or cross pointers (HZ-444).

The pitch attitude displayed is straight and completely linear from 0° to 80° up or down. The roll display has a full 360° capability with earth and sky presentations for any attitude.

The glide slope deviation pointer and scale is located in the right side of the indicator and presents glide slope deviation only when tuned to an ILS frequency and a valid glide slope signal is present.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

ATTITUDE DIRECTOR INDICATOR (ADI) (CONT)

The radio altitude bar presents height above ground level below approximately 200 feet and moves toward the symbolic airplane during descent toward the runway, contacting the bottom of the symbolic airplane at touchdown.

The expanded localizer display presents an amplified localizer signal for use during a final ILS approach.

HORIZONTAL SITUATION INDICATOR (HSI)

The HSI replaces the separate OBS and compass indicator with a combined course and heading display.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

COLLINS 329B-7R-2 FLIGHT DIRECTOR INDICATOR
AND 331A-6R COURSE INDICATOR
WITH
BENDIX M4D COMPUTER/CONTROLLER

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 03-30-79

REISSUED DATE: 9-24-85

Don P. Watson

Don P. Watson, Manager
Aircraft Certification Division
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Southwest Region,
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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the Collins 329B-7R-2 Flight Director Indicator and 331A-6R Course Indicator with Bendix M4D Computer/Controller are installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

The use of the Collins 329B-7R-2 Flight Director Indicator and 331A-6R Course Indicator with Bendix M4D Computer/Controller is approved for Category I Operation only.

SECTION 3 EMERGENCY PROCEDURES

ATTITUDE DIRECTOR INDICATOR WARNING FLAGS

1. RAD ALT (Radio Altimeter) Flag
   Visible ..... RADIO ALTIMETER MALFUNCTION

NOTE

Remaining information correct.

SECTION 3 EMERGENCY PROCEDURES (CONT)

ATTITUDE DIRECTOR INDICATOR WARNING FLAGS (CONT)

2. COMPUTER Flag Visible ..... INPUT SIGNAL MALFUNCTION. COMMAND INFORMATION UNUSABLE

NOTE

Altitude, heading, radio position, and glide slope information may be correct.

3. GYRO COMPUTER Flag Visible ..... GYRO INPUT SIGNAL MALFUNCTION. ATTITUDE AND BANK INDICATIONS UNRELIABLE
4. GS (Glide Slope) Flag Visible ..... GLIDE SLOPE RECEIVER MALFUNCTION OR UNRELIABLE GS SIGNAL. VERTICAL COMMANDS IN APPR MODE UNRELIABLE

NOTE

Remaining operational modes correct.

HORIZONTAL SITUATION INDICATOR WARNING FLAGS

1. COMPASS Flag Visible ..... HEADING, POWER OR COMPASS MONITOR MALFUNCTION. HEADING DISPLAY AND COMMAND INFORMATION UNUSABLE
2. VOR LOC Flag Visible ..... VOR OR LOC SIGNAL WEAK, LOST OR POWER MALFUNCTION. LATERAL DEVIATION AND ROLL COMMANDS UNRELIABLE
3. GS (Glide Slope) Flag Visible ..... GLIDE SLOPE RECEIVER MALFUNCTION OR UNRELIABLE GS SIGNAL. VERTICAL COMMANDS IN APPR MODE UNRELIABLE

NOTE

Remaining operational modes correct.

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

PREFLIGHT CHECK

1. Electrical Power ..... ON (AC and DC)
2. Radio Master Switches ..... ON
3. Autopilot Control Breaker Switch .... ON, COMPUTER FLAG OUT OF VIEW

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

4. F/D (Flight Director) Switch ..... ON. COMMAND V BAR VISIBLE

NOTE

There should be NO warning flags visible.

5. HDG Selector ..... SET TO CORRESPOND WITH LUBBER LINE; ADI V BAR CENTER (LEVEL)
6. HDG Selector ..... ADJUST 10° LEFT AND RIGHT OF LUBBER LINE; ADI V BAR BANKS TOWARD NEW HEADING ACCORDINGLY

BEFORE TAKEOFF

1. Autopilot Control Breaker Switch .... ON
2. F/D Switch ..... ON (IF REQUIRED)
3. Course ..... SET AS REQUIRED
4. Heading (HDG) ..... SET AS REQUIRED

NOTE

The flight director presents normal attitude and horizontal situation displays with the F/D switch in the OFF position.

CLIMB

NOTE

The flight director commands should be satisfied before engaging the autopilot. Accomplish this by manually flying to align the command V bar with the fixed reference.

1. F/D Switch ..... ON. (IF DESIRED)
2. PITCH SYNC Button ..... MOMENTARILY PUSH TO SYNCHRONIZE FLIGHT DIRECTOR ATTITUDE

NOTE

Pressing PITCH SYNC button cancels glide slope, altitude hold, and go around modes.

3. Autopilot Heading (HDG) Button ..... PRESS. FLIGHT DIRECTOR COMMANDS A FLY TO THE PRESET HEADING. BANK ANGLE IS LIMITED TO APPROXIMATELY 22°

SECTION 5 NORMAL PROCEDURES (CONT)

CLIMB (CONT)

4. At Cruise Altitude ..... PRESS AUTOPILOT ALT BUTTON. FLIGHT DIRECTOR COMMANDS A FLY TO THE ATTITUDE FOR MAINTAINING DESIRED ALTITUDE. ADJUST ENGINE POWER AS REQUIRED TO MAINTAIN DESIRED AIRSPEED

NOTE

The ALT button may be pressed at any time.

CRUISE

1. Heading Change (If Required) ..... CHANGE HDG SELECTOR AS REQUIRED; FLIGHT DIRECTOR COMMANDS A FLY TO THE NEW HEADING. BANK ANGLE IS LIMITED TO APPROXIMATELY 22°

2. NAV VOR Variable Intercept and Track - Angle Greater Than 45°

NOTE

The number of degrees between the selected course and HDG is the intercept angle. If intercept angle desired is 45°, use Fixed Intercept Approach method.

a. VOR Course ..... SELECT AS REQUIRED
b. Heading (HDG) ..... SET TO ESTABLISH DESIRED INTERCEPT ANGLE
c. HDG and NAV Buttons ..... PRESS SIMULTANEOUSLY
d. Flight Director ..... COMMANDS A TURN TO SELECTED HEADING UNTIL DEVIATION NEEDLE IS APPROXIMATELY ONE DOT FROM FULL DEFLECTION
e. HDG ON Annunciator ..... EXTINGUISHES. FLIGHT DIRECTOR COMMANDS NAV TRACK HEADING

3. NAV VOR Fixed Intercept and Track
a. VOR Course ..... SELECT AS REQUIRED
b. NAV Button ..... PRESS. FLIGHT DIRECTOR COMMANDS AN INTERCEPT ANGLE OF APPROXIMATELY 45°

NOTE

Crosswind correction is automatic after course capture.

SECTION 5 NORMAL PROCEDURES (CONT)

APPROACH

1. Variable Intercept - Angle Greater Than 45°

NOTE

The number of degrees between the selected course and HDG is the intercept angle. If intercept angle is less than 45°, use Fixed Intercept Approach method.

a.	LOC Course	SET INBOUND
b.	Heading (HDG)	SET TO ESTABLISH DESIRED INTERCEPT ANGLE
c.	HDG and APPR Buttons	PRESS SIMULTANEOUSLY
d.	FLT DIR	COMMANDS A FLY TO THE SELECTED HEADING UNTIL DEVIATION NEEDLE IS ONE DOT FROM FULL DEFLECTION
e.	HDG ON Annunciator	EXTINGUISHES FLIGHT DIRECTOR COMMANDS LOCALIZER TRACK HEADING

2. Fixed Intercept

a.	LOC Course	SET INBOUND
b.	APPR Button	PRESS. FLIGHT DIRECTOR COMMANDS LOCALIZER INTERCEPT ANGLE OF APPROXIMATELY 45°

3. Glide Slope - Automatic Mode

The glide slope is automatically armed when the following conditions are satisfied:

a.	NAV Receiver	TUNED TO LOCALIZER FREQUENCY AND TRACKING
b.	Glide Slope Beam	BELOW BEAM 20 SECONDS (MINIMUM) BEFORE INTERCEPTION
c.	Area Navigation	OFF
d.	APPR (Approach) Mode Button	ENGAGE
e.	Glide Slope Pointer Centers	GS ARM ANNUNCIATOR EXTINGUISHES. FLIGHT DIRECTOR COMMANDS RATE OF DESCENT

NOTE

Glide slope may be disengaged by 1) pressing ALT hold button, 2) adjusting pitch command, 3) pressing go around (GA) switch or, 4) pressing the PITCH SYNC button.

4. Glide Slope Manual Mode

a.	When GS Pointer centers	PRESS GS BUTTON

NOTE

Manual glide slope may be activated during any mode except go around.

SECTION 5 NORMAL PROCEDURES (CONT)

APPROACH (CONT)

5. Back Course Variable Intercept Angles Greater Than 45°

NOTE

The number of degrees between the selected course and heading is the intercept angle. If intercept angle is less than 45°, use Back Course Fixed Intercept method.

a.	LOC Course	SET INBOUND
b.	Heading (HDG)	SET TO ESTABLISH DESIRED INTERCEPT ANGLE
c.	HDG and REV Buttons	PRESS SIMULTANEOUSLY
d.	Flight Director	COMMANDS TURN TO SELECTED HEADING UNTIL DEVIATION NEEDLE IS APPROXIMATELY ONE DOT FROM FULL DEFLECTION
e.	HDG ON Annunciator	EXTINGUISHES. FLIGHT DIRECTOR COMMANDS LOCALIZER TRACK

6. Back Course Fixed Intercept

a.	LOC Course	SET INBOUND
b.	REV Button	PRESS
c.	FLT DIR	COMMANDS INTERCEPT CAPTURE OF APPROXIMATELY 45° AND TRACK OUTBOUND ON FRONT COURSE

7. GA (Go Around) ..... PRESS GA SWITCH ON LH POWER LEVER

a.	GA Annunciator	ILLUMINATES
b.	Flight Director	COMMANDS A WING LEVEL PITCH CHANGE OF APPROXIMATELY 8° NOSE UP

NOTE

Must be in APPR mode for GA operations. The GA annunciator is connected to the autopilot go around mode and operates separately from the flight director.

AFTER SHUTDOWN

1. F/D Switch ..... OFF
2. Autopilot Control Breaker Switch .... OFF

SYSTEM DESCRIPTION

GENERAL

The Collins 329B-7R-2 Flight Director Indicator and 331A-6R Course Indicator with Bendix M4D Computer/Controller are panel mounted units that display symbolic, forward looking information derived from the automatic flight (autopilot) system control components. The indicator displays attitude, heading, radio deviation, and steering commands to the pilot.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

GENERAL (CONT)

Illumination is internal and intensity is controlled by the PILOT FLT INST lights rheostat on the overhead switch panel. The digital DME readouts are dimmed with the ANN NORM/DIM switch on the upper left side of the pilot's instrument panel.

FLIGHT DIRECTOR

The flight director indicator is similar in appearance to the conventional gyro that displays the airplane's attitude. The FDI also incorporates flight control commands by means of a single cue inverted V bar.

The pitch attitude display is straight and completely linear from 0° to 90° up or down. The roll display has an additional bank indicator at the bottom and a full 360° capability with earth and sky indication for any attitude. The glide slope deviation pointer and scale are located in the left side of the indicator. Expanded localizer information is available in the LOC APP mode.

COURSE INDICATOR

The course indicator replaces the conventional OBS and compass indicators with a combined course display. The course setting incorporates a digital display in the upper right corner in conjunction with the azimuth card setting. A digital three digit distance display is located in the upper left corner which works in conjunction with the DME. Distances up to 100 nautical miles are displayed with a decimal digit. Above 100 nautical miles, the decimal is dropped.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

SPERRY HZ-454 OR HZ-444 ATTITUDE DIRECTOR INDICATOR
AND RD-500 HORIZONTAL SITUATION INDICATOR
WITH
BENDIX M4D COMPUTER/CONTROLLER & RNS-3500 RNAV

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 01-02-80

REISSUED DATE: 9-24-85

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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the Sperry HZ-454 or HZ-444 Attitude Director Indicator and RD-500 Horizontal Situation Indicator with Bendix M4D Computer/Controller and RNS-3500 RNAV are installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

1. The use of the Sperry HZ-454 or HZ-444 Attitude Director Indicator and RD-500 HSI with Bendix M4D Computer/Controller is approved for Category I Operation only.
2. The Mode selector of the RNS-3500 Area Navigation System (if installed) should be in the VOR/DME position during ILS approaches.

SECTION 3 EMERGENCY PROCEDURES

IN-FLIGHT OPERATION

1.	FD (Flight Director) Flag Visible ...	ABSENCE OF POWER OR COMPUTER/CONTROLLER INOPERATIVE. COMMAND PRESENTATION UNRELIABLE
2.	ATT (Attitude) Flag Visible	ATTITUDE REFERENCE SYSTEM FAILURE. ATTITUDE AND COMMAND INFORMATION UNUSABLE. RADIO AND HEADING INFORMATION REMAINS RELIABLE.
3.	NAV (Navigation) Flag Visible	LATERAL DEVIATION INFORMATION SOURCE MALFUNCTION. ROLL STEERING UNRELIABLE

SECTION 3 EMERGENCY PROCEDURES

IN-FLIGHT OPERATION (CONT)

4.	VERT (Vertical) Deviation Flag Visible	LOSS OF VERTICAL DEVIATION SIGNAL. GLIDE SLOPE PRESENTATION UNRELIABLE. REMAINING OPERATIONAL MODES CORRECT
5.	HDG (Heading) Flag Visible	ABSENCE OF POWER, INVALID GYRO SIGNAL OR ERROR BETWEEN DISPLAYED HEADING AND RECEIVED SIGNAL. DIRECTIONAL INFORMATION PRESENTATION UNRELIABLE

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

PREFLIGHT CHECK

1.	Electrical Power	ON (AC AND DC)
	a. Radio Master Switches	ON
	b. Autopilot Control Breaker Switch	ON
	c. F/D Switch	ON
2.	Flight Director Indicator (ADI)	
	a. Attitude Presentation	CHECK. ATT and FD FLAGS OUT OF VIEW. ADI SHOULD REFLECT PRESENT ROLL AND PITCH ATTITUDE
	b. ATT TEST Switch	PRESS AND HOLD
	c. Attitude Display	
	(1) Roll	20° RIGHT
	(2) Pitch	10° UP
	(3) ATT Flag	VISIBLE
	d. Remaining Warning Flags	OUT OF VIEW
	e. ATT TEST Switch	RELEASE

CAUTION

DO NOT USE FLIGHT DIRECTOR IF TEST IS UNSATISFACTORY.

3.	HSI Warning Flags	OUT OF VIEW

BEFORE TAKEOFF

1.	Course	AS REQUIRED

SECTION 5 NORMAL PROCEDURES (CONT)

BEFORE TAKEOFF (CONT)

2. Heading ..... AS REQUIRED

NOTE

The flight director presents normal attitude and horizontal situation displays with the F/D switch in the OFF position.

FLIGHTS USING RNS-3500 AREA NAVIGATION SYSTEM (IF INSTALLED)

1. NAV Receiver ..... TUNED TO RNAV WAYPOINT FREQUENCY
2. RNAV Mode Selector ..... RNAV POSITION
3. **RNAV** and **ENRT** Annunciators ..... ILLUMINATE

NOTE

APPR annunciator will illuminate in lieu of **ENRT** when the approach mode is selected on the RNAV mode controller.

4. HSI Distance Display ..... DISPLAYS DISTANCE TO THE RNAV WAYPOINT

NOTE

When VOR/LOC is selected on the RNAV control/indicator, the distance displayed is the distance to the VOR/LOC station as measured by the DME.

The DME selector must be in the NAV 1 position and receiving a valid signal for a display of distance in the HSI distance display. All other DME selector positions will cause a blanking of the HSI distance display.

CLIMB

NOTE

The flight director commands should be satisfied before engaging the autopilot. Accomplish this by manually flying to align the command cue with the fixed reference.

1. F/D Switch ..... CHECK ON (IF DESIRED)
2. PITCH SYNC Button ..... MOMENTARILY PUSH TO SYNCHRONIZE FLIGHT DIRECTOR ATTITUDE

NOTE

Pressing the PITCH SYNC button cancels glide slope, altitude hold, and go around modes.

SECTION 5 NORMAL PROCEDURES (CONT)

CLIMB (CONT)

3.	Autopilot Heading (HDG) Button	PRESS. FLIGHT DIRECTOR COMMANDS A FLY TO THE PRESET HEADING. BANK ANGLE IS LIMITED TO APPROXIMATELY 22°
4.	At Cruise Altitude	PRESS AUTOPILOT ALT BUTTON. ADJUST ENGINE POWER AS REQUIRED TO MAINTAIN DESIRED AIRSPEED

NOTE

The ALT button may be pressed at any time.

CRUISE

1.	Heading Change (If Required)	CHANGE HDG SELECTOR AS REQUIRED. FLIGHT DIRECTOR COMMANDS A FLY TO THE NEW HEADING. BANK ANGLE IS LIMITED TO APPROXIMATELY 22°
2.	NAV VOR Variable Intercept and Track - Angle Greater Than 45°	
	a. VOR Course	SELECT AS REQUIRED
	b. HDG and NAV Buttons	PRESS SIMULTANEOUSLY. FLIGHT DIRECTOR COMMANDS TURN TO SELECTED HDG FOR TRACKING
	c. Deviation Needle Decreases One Dot From Full Deflection	HDG ON ANNUNCIATOR EXTINGUISHES. FLIGHT DIRECTOR COMMANDS FOR A 45° INTERCEPT ANGLE AND TRACK
3.	NAV VOR Fixed Intercept and Track	
	a. VOR Course	SELECT AS REQUIRED
	b. NAV Button	PRESS. FLIGHT DIRECTOR ASSUMES INTERCEPT ANGLE OF APPROXIMATELY 45°

NOTE

Crosswind correction is automatic after course capture.

APPROACH

NOTE

The Mode Selector of the RNS-3500 RNAV (if installed) should be in the VOR/DME position during ILS approaches.

1.	Variable Intercept - Angle Greater Than 45°	
	a. LOC Course	SET INBOUND

SECTION 5 NORMAL PROCEDURES (CONT)

APPROACH (CONT)

b. Heading ..... SET TO ESTABLISH DESIRED INTERCEPT ANGLE

NOTE

The number of degrees between the selected course and HDG is the intercept angle. If intercept angle is less than 45°, use Fixed Intercept Approach method.

c. HDG and APPR Buttons ..... PRESS SIMULTANEOUSLY
d. Flight Director ..... COMMANDS A FLY TO THE SELECTED HDG UNTIL DEVIATION NEEDLE IS ONE DOT FROM FULL DEFECTION
e. HDG ON Annunciator ..... EXTINGUISHES. FLIGHT DIRECTOR CUE COMMANDS LOC COURSE INTERCEPT ANGLE OF APPROXIMATELY 45°

2. Fixed Intercept
   a. LOC Course ..... SET INBOUND
   b. APPR Button ..... PRESS. FLIGHT DIRECTOR COMMANDS LOC COURSE INTERCEPT ANGLE OF APPROXIMATELY 45°

3. Glide Slope Automatic Mode
The glide slope is automatically armed when the following conditions are satisfied:

   a. NAV Receiver ..... TUNED TO LOC FREQUENCY AND TRACKING
   b. Glide Slope Beam ..... BELOW BEAM 20 SECONDS (MINIMUM) BEFORE INTERCEPTION
   c. Area Navigation ..... OFF
   d. APPR Mode Button ..... ENGAGE
   e. Glide Slope Pointer Centers .... GS ARM ANNUNCIATOR EXTINGUISHES. FLIGHT DIRECTOR COMMANDS RATE OF DESCENT

NOTE

Glide slope may be disengaged by 1) pressing the ALT hold button, 2) adjusting pitch command, 3) pressing the go around (GA) switch, or 4) pressing the PITCH SYNC button.

4. Glide Slope Manual Mode
   a. When GS Pointer Centers ..... PRESS GS BUTTON

NOTE

Manual glide slope may be activated during any mode except go around.

SECTION 5 NORMAL PROCEDURES (CONT)

APPROACH (CONT)

5. Radio Altimeter Rising Runway ..... BECOMES VISIBLE APPROXIMATELY 200 FEET ABOVE GROUND LEVEL AND CONTINUES TO INDICATE AIRPLANE ALTITUDE ABOVE RUNWAY UNTIL TOUCHDOWN

NOTE

The radio altitude rising runway bar is connected to the radio altimeter and operates separately from the flight director system.

6. Back Course Variable Intercept - Angle Greater Than 45°
   a. LOC Course ..... SET FRONT INBOUND COURSE
   b. Heading ..... SET TO DESIRED INTERCEPT ANGLE

NOTE

The number of degrees between the selected course and HDG is the intercept angle. If intercept angle is less than 45°, use the Back Course - Fixed Intercept method.

   c. HDG and REV Buttons ..... PRESS SIMULTANEOUSLY
   d. Flight Director ..... COMMANDS TURN TO SELECTED HDG UNTIL DEVIATION NEEDLE IS APPROXIMATELY ONE DOT FROM FULL DEFLECTION
   e. **HDG ON** Annunciator ..... EXTINGUISHED. FLIGHT DIRECTOR COMMANDS AN AUTOMATIC 45° INTERCEPT ANGLE TO REVERSE LOC

7. Back Course - FIxed Intercept
   a. LOC Course ..... SET FRONT INBOUND COURSE
   b. REV Button ..... PRESS
   c. Flight Director ..... COMMANDS INTERCEPT CAPTURE OF APPROXIMATELY 45° AND TRACK OUTBOUND ON THE FRONT COURSE

APPROACH - RNAV (USING RNS-3500 AREA NAVIGATION SYSTEM, IF INSTALLED)

1. Approach Data W/P Number ..... SELECT IN SBY DISPLAY
2. MODE Control ..... SELECT APR POSITION
3. W/P Transfer Button ..... PRESS. APPROACH DATA WILL BECOME ACTIVE AND BE DISPLAYED

AFTER SHUTDOWN

1. F/D Switch ..... OFF
2. Radio Master Switches ..... OFF

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION

GENERAL

The Sperry HZ-454/444 Attitude Director Indicator and RD-500 Horizontal Situation Indicator with Bendix M4D Computer/Controller are instrument panel mounted units that display symbolic, forward looking information. The system is comprised of two units: attitude director indicator (ADI) and horizontal situation indicator (HSI). The ADI displays roll and pitch steering commands and the HSI displays heading and radio deviation to the pilot.

ATTITUDE DIRECTOR INDICATOR (ADI)

The attitude director indicator is similar in appearance to the conventional gyro that displays the airplane's attitude. The ADI also incorporates flight control system commands by means of a single cue inverted Vbar (HZ-454) or cross pointers (HZ-444).

The pitch attitude displayed is linear from 0° to 80° up or down. The roll display has a full 360° capability with earth and sky attitude indication.

The glide slope deviation pointer and scale is located in the side of the indicator and presents glide slope deviation only when tuned to an ILS frequency and a valid glide slope signal is present.

The radio altitude bar presents height above ground level below approximately 200 feet and moves toward the symbolic airplane during descent toward the runway, contacting the bottom of the symbolic airplane at touchdown.

The expanded localizer display presents an amplified localizer signal for use during the final portion of an ILS approach.

HORIZONTAL SITUATION INDICATOR (HSI)

The HSI replaces the separate OBS and compass indicators with a combined course and heading display. The course setting incorporates a digital course display in the upper left corner in conjunction with the azimuth card setting. A digital four digit distance (DIST) display is located in the upper right corner of the indicator. The DIST display operates in conjunction with the DME. The range being displayed is the distance to the VOR station or the RNAV waypoint (with the RNS-3500 RNAV installed and engaged). The distance displayed is that displayed by the DME or the RNS-3500 RNAV system (if installed and engaged). The DME selector must be in the NAV 1 position and a valid signal present for a distance

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

HORIZONTAL SITUATION INDICATOR (HSI) (CONT)

display. Any other mode (HOLD or NAV 2) selected will cause the blanking of the HSI distance display.

NOTE

If the RNS-3500 RNAV is not installed, the RNAV annunciator will not illuminate and only the ENRT (Enroute) or APPR annunciators will illuminate.

The HSI has three warning flags which come into view should a malfunction occur. The HDG (Heading) warning flag indicates the absence or loss of power, an invalid gyro signal or an error between the displayed heading and signal being received. The VERT (Vertical) warning flag indicates the loss of a valid vertical deviation signal for both the altitude select and the glide slope. The NAV (Navigation) warning flag indicates the absence or loss of power to the NAV receiver, NAV receiver malfunction or unreliable signal being received.

LIGHTING

The ADI and HSI are internally illuminated. Intensity is controlled by the PILOT FLT INST rheostat located in the overhead console.

Illumination of HSI DME distance display is controlled by the HSI DIM rheostat located in the pilot instrument panel to the right of the control column.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

BENDIX M-4D AUTO FLIGHT (AUTOPILOT) SYSTEM
WITH BENDIX PITCH TRIM AND AUTOMATIC RUDDER TRIM

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

THIS REISSUED EDITION IS APPLICABLE TO
AIRPLANES WHICH INCORPORATE MITSUBISHI
SERVICE BULLETIN NO.066/22-006

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 09-05-78

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for _____
Manager-Wichita Aircraft Certification Office
Federal Aviation Administration
Central Region
Wichita, Kansas

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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the Bendix M-4D Auto Flight (Autopilot) System with Bendix Pitch Trim and Automatic Rudder Trim are installed in accordance with MITSUBISHI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

1. Maximum Operating Limit ..... 250 KCAS (Vmo)
2. Maximum Operating Mach Number ..... 0.57 MACH (Mmo)
3. Takeoff and Landing ..... DO NOT OPERATE AUTOPILOT AND YAW DAMPER (DISENGAGE)
4. ILS Approach ..... FLAPS 20°
5. Coupled Approach, Minimum Operating Limit ..... 125 KCAS AND 300 FEET AGL

SECTION 2 OPERATING LIMITATIONS (CONT)

WARNING

DO NOT MANUALLY OVERRIDE THE AUTOPILOT AND YAW DAMPER SYSTEM DURING FLIGHT. THE AUTOPILOT WILL TRIM THE AIRPLANE TO OPPOSE THE PILOT'S ACTIONS. THIS COULD RESULT IN A SEVERELY OUT OF TRIM CONDITION.

DO NOT ENGAGE THE AUTOPILOT IF THE AIRPLANE IS OUT OF TRIM.

DURING AUTOPILOT OPERATION, THE PILOT MUST BE SEATED AT THE CONTROLS WITH THE SEAT BELT FASTENED.

IF ONE ENGINE BECOMES INOPERATIVE, ADJUST THE ROLL TRIM TO COMPENSATE FOR THE ASYMMETRIC POWER.

IN CASE OF EMERGENCY, THE AUTOPILOT MAY BE OVERPOWERED MANUALLY TO CORRECT THE ATTITUDE, BUT THE AUTOPILOT MUST IMMEDIATELY BE DISENGAGED. IF THE AUTOPILOT REMAINS ENGAGED, THE AUTOPILOT WILL TRIM THE AIRPLANE TO OPPOSE THE PILOT'S ACTIONS. THIS COULD RESULT IN A SEVERELY OUT OF TRIM CONDITION.

SECTION 3 EMERGENCY PROCEDURES

AUTOPILOT/TRIM MALFUNCTION

NOTE

In an emergency condition the pilot may not be able to distinguish between an autopilot or trim malfunction.

WARNING

IN CASE OF EMERGENCY, THE AUTOPILOT CAN BE OVERPOWERED MANUALLY TO CORRECT THE ATTITUDE, BUT THE AUTOPILOT MUST IMMEDIATELY BE DISENGAGED. IF THE AUTOPILOT REMAINS ENGAGED, THE AUTOPILOT WILL TRIM THE AIRPLANE TO OPPOSE THE PILOT'S ACTIONS. THIS COULD RESULT IN A SEVERELY OUT OF TRIM CONDITION.

SECTION 3 EMERGENCY PROCEDURES (CONT)

AUTOPILOT/TRIM MALFUNCTION (CONT)

CAUTION

AUTOPILOT CANNOT BE DISENGAGED BY PRESSING THE AP BUTTON ON THE AUTOPILOT CONTROLLER.

If for any reason the sonalert sounds, the trim and/or autopilot does not function properly, or trim runaway occurs, then:

1. AP DISC/TRIM INTR Switch ..... PRESS TO SECOND DETENT AND HOLD (ALL THE WAY IN)

NOTE

The autopilot is disengaged and the electric pitch trim system operation is interrupted while pressing AP DISC/TRIM INTER switch to second detent.

2. Left Radio Master Switch ..... OFF

CAUTION

SOME RADIOS INCLUDING VHF COMM ARE ALSO DISCONNECTED WHEN RADIO MASTER SWITCH IS OFF.

NOTE

The Left Radio Master Switch is located in outboard row on the circuit breaker panel.

3. AP DISC/TRIM INTR Switch ..... RELEASE
4. Manual Trim Wheel ..... ADJUST TRIM MANUALLY
5. Autopilot Circuit Breaker Switch .... OFF (AUTOPILOT/CONT)
6. Associated Circuit Breakers ..... DISENGAGE (AUTOPILOT/DC and AC)

NOTE

After turning off autopilot circuit breaker switch, the electric pitch trim also becomes inactive.

SECTION 3 EMERGENCY PROCEDURES (CONT)

AUTOPILOT/TRIM MALFUNCTION (CONT)

7. Left Radio Master Switch ..... ON

CAUTION

PILOT SHOULD ASSURE THAT THE AUTOPILOT AND/OR TRIM DOES NOT CONTINUE TO OPERATE.

CAUTION

THE AUTOPILOT IS DISENGAGED AND BOTH AUTOPILOT AND ELECTRIC PITCH TRIM OPERATIONS SHOULD NOT BE UTILIZED FOR THE REMAINDER OF THE FLIGHT AND SHOULD NOT BE USED UNTIL THE NECESSARY MAINTENANCE TO CORRECT THE DEFICIENCY HAS BEEN PERFORMED.

CAUTION

DURING AN ILS APPROACH, MAXIMUM ALTITUDE LOSS OF AS MUCH AS 240 FEET, ASSUMING A ONE SECOND PILOT DELAY, MAY BE EXPERIENCED.

NOTE

PITCH MALFUNCTION	MAXIMUM ALTITUDE LOSS
1. Climb, Cruise, Descent	250 feet (3 SEC DELAY)
2. Two Engine ILS Approach	240 feet (1 SEC DELAY)
3. One Engine ILS Approach	240 feet (1 SEC DELAY)

SECTION 3 EMERGENCY PROCEDURES (CONT)

AUTOPILOT/TRIM MALFUNCTION (CONT)

NOTE

The autopilot can also be disengaged by any of the following methods:

1. Operate trim switch UP or DN

NOTE

The roll and pitch axes of the autopilot is disengaged, leaving the yaw damper engaged.

2. Position inverter switch to OFF momentarily and then return to original position.

CAUTION

WHILE THE SWITCH IS PLACED OFF, THE AC POWER WILL ALSO BE REMOVED FROM AC DRIVEN EQUIPMENT.

3. Turn off the ELECTRIC MASTER SWITCH.
(This will also disengage the electric pitch trim)

WARNING

CABIN WILL DEPRESSURIZE. MOST ELECTRICALLY POWERED SYSTEMS WILL BE INOPERATIVE. CONSULT THE BASIC AFM FOR FURTHER INFORMATION.

CAUTION

AFTER THE AUTOPILOT IS POSITIVELY DISENGAGED, IT MAY BE NECESSARY TO RESTORE OTHER ELECTRICAL FUNCTIONS. BE SURE WHEN THE MASTER SWITCH IS TURNED ON THAT THE AUTOPILOT DOES NOT RE-ENGAGE.

SECTION 3 EMERGENCY PROCEDURES (CONT)

ENGINE FAILURE

1. In Flight or Approach ..... ADJUST ROLL TRIM TO COMPENSATE FOR ASYMMETRIC POWER

NOTE

The automatic yaw trim will compensate for asymmetric power when the autopilot is engaged.

2. During Go Around
   a. Autopilot ..... DISENGAGE
   b. Airplane Trim ..... ADJUST TO COMPENSATE FOR ASYMMETRIC POWER
   c. Autopilot ..... AS DESIRED

WARNING

AUTOPILOT AND YAW DAMPER SHOULD BE OFF DURING TAKEOFF AND LANDING.

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

PREFLIGHT CHECK

1. Radio Master Switches ..... ON
2. Autopilot Circuit Breaker Switch .... ON (AUTOPILOT/CONT)
3. Associated Circuit Breakers ..... ENGAGE (AUTOPILOT/DC and AC)
4. Attitude and Directional Gyro ..... WARNING FLAGS NOT VISIBLE
5. TURN Control ..... CENTER DETENT POSITION
6. TEST Button ..... PRESS. ANNUNCIATORS ILLUMINATE

NOTE

The TEST button checks annunciators and has no effect on the autopilot control functions.

7. Autopilot Engage Switch ..... PRESS AP BUTTON. **AP ON** AND **YAW ON** ANNUNCIATORS ILLUMINATE

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

NOTE

The yaw trim may run depending on the lateral inclination of the airplane.

8.	Flight Controls	APPLY FORCE TO EACH AXIS TO CONFIRM AUTOPILOT MAY BE OVERPOWERED
9.	AP DISC/TRIM INTR Switch	PRESS TO FIRST DETENT. AUTOPILOT DISENGAGES. VERIFY BY FREE MOVEMENT OF CONTROL SURFACES
10.	Autopilot Engage Switch	PRESS AP BUTTON AGAIN
11.	Trim Switches	
	a. A/P Switch (left half)	UP AND DOWN. AUTOPILOT DISENGAGES AND WARNING TONE AUDIBLE BOTH POSITIONS
	b. TRIM Switch (right half)	UP AND DOWN. WARNING TONE AUDIBLE BOTH POSITIONS
	c. A/P and TRIM Switches	SIMULTANEOUSLY UP AND DOWN. NO AUDIBLE WARNING TONE HEARD; TRIM WHEEL MOVES IN PROPER DIRECTION. GRASP TRIM WHEEL AND STOP ITS MOVEMENT TO CONFIRM ELECTRIC PITCH TRIM MAY BE OVERPOWERED
	d. AP DISC/TRIM INTR Switch	PRESS TO SECOND DETENT (ALL THE WAY IN) WHILE OPERATING ELECTRIC PITCH TRIM. TRIM WHEEL STOPS RUNNING WHILE PRESSING

NOTE

AP DISC/TRIM INTR switch has two detent levels. The first level detent disengages the autopilot/yaw damper. And when depressed and held to second level detent, the electric pitch trim system operation will be interrupted.

NOTE

When copilot is part of the crew, repeat above steps 7 and 9 through 11 with copilot's switches.

12.	Manual Trim Wheel	CHECK FREE MOVEMENT

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

CAUTION

CHECK AND MANUALLY RE-TRIM IN ALL AXIS AFTER PREFLIGHT CHECK PRIOR TO TAKEOFF. THE YAW TRIM MAY RUN DEPENDING ON THE LATERAL INCLINATION OF THE AIRPLANE.

IN-FLIGHT OPERATION

WARNING

DO NOT MANUALLY OVERRIDE THE AUTOPILOT AND YAW DAMPER SYSTEMS DURING FLIGHT. THE AUTOPILOT WILL TRIM THE AIRPLANE TO OPPOSE THE PILOT'S ACTIONS. THIS COULD RESULT IN A SEVERELY OUT OF TRIM CONDITION.

R OPERATION OF THE AUTOPILOT IN ICING CONDITIONS

NOTE

Conditions exist for icing when the outside air temperature (OAT) on the ground is +10°C or below or the indicated OAT (RAT) in flight is +10°C or below and visible moisture in any form is present.

WARNING

DUE TO DISTORTION OF AIRFOILS, STALLING SPEEDS SHOULD BE EXPECTED TO INCREASE AS ICE ACCUMULATES ON THE AIRPLANE. STALL WARNING DEVICES MAY NOT BE ACCURATE AND SHOULD NOT BE RELIED UPON. PILOTS SHOULD BE AWARE THAT OPERATION OF THE AUTOPILOT'S VERTICAL MODES MAY RESULT IN AN UNSAFE AIRSPEED IF ICE ACCUMULATES ON THE AIRPLANE.

IN ORDER TO MINIMIZE ICE ACCUMULATIONS ON UNPROTECTED LOWER SURFACES, MAINTAIN A MINIMUM SPEED OR 180 KIAS DURING OPERATIONS IN SUSTAINED CRUISE IN ICING CONDITIONS. THIS WILL PROVIDE AN ANGLE OF ATTACK THAT REDUCES EXPOSURE (FRONTAL AREA) OF THE LOWER SURFACES TO ICE ACCUMULATION. IF UNABLE TO MAINTAIN 180 KIAS AT MAXIMUM CONTINUOUS POWER, A CHANGE OF ALTITUDE AND/OR COURSE MAY BE NECESSARY TO MAINTAIN MINIMUM AIRSPEED AND/OR EXIT THE ICING CONDITIONS.

FOR OPERATION IN ICING CONDITIONS IN OTHER THAN SUSTAINED CRUISE, INCREASE NORMAL SPEEDS BY AT LEAST 10% WITHIN OPERATIONAL AIRCRAFT LIMITS.

SECTION 5 NORMAL PROCEDURES (CONT)

IN-FLIGHT OPERATION

R **DURING LANDING, DO NOT SELECT 40° FLAPS WHEN OPERATING IN**
R **ICING CONDITIONS. THE FAA HAS DETERMINED THAT ICE**
R **ACCUMULATIONS ON THE TAIL PLANE OF MANY AIRCRAFT MAY**
R **RESULT IN A REDUCED DOWN FORCE ON THE HORIZONTAL**
R **STABILIZER WHEN FULL FLAPS ARE USED. THIS REDUCED DOWN**
R **FORCE MAY RESULT IN THE AIRCRAFT PITCHING NOSE DOWN.**

CAUTION

THE AUTOPILOT DOES NOT ADJUST FOR AIRSPEED, BUT DOES CONTROL THE AIRPLANE IN LONGITUDINAL OPERATION (ALTITUDE, GLIDE SLOPE, ATTITUDE HOLD, ETC) BY CHANGING THE PITCH ATTITUDE ONLY. THE PILOT MUST ALWAYS MAINTAIN POWER SETTINGS TO ASSURE A SAFE AIRSPEED.

NOTE

Automatic pitch trim and automatic yaw trim are provided whenever the autopilot is engaged. To manually operate any trim tab, the autopilot must be disengaged.

If the electric pitch trim is used with the autopilot engaged, all autopilot functions except the yaw damper will disengage.

ENGAGEMENT PROCEDURE

WARNING

PILOT SHOULD BE SEATED WITH HIS SEAT BELT ON.

1. Airplane Trim ..... MANUALLY ADJUST
2. TURN Control Switch ..... CENTER DETENT
3. PITCH SYNC Button ..... PUSH. ELEV TRIM INDICATOR CENTERED

NOTE

With pitch trim indicator centered, the autopilot has synchronized to the airplane pitch attitude.

4. ROLL TRIM Knob ..... ADJUST TO WINGS LEVEL INDICATION
5. Rudder Trim ..... MANUALLY CENTER
6. Heading ..... SELECT AS REQUIRED
7. Autopilot Engage Switch ..... PRESS AP BUTTON. **AP ON** AND **YAW ON** ANNUNCIATORS ILLUMINATE

SECTION 5 NORMAL PROCEDURES (CONT)

ENGAGEMENT PROCEDURE (CONT)

NOTE

Pitch sync retains airplane attitude at the time of autopilot engagement.

The yaw damper system may be engaged without engaging the autopilot by pressing the yaw button, however, automatic yaw trim will not be available.

8. ROLL TRIM Knob (on autopilot controller) ..... ADJUST TO WINGS LEVEL ATTITUDE, IF NECESSARY

CAUTION

BE SURE THE AIRCRAFT ROLL AND RUDDER TRIM ARE PROPERLY ADJUSTED BEFORE ADJUSTING ROLL TRIM KNOB ON AUTOPILOT CONTROLLER. THIS SHALL BE MADE WITH THE TURN CONTROL SWITCH IN THE CENTER DETENT POSITION AND ALL LATERAL MODES DISENGAGED.

DISENGAGE PROCEDURE

WARNING

PILOT SHOULD BE SEATED WITH HIS SEAT BELT ON.

1. AP DISC/TRIM INTR Switch ..... PRESS TO FIRST DETENT

NOTE

If the autopilot fails to disconnect, see section 3 of this supplement for additional methods of disengagement.

CAUTION

AUTOPILOT CANNOT BE DISENGAGED BY PRESSING THE AP BUTTON ON THE AUTOPILOT CONTROLLER.

NOTE

Check the aircraft trim and monitor the controls prior to disengagement. The automatic pitch trim should have the aircraft properly trimmed.

SECTION 5 NORMAL PROCEDURES (CONT)

DISENGAGE PROCEDURE (CONT)

Movement of electric pitch trim switch will also disengage the autopilot.

AP DISC/TRIM INTR switch has two detent levels. The first level detent disengages the autopilot and the yaw damper also. And when depressed and held to second level detent, the electric pitch trim system operation will be interrupted.

CLIMB

1. Engage autopilot according to ENGAGE PROCEDURE with climb attitude established.

NOTE

After engaging autopilot during level flight, the climb attitude may also be established by rotating the pitch control knob on the autopilot controller or pulling the control column manually while simultaneously pressing the PITCH SYNC button on the control wheel.

2. HDG (Heading) Button ..... PRESS. **ON** ANNUNCIATOR ILLUMINATES
(or other function as required)

NOTE

Autopilot tracks the selected heading or course from the HSI.

3. At Cruise Altitude/
Altitude Hold ..... PRESS ALT BUTTON. **ON** ANNUNCIATOR ILLUMINATES

NOTE

For smooth altitude capture, it is recommended that the rate of climb be reduced before reaching a desired altitude.

Adjust engine power as required to maintain desired airspeed. The airplane will maintain the pressure altitude established at the time the ALT button is depressed.

CRUISE

1. Heading Change Required ..... CHANGE HSI HEADING AS REQUIRED

SECTION 5 NORMAL PROCEDURES (CONT)

CRUISE (CONT)

NOTE

Airplane will turn to acquire the new heading, less than 180°, at a bank angle of approximately 22°.

Heading may also be changed by the turn knob on the autopilot controller.

2. Variable VOR Intercept and Track
   a. VOR Course ..... SELECT AS REQUIRED
   b. Heading ..... SELECT AS REQUIRED
   c. HDG and NAV Buttons ..... PRESS SIMULTANEOUSLY. **ON** ANNUNCIATORS ILLUMINATE

NOTE

Airplane will turn to and track the selected heading until the deviation needle decreases to one dot from full deflection.

   d. Deviation Needle Decreased One Dot from Full Deflection ..... HDG **ON** LIGHT EXTINGUISHES, NAV **ON** ANNUNCIATOR REMAINS ILLUMINATED. AIRPLANE WILL ROLL OUT AND TRACK VOR COURSE

3. Fixed VOR Intercept and Track
   a. VOR Course ..... SELECT AS REQUIRED
   b. NAV Button ..... PRESS. **ON** ANNUNCIATOR ILLUMINATES

NOTE

If the course needle is full scale, the airplane will assume an intercept angle of approximately 45° to capture and track the selected course.

When making a VOR course capture less than 25 nautical miles from a station, it is recommended that HDG mode only be used to center the course deviation needle of the HSI prior to engaging NAV.

APPROACH

1. Variable Intercept
   a. Approach Heading ..... SET DESIRED INTERCEPT ANGLE
   b. HDG Button ..... PRESS. **ON** ANNUNCIATOR ILLUMINATES
   c. **NAV** Annunciator ..... EXTINGUISHES

SECTION 5 NORMAL PROCEDURES (CONT)

APPROACH (CONT)

d. ALT Button ..... PRESS IF REQUIRED. **ON** ANNUNCIATOR ILLUMINATES FOR ALT HOLD
e. NAV Receiver ..... SELECT LOC FREQUENCY AS REQUIRED
f. LOC Course ..... SET INBOUND
g. Final Intercept Heading ..... PRESS HDG AND APPR SIMULTANEOUSLY. ANNUNCIATORS ILLUMINATE
h. Airplane continues on heading until course needle of HSI is one deviation dot from full deflection.
i. **HDG** Annunciator ..... EXTINGUISHES
j. **APPR** Annunciator ..... REMAINS ILLUMINATED. SYSTEM ASSUMES AUTOMATIC 45° INTERCEPT ANGLE
k. Airplane turns as required to capture localizer.

2. Fixed Intercept
   a. LOC Course ..... SET INBOUND COURSE
   b. APPR Button ..... PRESS. **ON** ANNUNCIATOR ILLUMINATES
   c. Airplane will assume an approximate 45° intercept angle to the localizer.

3. Glide Slope
   a. **GS ARM** ANNUNCIATOR ..... ILLUMINATES APPROXIMATELY 20 SECONDS AFTER AIRPLANE IS ON LOC AND BELOW GS BEAM
   b. Glide Slope Needle on HSI Centers ..... GLIDE SLOPE CAPTURED AUTOMATICALLY
   c. **GS ARM** Annunciator ..... EXTINGUISHES
   d. **GS** Annunciator ..... ILLUMINATES. **APPR ON** ANNUNCIATOR REMAINS ILLUMINATED
   e. **ALT ON** Annunciator ..... EXTINGUISHES. ALTITUDE HOLD DISENGAGES

4. Back Course Localizer Approach (If Desired)
   a. Course Selector ..... SELECT LOC FRONT COURSE INBOUND HEADING
   b. REV Button ..... PRESS. **APPR ON** AND **REV ON** ANNUNCIATORS ILLUMINATE

NOTE

The autopilot will direct the airplane to capture and track outbound on the front course or inbound on the back course at an intercept angle less than 45°.

5. Go Around
   Should a Go Around be required, proceed as follows:
   a. G/A Switch ..... PRESS. **GS ON** ANNUNCIATOR EXTINGUISHES AND **GA** ANNUNCIATOR ILLUMINATES

SECTION 5 NORMAL PROCEDURES (CONT)

APPROACH (CONT)

b. Airplane Attitude ..... CLIMBS AT GO AROUND ANGLE. SYSTEM TRACKS LOC OR RADIAL.

NOTE

Apply engine power. Retract landing gear after desired airspeed is attained.

c. Missed Approach Heading ..... SELECT AS REQUIRED
d. HDG Button ..... PRESS. AIRPLANE MANEUVERS TO AND/OR TRACKS SELECTED HEADING

NOTE

GA mode may be cancelled by movement of PITCH command wheel, pressing PITCH SYNC or ALT buttons.

LANDING

CAUTION

DO NOT USE AUTOPILOT FOR LANDING.

AFTER SHUTDOWN

1. Autopilot Circuit Breaker Switch .... OFF
   (AUTOPILOT/CONT)

2. Associated Circuit Breakers ..... DISENGAGE
   (AUTOPILOT/DC and AC)

SYSTEM DESCRIPTION

GENERAL DESCRIPTION

The Bendix M-4D Auto Flight (Autopilot) System consists of an autopilot and a flight director combined into an integrated system. This solid state system features all angle intercept, smooth station passage, automatic glide slope capture, pitch integration, pitch synchronization, and independent yaw damping.

The complete system consists of 12 components. The pilot's instruments are the push button controller, turn and bank indicator, director horizon, and a horizontal situation indicator (HSI). The computer, vertical gyro, slip skid sensor, and altitude controller are remotely mounted in the fuselage. Four servomechanisms are connected to the airplane's control surface cables to control roll, pitch, yaw and pitch trim.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION

AP BUTTON

When the AP button is pressed, the **AP ON** and **YAW ON** annunciators will illuminate. Power will be applied to all servos and the airplane will be controlled by the autopilot. The airplane will stabilize at the pitch attitude existing at the time of engagement. The turn knob is interlocked to prevent engagement of the autopilot with a turn signal present.

YAW BUTTON

When the YAW button is pressed, the **YAW ON** annunciator will illuminate and only the yaw axis will engage. The roll and pitch servos, if previously engaged, will disengage. The YAW axis incorporates a yaw damper system.

HDG BUTTON

When the HDG button is pressed, the **HDG ON** annunciator will illuminate. This mode commands the airplane to acquire the heading indicated on the HSI. The HDG on the HSI may be employed to initiate a turn to a new heading.

NAV BUTTON

When the NAV button is pressed, the **NAV ON** annunciator will illuminate. The airplane is commanded to intercept and track a preselected VOR radial. The VOR course is selected by rotating the course knob on the HSI.

APPR BUTTON

When the APPR button is pressed, the **APPR ON** annunciator will illuminate and the airplane is commanded to intercept and track the inbound ILS or VOR course. Set the course knob on the HSI to the published inbound course for an ILS or VOR approach. The airplane will assume an intercept angle of approximately 45° to the localizer or VOR course.

NAV BUTTON

The NAV button incorporates an **RNV** annunciator to indicate the area navigation system is in operation. When the **RNV** annunciator is illuminated, the area navigation is in operation and the automatic glide slope function is locked out.

REV BUTTON

When the REV button is pressed, the **REV ON** and **APPR ON** annunciators are illuminated, thus indicating a reverse approach. The localizer front course, inbound course, must be selected with the course knob on the HSI. The intercept angle must be less than 45°.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

GS BUTTON

The GS button contains two annunciators: **GS ARM** and **GS ON.** The **GS ARM** annunciator will illuminate when the following conditions are satisfied: (1) the NAV receiver is tuned to a LOC frequency, (2) the APPR mode is engaged and the airplane is tracking the localizer, (3) the area navigation is not ON, and (4) the airplane has been below the glide slope beam for at least 20 seconds. The **GS ON** annunciator will illuminate when the GS pointer centers. When **GS ON** illuminates, the autopilot has automatically captured the glide slope beam. The GS may be activated manually by pressing the GS button in any mode except Go Around.

ALT BUTTON

When the ALT button is pressed, the **ALT ON** annunciator will illuminate and the altitude hold mode will activate.

TURN CONTROL

The TURN knob is used to turn the airplane during automatic flight. The knob has two positions each side of the center detent and is not self-centering. The first detent turns the airplane at a bank angle of approximately 15°, while the second detent turns the airplane at a bank angle of approximately 30°. When the knob is turned, it disengages the HDG, NAV, APPR, or REV mode of operation. The TURN knob must be in the center detent prior to engaging the AP button.

ROLL TRIM CONTROL

The ROLL TRIM knob allows the pilot to correct for any out of trim condition existing in the roll axis. The adjustment must be made in the basic attitude mode with the TURN knob centered and the HDG/NAV modes disengaged. First, be certain the airplane is manually trimmed in each axis, adjust ROLL TRIM for wings level indication, engage the autopilot and readjust trim as required.

PITCH COMMAND CONTROL

The PITCH command controls the pitch attitude of the airplane during automatic flight. The PITCH control knob is self-centering upon release. The airplane will retain the newly acquired pitch attitude until a new pitch attitude is commanded. The pitch angle is determined by the length of time the knob is held in the command position. The rate of pitch angle change is proportional to the amount of knob rotation. Moving the PITCH control will disengage the GS, ALT, or GA mode of operation.

ELEV TRIM METER

The ELEV trim meter, when centered, indicates to the pilot that the autopilot has synchronized to the airplane pitch attitude. The autopilot pitch synchronization is provided for pitch changes of approximately 20°.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

DIM CONTROL

The DIM control dims all amber annunciators associated with the flight controller during autopilot operation.

TEST BUTTON

When the TEST button is pressed, the annunciators of all modes will illuminate to full brilliance to test the integrity of the lamps. Pressing the TEST button will not affect any mode of autopilot operation.

ELECTRIC PITCH TRIM SWITCHES

The electric pitch trim switches are located on the outboard hand grip of the pilot and co-pilot control wheels. Each switch is a split type switch with a left and right half. This switch aids the pilot in manually trimming the airplane's pitch when the autopilot is not engaged.

Power is supplied to the pitch trim system through the AUTOPILOT CONT (AUTOPILOT CONTROL) circuit breaker. Movement of either half does not cause trim to run but does cause the sonalert to sound. Simultaneous movement of both halves will cause the electric pitch trim to operate. Movement of the left half of either switch will disengage the autopilot.

PITCH SYNC BUTTON

The PITCH SYNC button is located on the outboard hand grip of the pilot control wheel (co-pilot side optional). Pressing and holding the PITCH SYNC button disengages the pitch axis and allows the pilot to manually adjust the aircraft pitch attitude. When released, the pitch axis is re-engaged and the autopilot will maintain the new attitude.

GA BUTTON

The GA (GO AROUND) button is located in the left power lever. This button may be depressed anytime the autopilot is in APPR mode and the pilot decides to discontinue the approach to landing. Pressing the GA button will cause the aircraft to automatically assume a pre-set of approximately 8° nose up. The pilot must adjust power settings to maintain airspeed.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

SPERRY SPZ-500 FLIGHT CONTROL SYSTEM
WITH
AD-500 SERIES ADI AND RD-500/550 SERIES HSI

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

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Central Region
Wichita, Kansas

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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the Sperry SPZ-500 Flight Control System with AD-500 Series ADI and RD-500/550 Series HSI is installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

GENERAL

1. Airspeed
   a. Maximum Operating Limit ..... 250 KCAS/0.57 MACH
2. Autopilot
   a. Operation
      (1) Approved for Category I ILS approaches
      (2) NOT approved for single engine approaches
      (3) NOT approved for use with alternate static source.
      (4) NOT approved for back course approaches if radio altimeter is inoperative or not installed
   b. Takeoff and Landing ..... DO NOT OPERATE (DISENGAGE)

SECTION 2 OPERATING LIMITATIONS (CONT)

GENERAL (CONT)

c. In Flight

(1) Pilot Location ..... SEATED, SEAT BELT AND SHOULDER HARNESS FASTENED

R (2) Approach (Two Engine) ..... FLAPS 20°

CAUTION

AUTOPILOT NOT TO BE USED FOR APPROACH IF AP TRIM TEST UNSATISFACTORY. BOTH AP TRIM ANNUNCIATOR ILLUMINATION AND
R TRIM WHEEL ACTIVITY MUST OCCUR FOR SATISFACTORY AP TRIM TEST.

3. Yaw Damper ..... NOT TO BE USED DURING TAKEOFF AND LANDING

4. Flight Director Operation
   a. Approved for Category I operation only
   b. NOT approved for back course approaches if radio altimeter is inoperative or not installed

5. Prior to Flight
   a. Pilot's Barometric Encoding Altimeter ..... OPERABLE
   b. Copilot's Barometric Altimeter .. REQUIRED AND OPERABLE
   c. Autopilot Controller TEST EACH FLT Switch ..... PRESS AND TEST AUTOPILOT SYSTEM PRIOR TO EACH FLIGHT. DO NOT USE AUTOPILOT SYSTEM IF TEST IS UNSATISFACTORY
   d. AP TRIM TEST Unsatisfactory..... DO NOT USE AUTOPILOT FOR APPROACH

REQUIRED PLACARDS

Near Autopilot Controller

R 1. AUTOPILOT NOT APPROVED FOR SINGLE ENGINE APPROACH
R 2. AUTOPILOT NOT APPROVED FOR USE WITH ALTERNATE STATIC SOURCE
R 3. YAW DAMPER NOT APPROVED FOR TAKE-OFF & LANDING

SECTION 3 EMERGENCY PROCEDURES

1. AP TORQ (Autopilot Torque) Annunciator ..... ILLUMINATES. AUTOPILOT DISENGAGES. AUTOPILOT MAY BE REENGAGED IF LIGHT EXTINGUISHES

R
R
R
R
R
R
R
R
R

WARNING

IN FLIGHT, DO NOT OVERPOWER THE AUTOPILOT IN PITCH OR YAW. THE TRIM WILL OPERATE IN THE DIRECTION OPPOSING THE OVERPOWER FORCE, WHICH WILL RESULT IN LARGE OUT-OF-TRIM FORCES.

2.	Autopilot Malfunction	
	a. Disengage	PRESS TRIM-A/P DISC OR GA SWITCH
	b. Autopilot Circuit Breakers	DISENGAGE
	c. Associated Circuit Breakers	DISENGAGE
3.	Pitch Malfunction - Maximum Altitude Loss	
	a. Cruise	300 FEET
	b. Maneuver	200 FEET
	c. Descent	500 FEET
	d. Two Engine ILS Approach	80 FEET
4.	Electric Pitch Trim Runaway	INDICATED BY CONTINUOUS ILLUMINATION OF TRIM UP OR DN ANNUNCIATOR
	a. TRIM A/P DISC Switch	PRESS
	b. Electric Trim Switch	OPERATE IN OPPOSITE DIRECTION OF RUNAWAY
	c. Manual Trim Wheel	STOP AND HOLD
	d. TRIM ELEV (Elevator) Circuit Breaker	DISENGAGE
5.	Rudder Trim Malfunction	INDICATED BY CONTINUOUS ILLUMINATION OF R TRIM INOP (OR RUDD TRIM) ANNUNCIATOR
	a. TRIM A/P DISC Switch	PRESS
	b. Autopilot Circuit Breaker	DISENGAGE
6.	Engine Failure	
	a. In Flight	DISCONNECT AUTOPILOT AND MANUALLY TRIM TO COMPENSATE FOR ASYMMETRIC POWER. REENGAGE AUTOPILOT AS DESIRED

WARNING

AUTOPILOT NOT APPROVED FOR SINGLE ENGINE APPROACHES.

GENERAL

1.	Red ATT (Attitude) Flag Visible	ATTITUDE REFERENCE SYSTEM FAILURE. ATTITUDE AND COMMAND INFORMATION UNUSABLE

SECTION 3 EMERGENCY PROCEDURES (CONT)

GENERAL (CONT)

2. Red FD (Flight Director) Flag Visible	ABSENCE OF POWER OR COMPUTER/CONTROLLER INOPERATIVE. COMMAND PRESENTATION UNRELIABLE
3. Red HDG (Heading) Flag Visible	ABSENCE OF POWER, INVALID GYRO SIGNAL OR ERROR BETWEEN DISPLAYED HEADING AND RECEIVED SIGNAL. DIRECTIONAL INFORMATION UNRELIABLE
4. Red VERT (Vertical) Deviation Flag Visible	LOSS OF VALID VERTICAL DEVIATION SIGNAL. GLIDE SLOPE PRESENTATION UNRELIABLE
5. Red NAV (Navigation) Flag Visible ...	ABSENCE OF POWER, NAV RECEIVER MALFUNCTION OR UNRELIABLE SIGNAL. VOR OR LOC DEVIATION INFORMATION UNUSABLE
6. Red Attitude Alert Controller OFF Flag Visible	ABSENCE OR LOSS OF POWER TO SYSTEM. ALTITUDE ALERTER OR AIR DATA COMPUTER NOT FUNCTIONING
7. Red Barometric Encoding Altimeter OFF Flag Visible	ABSENCE OR LOSS OF POWER TO SYSTEM. ALTIMETER OR AIR DATA COMPUTER NOT FUNCTIONING

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

OPERATION OF THE AUTOPILOT IN ICING CONDITIONS

NOTE

Conditions exist for icing when the outside air temperature (OAT) on the ground is +10°C or below or the indicated OAT (RAT) in flight is +10°C or below and visible moisture in any form is present.

SECTION 5 NORMAL PROCEDURES (CONT)

GENERAL (CONT)

WARNING

DUE TO DISTORTION OF AIRFOILS, STALLING SPEEDS SHOULD BE EXPECTED TO INCREASE AS ICE ACCUMULATES ON THE AIRPLANE. STALL WARNING DEVICES MAY NOT BE ACCURATE AND SHOULD NOT BE RELIED UPON. PILOTS SHOULD BE AWARE THAT OPERATION OF THE AUTOPILOT'S VERTICAL MODES MAY RESULT IN AN UNSAFE AIRSPEED IF ICE ACCUMULATES ON THE AIRPLANE.

IN ORDER TO MINIMIZE ICE ACCUMULATIONS ON UNPROTECTED LOWER SURFACES, MAINTAIN A MINIMUM SPEED OF 180 KIAS DURING OPERATIONS IN SUSTAINED CRUISE IN ICING CONDITIONS. THIS WILL PROVIDE AN ANGLE OF ATTACK THAT REDUCES EXPOSURE (FRONTAL AREA) OF THE LOWER SURFACES TO ICE ACCUMULATION. IF UNABLE TO MAINTAIN 180 KIAS AT MAXIMUM CONTINUOUS POWER, A CHANGE OF ALTITUDE AND/OR COURSE MAY BE NECESSARY TO MAINTAIN MINIMUM AIRSPEED AND/OR EXIT THE ICING CONDITIONS.

FOR OPERATION IN ICING CONDITIONS IN OTHER THAN SUSTAINED CRUISE, INCREASE NORMAL SPEEDS BY AT LEAST 10% WITHIN OPERATIONAL AIRCRAFT LIMITS.

DURING LANDING, DO NOT SELECT 40° FLAPS WHEN OPERATING IN ICING CONDITIONS. THE FAA HAS DETERMINED THAT ICE ACCUMULATIONS ON THE TAIL PLANE OF MANY AIRCRAFT MAY RESULT IN A REDUCED DOWN FORCE ON THE HORIZONTAL STABILIZER WHEN FULL FLAPS ARE USED. THIS REDUCED DOWN FORCE MAY RESULT IN THE AIRCRAFT PITCHING NOSE DOWN.

PREFLIGHT CHECK

	1.	Airplane Electrical Power	ON (AC and DC)	
	2.	RADIO MASTER Switches	ON	
	3.	Autopilot Circuit Breakers	ENGAGED	
	4.	Associated Circuit Breakers	ENGAGED	
R	5.	ANN TEST Switch	PRESS.	ANNUNCIATORS ILLUMINATE
	6.	Attitude Direction Indicator	CHECK.	WARNING FLAGS NOT VISIBLE
	7.	Horizontal Situation Indicator	CHECK.	WARNING FLAGS NOT VISIBLE
	8.	Barometric Encoding Altimeter	CHECK.	OFF FLAG NOT VISIBLE
	9.	Altitude Alert Controller	CHECK.	OFF FLAG NOT VISIBLE
	10.	Mode Selector	CHECK.	SBY ANNUNCIATOR ILLUMINATED
	11.	Elevator Trim Annunciators	CHECK.	UP OR DN ANNUNCIATORS EXTINGUISHED

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

CAUTION

A STEADY ILLUMINATION OF THE UP OR DN ANNUNCIATOR DENOTES THAT THE AUTOMATIC SYNCHRONIZATION IS NOT FUNCTIONING AND THE AUTOPILOT SHOULD NOT BE ENGAGED.

12. TURN Control ..... CENTER DETENT POSITION
13. Flight Controls ..... MOVE TO APPROXIMATELY MID TRAVEL
14. AP (Autopilot) Engage Switch ..... PRESS. AP ENGAGE AND YD ENGAGE ANNUNCIATORS ILLUMINATE
15. Flight Controls ..... PUSH AND HOLD. TRIM WILL RUN NOSE UP WITHIN 3 TO 5 SECONDS. TRIM UP ANNUNCIATOR ILLUMINATES WHILE TRIM IS RUNNING

R 16. Flight Controls ..... PULL AND HOLD. TRIM WILL RUN NOSE DOWN WITHIN APPROXIMATELY 1 TO 2 SECONDS. TRIM DOWN ANNUNCIATOR ILLUMINATES WITHIN APPROXIMATELY 3 TO 5 SECONDS.

17. TRIM-A/P DISC Switch ..... PRESS. AUTOPILOT DISENGAGES. VERIFY BY FREE MOVEMENT OF CONTROL SURFACES. PITCH TRIM IS INHIBITED WHILE SWITCH IS DEPRESSED. AP OFF ANNUNCIATOR ILLUMINATES AND WARNING HORN IS MOMENTARILY AUDIBLE
18. AP Engage Switch ..... PRESS. AP ENGAGE AND YD ENGAGE ANNUNCIATORS ILLUMINATE
19. Autoplilot Controller TEST Switch ... PRESS. AUTOPILOT AND YAW DAMPER DISENGAGE. ENGAGE ANNUNCIATORS EXTINGUISH. AP OFF ANNUNCIATOR ILLUMINATES AND AP TORQ ANNUNCIATOR REMAINS ILLUMINATED WHILE THE TEST SWITCH IS PRESSED.

CAUTION

IF THE AUTOPILOT DOES NOT DISENGAGE OR THE AP TORQ ANNUNCIATOR DOES NOT ILLUMINATE WHEN THE TEST SWITCH IS PRESSED, THE AUTOPILOT TORQUE MONITORS ARE NOT FUNCTIONING PROPERLY. DO NOT USE THE AUTOPILOT IN FLIGHT UNTIL CORRECTIVE ACTION HAS BEEN TAKEN.

20. DOWN/UP Trim Switches
    a. Outboard Switch Half ..... ACTUATE UP AND DOWN - TRIM WILL NOT OPERATE
    b. Inboard Switch Half ..... ACTUATE UP AND DOWN - TRIM WILL NOT OPERATE

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

c.	Outboard and Inboard Switch Halves	ACTUATE SIMULTANEOUSLY UP AND DOWN - TRIM WILL OPERATE IN DIRECTION OF SWITCH MOVEMENT
21.	Manual Trim Wheel	CHECK FREE MOVEMENT
22.	Flight Director Indicator (ADI)	
a.	Attitude Presentation	CHECK - ATT FLAG OUT OF VIEW AND SHOULD REFLECT PRESENT ROLL AND PITCH ATTITUDE
b.	ATT (Attitude) Test Switch	PRESS AND HOLD
c.	Attitude Display	
	(1) Roll	20° RIGHT
	(2) Pitch	10° UP
	(3) ATT Flag	VISIBLE
d.	Remaining Warning Flags	OUT OF VIEW
e.	ATT Test Switch	RELEASE

NOTE

The ADI attitude reference sphere may be unreliable if the test is unsatisfactory.

23.	Flight Director Mode Selector	
a.	SBY (Standby) Mode Select Switch	PRESS. ALL MODE SELECT SWITCH ANNUNCIATORS ILLUMINATE AND FD FLAG MOVES INTO VIEW
b.	SBY Mode Select Switch	RELEASE. FD FLAG MOVES FROM VIEW, ALL MODE SELECT SWITCH ANNUNCIATORS EXTINGUISH EXCEPT SBY
c.	HSI Heading Reference Indicator	CENTER ON LUBBER LINE
d.	HDG (Heading) and ALT (Altitude) Mode Select Switches	PRESS. COMMAND CUE MOVES INTO VIEW AT WINGS LEVEL AND ZERO PITCH ATTITUDE. HDG AND ALT ON ANNUNCIATORS ILLUMINATE
e.	HSI HDG Reference Indicator	SELECT NEW HEADING. COMMANDS ROLL TO THE NEW HEADING
f.	GA (Go Around) Switch	PRESS. GA ANNUNCIATOR ILLUMINATES. COMMANDS A PITCH UP ATTITUDE, WINGS LEVEL COMMAND. ALL OTHER COMMANDS CANCELLED
g.	SBY Mode Select Switch	PRESS. ALL ANNUNCIATORS ILLUMINATE. ALL COMMANDS CANCELLED AND SBY ANNUNCIATOR REMAINS ILLUMINATED WHEN SWITCH IS RELEASED

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

CAUTION

DO NOT USE FLIGHT DIRECTOR IF TEST IS UNSATISFACTORY.

BEFORE TAKEOFF

1. Horizontal Situation Indicator
   a. Heading ..... SET TO CORRESPOND WITH RUNWAY
   b. Course ..... SET TO FIRST VOR COURSE RADIAL
2. Altitude Alert Controller ..... SELECT DESIRED FLIGHT ALTITUDE
3. Airplane Centered On Runway
   a. HDG Mode Select Switch ..... PRESS. HDG ON ANNUNCIATOR ILLUMINATES
   b. Heading ..... ADJUST TO CENTER ROLL COMMAND OF FLIGHT DIRECTOR ADI

NOTE

The ADI and HSI present normal attitude and horizontal situation displays when no modes are selected.

IN-FLIGHT OPERATION

NOTE

The TCS (touch control steering) does not function when the TURN control is in a position other than the center detent.

If the electric trim is used while the autopilot is engaged, the autopilot and rudder trim system (except yaw damper) will disengage.

Do not manually override the autopilot system during flight to change the bank angle, pitch attitude, or yaw heading.

CLIMB

1. Manually fly the airplane to desired pitch attitude while holding TCS button depressed
2. TCS Button ..... RELEASE
3. AP Engage Switch ..... PRESS. AP ENGAGE AND YD ENGAGE ANNUNCIATORS ILLUMINATE

SECTION 5 NORMAL PROCEDURES (CONT)

IN-FLIGHT OPERATION (CONT)

CLIMB (CONT)

NOTE

Pitch attitude is maintained by the autopilot as displayed by the pitch command.

4. ALTSEL (Altitude Select) Mode Select Switch ..... PRESS. ALTSEL ARM ANNUNCIATOR ILLUMINATES
5. IAS (Indicated Airspeed) or VS (Vertical Speed) Mode Select Switch ..... PRESS AS DESIRED DURING CLIMB TO MAINTAIN CONSTANT AIRSPEED OR VERTICAL SPEED

NOTE

Change of engine power while in the IAS mode will vary the vertical speed. Change of engine power while in the VS mode will vary the airspeed. Pitch wheel may be used to vary pitch attitude in climb but will cancel IAS or VS mode.

6. Airspeed or Vertical Speed Adjustments (if required) ..... PRESS TCS SWITCH AND ADJUST PITCH AS REQUIRED
7. Heading Change ..... ADJUST REFERENCE INDICATOR AS REQUIRED
8. Approximately 1,000 Feet Below Selected Cruise Altitude
   a. Altimeter Altitude Alert Light .. ILLUMINATES
   b. Warning Tone ..... AUDIBLE APPROXIMATELY 1 SECOND
9. Approximately 250 Feet Below Selected Cruise Altitude
   a. Altimeter Altitude Alert Light .. EXTINGUISHES
10. Approaching Selected Cruise Altitude
    a. ALTSEL CAP Annunciator ..... ILLUMINATES

NOTE

The altitude at which ALTSEL CAP annunciator illuminates will vary (within 900 feet of the selected altitude) depending on ascent rate.

b. IAS or VS Mode Selected ..... CANCELLED WHEN ALTSEL CAP ANNUNCIATOR ILLUMINATES

SECTION 5 NORMAL PROCEDURES (CONT)

IN-FLIGHT OPERATION (CONT)

CLIMB (CONT)

11. At Selected Cruise Altitude
    a. ALTSEL CAP Annunciator ..... EXTINGUISHES
    b. ALT ON Annunciator ..... ILLUMINATES

CRUISE

1. Heading Change ..... ADJUST REFERENCE INDICATOR AS REQUIRED

NOTE

Airplane will turn to acquire the new heading at a bank angle of approximately 27° .

2. VOR/RNAV Intercept and Track
    a. NAV Receiver ..... TUNE TO DESIRED VOR STATION
    b. RNAV Control Indicator ..... SELECT VOR OR RNAV AS DESIRED

NOTE

RNAV and ENRT annunciator illuminates when RNAV is selected.

    c. HSI Course ..... AS REQUIRED
    d. Heading Selector Indicator ..... DESIRED INTERCEPT ANGLE
    e. NAV Mode Selector Switch ..... PRESS. NAV ARM AND HDG ON ANNUNCIATORS ILLUMINATE. FLIGHT DIRECTOR COMMANDS A TURN TO THE SELECTED HEADING FOR COURSE CAPTURE AND TRACKING

NOTE

If RNAV has been selected, the information presented on the HSI is in reference to the selected waypoint.

    f. VOR/RNAV Course Capture ..... NAV ARM AND HDG ON ANNUNCIATORS EXTINGUISH (IF ILLUMINATED). NAV CAP ANNUNCIATOR ILLUMINATES INDICATING COURSE CAPTURE AND TRACKING

SECTION 5 NORMAL PROCEDURES (CONT)

IN-FLIGHT OPERATION (CONT)

CRUISE (CONT)

NOTE

The autopilot, when engaged, will maintain tracking as commanded by the flight director.

Should the NAV warning flag come into view while tracking, the autopilot will maintain the heading, but the command cue will be out of view and the NAV CAP annunciator will extinguish.

DESCENT

1. Altitude Alert Controller ..... SELECT DESIRED FLIGHT ALTITUDE
2. ALTSEL Mode Select Switch ..... PRESS. ALTSEL ARM ANNUNCIATOR ILLUMINATES
3. IAS or VS Mode Select Switch ..... PRESS IF DESIRED DURING DESCENT TO MAINTAIN CONSTANT AIRSPEED OR VERTICAL SPEED

NOTE

Change of engine power while in the IAS mode will vary the vertical speed. Change of engine power while in the VS mode will vary the airspeed. Pitch wheel may be used to vary pitch attitude in descent but will cancel IAS or VS mode.

4. Airspeed or Vertical Speed Adjustments (if required) ..... PRESS TCS SWITCH, ADJUST PITCH AS REQUIRED
5. Heading Change ..... ADJUST REFERENCE INDICATOR AS REQUIRED
6. Approximately 1,000 Feet Above Selected Cruise Altitude
   a. Altimeter Altitude Alert Light .. ILLUMINATES
   b. Warning Tone ..... AUDIBLE APPROXIMATLY 1 SECOND
7. Approximately 250 Feet Above Selected Cruise Altitude
   a. Altimeter Altitude Alert Light .. EXTINGUISHES
8. Approaching Selected Cruise Altitude
   a. ALTSEL CAP Annunciator ..... ILLUMINATES

NOTE

The altitude at which ALTSEL CAP annunciator illuminates will vary (within 900 feet of selected altitude) depending on descent rate.

SECTION 5 NORMAL PROCEDURES (CONT)

IN-FLIGHT OPERATION (CONT)

DESCENT (CONT)

b. IAS or VS Mode Selected ..... CANCELLED WHEN ALTSEL CAP ANNUNCIATOR ILLUMINATES

9. At Selected Cruise Altitude
   a. ALTSEL CAP Annunciator ..... EXTINGUISHES
   b. ALT ON Annunciator ..... ILLUMINATES

APPROACH

1. VOR/RNAV
   a. AP TRIM TEST (Prior to gear and/or flap extension) ..... PRESS. AP TRIM ANNUNCIATOR ILLUMINATES. TRIM WHEEL MUST BE ACTIVE TO INDICATE THAT 100% TRIM IS OPERATIVE

CAUTION

DO NOT USE AUTOPILOT FOR APPROACH IF AP TRIM TEST IS UNSATISFACTORY

   b. NAV Receiver ..... TUNE DESIRED VOR STATION
   c. DME Selector ..... NAV 1
   d. RNAV Control Indicator ..... VOR OR RNAV/APR AS DESIRED

NOTE

RNAV and APPR annunciators illuminate when RNAV/APR is selected.

   e. HSI Course ..... SET PUBLISHED INBOUND COURSE
   f. Heading Selector Indicator ..... SET DESIRED INTERCEPT HEADING
   g. VORAPR (Approach) Mode Select Switch ..... PRESS. VORAPR ARM AND HDG ON ANNUNCIATORS ILLUMINATE. FLIGHT DIRECTOR COMMANDS A TURN TO THE SELECTED HEADING FOR COURSE CAPTURE AND TRACKING

NOTE

If RNAV has been selected, the information presented on the HSI is in reference to the selected waypoint.

SECTION 5 NORMAL PROCEDURES (CONT)

IN-FLIGHT OPERATION (CONT)

APPROACH (CONT)

h. VOR/RNAV ..... VORAPR ARM AND HDG ON ANNUNCIATORS (IF ILLUMINATED) EXTINGUISH. VORAPR CAP ANNUNCIATOR ILLUMINATES INDICATING COURSE CAPTURE AND TRACKING

NOTE

The autopilot, when engaged, will maintain the tracking as commanded by the flight director.

Should the NAV warning flag come into view while tracking, the autopilot will maintain the heading but the command cue will be out of view and the VORAPR CAP annunciator will extinguish.

2. LOC Front Course

a. AP TRIM TEST (Prior to gear and/or flap extension) ..... PRESS. PITCH TRIM ANNUNCIATOR ILLUMINATES. TRIM WHEEL MUST BE ACTIVE TO INDICATE THAT 100% TRIM IS OPERATIVE

CAUTION

DO NOT USE AUTOPILOT FOR APPROACH IF AP TRIM TEST IS UNSATISFACTORY.

b. NAV Receiver ..... TUNE DESIRED LOC FREQUENCY

c. HSI Course ..... SET TO PUBLISHED INBOUND COURSE

d. HSI Heading ..... DESIRED INTERCEPT HEADING

e. APR (Approach) Mode Select Switch ..... PRESS. NAV ARM, APRARM AND HDG ON ANNUNCIATORS ILLUMINATE. FLIGHT DIRECTOR COMMANDS A TURN TO THE SELECTED HEADING FOR COURSE CAPTURE AND TRACKING

NOTE

The localizer and glide slope are armed.

f. Near LOC Beam ..... HDG ON ANNUNCIATOR EXTINGUISHES

g. NAV CAP Annunciator ..... ILLUMINATES WHEN LOC BEAM IS CAPTURED AND ON TRACK

SECTION 5 NORMAL PROCEDURES (CONT)

IN-FLIGHT OPERATION (CONT)

APPROACH (CONT)

NOTE

The expanded LOC pointer at the bottom of the ADI will appear when the deviation is about 1/3 dot or less.

h. After LOC Capture ..... SET HSI HEADING REFERENCE INDICATOR TO PUBLISHED MISSED APPROACH OR LANDING RUNWAY HEADING AS REQUIRED

i. Captured Glide Slope ..... APR ARM ANNUNCIATOR EXTINGUISHES AND APR CAP ANNUNCIATOR ILLUMINATES. FLIGHT DIRECTOR AND/OR AUTOPILOT (IF ENGAGED) WILL TRACK CENTER OF LOCALIZER AND GLIDE SLOPE BEAMS WITH WIND CORRECTIONS

NOTE

Any previously selected vertical mode will be automatically cancelled.

j. Altitude Alert Controller ..... SET PUBLISHED MISSED APPROACH ALTITUDE AS REQUIRED

k. At DH (Decision Height) ..... DH ANNUNCIATOR ILLUMINATES

l. TRIM A/P DISC Switch ..... PRESS. AUTOPILOT DISENGAGES, LAND AIRPLANE

NOTE

The rising runway bar becomes visible from 200 feet above ground level to touchdown.

Should the LOC and/or VRT (Vertical) warning flag come into view, the command cue will be out of view and the NAV CAP and/or APR CAP annunciators will extinguish respectively. When the respective warning flag goes out of view, the mode will be reengaged and the command cue will return to view.

3. LOC Back Course Approach

a. AP TRIM TEST (Prior to gear and/or flap extension) ..... PRESS. PITCH TRIM ANNUNCIATOR ILLUMINATES. TRIM WHEEL MUST BE ACTIVE TO INDICATE THAT 100% TRIM IS OPERATIVE

SECTION 5 NORMAL PROCEDURES (CONT)

IN-FLIGHT OPERATION (CONT)

APPROACH (CONT)

CAUTION

DO NOT USE AUTOPILOT FOR APPROACH IF AP TRIM TEST IS UNSATISFACTORY.

b. NAV Receiver ..... TUNE TO DESIRED LOC FREQUENCY
c. HSI Course ..... SET TO PUBLISHED FRONT COURSE OR LOC INBOUND COURSE
d. HSI Heading ..... DESIRED INTERCEPT HEADING
e. BC (Back Course) Mode Select Switch ..... BC ARM AND HDG ON ANNUNCIATORS ILLUMINATE. SYSTEM ARMED FOR BACK COURSE LOC CAPTURE

NOTE

Glide slope functions are cancelled when back course mode is selected. Autopilot/Flight Director Back Course approaches not approved without operable radio altimeter.

f. Near LOC Beam ..... HDG ON ANNUNCIATOR EXTINGUISHES
g. LOC Beam Captured
(1) BC ARM Annunciator ..... EXTINGUISHES
(2) BC CAP Annunciator ..... ILLUMINATES
(3) IAS (Indicated Airspeed) or VS (Vertical Speed) Mode Select Switch ..... PRESS. IAS OR VS ANNUNCIATOR ILLUMINATES
(4) TCS (Touch Control Steering) Switch ..... MOMENTARILY PRESS TO SYNCHRONIZE RATE OF DESCENT
(5) Rising Runway Bar ..... COMES INTO VIEW FROM ABOUT 200 FEET ABOVE GROUND LEVEL TO TOUCHDOWN
h. At MDA (Minimum Descent Altitude) ..... DH ANNUNCIATOR ILLUMINATES
i. TRIM A/P DISC Switch ..... PRESS. AUTOPILOT DISENGAGES, LAND AIRPLANE

NOTE

Should the LOC warning flag come into view, the roll command cue will be out of view and the BC CAP annunciator will extinguish.

SECTION 5 NORMAL PROCEDURES (CONT)

IN-FLIGHT OPERATION (CONT)

APPROACH (CONT)

4. Go Around

If Go Around required, proceed as follows:

a.	GA Switch	PRESS. AUTOPILOT DISENGAGES. NOTED BY MODE ANNUNCIATORS BEING EXTINGUISHED
b.	GA Annunciator	ILLUMINATES
c.	Command Cue	COMMANDS WINGS LEVEL PITCH UP ATTITUDE

NOTE

Apply engine power and retract landing gear after descent is stopped and desired airspeed is attained. Select flap position as required.

d.	Missed Approach Heading	SELECT HEADING AS REQUIRED
e.	AP Engage Switch	PRESS. AP ENGAGE AND YD ENGAGE ANNUNCIATORS ILLUMINATE
f.	Missed Approach Departure	
	(1) HDG Mode Select Switch	PRESS. HDG ON ANNUNCIATOR ILLUMINATES
	(2) ALTSEL Mode Select Switch	PRESS. ALTSEL ARM ANNUNCIATOR ILLUMINATES
	(3) Pitch Attitude	PRESS TCS SWITCH TO SYNCHRONIZE FLIGHT DIRECTOR AND STABILIZE VS OR IAS BEFORE ENGAGING VS OR IAS MODE
	(4) Approaching Published Missed Approach Altitude	ALTSEL ARM ANNUNCIATOR EXTINGUISHES. CAP ANNUNCIATOR ILLUMINATES (WITHIN 900 FEET DEPENDING ON VERTICAL SPEED)
	(5) At Published Missed Approach Altitude	ALTSEL CAP ANNUNCIATOR EXTINGUISHES. ALT ON ANNUNCIATOR ILLUMINATES

SYSTEM DESCRIPTION

GENERAL

The Sperry SPZ-500 Automatic Flight Control System with AD-500 Series ADI and RD-500/550 Series HSI consists of an autopilot and flight director combined in an integrated system. The system also provides follow-up trim for the pitch and yaw.

The cockpit components include the autopilot controller, mode selector, pilot's barometric altimeter, radio altimeter, altitude alert controller, flight director ADI (attitude director indicator) and HSI (horizontal situation indicator) with course and distance repeaters.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION

1. The autopilot controller is located on a remote swing up panel below the center pedestal. The controller contains the autopilot engage, yaw damper engage and soft ride push button switches, manual turn and pitch controls, trim up down indicator and system test switch.

   a. AP (Autopilot) Engage Switch
   The autopilot is engaged by pressing the AP ENGAGE switch and is noted by the AP ENGAGE annunciator illuminating. The yaw damper is automatically engaged when the AP switch is pressed and also noted by the illumination of the YD ENGAGE annunciator. The autopilot will not engage unless the TURN control is in the center detent position.

   The autopilot and yaw damper may be disengaged by any one of the following actions:
   (1) Pressing the TRIM A/P DISC switch on either control wheel.
   (2) Selection of the Go Around mode.
   (3) Selection of either the HDG INC (increase) or DEC (decrease) gyro slaving function.
   (4) Pressing the TEST EACH FLT switch on the autopilot controller, except when the flaps are in the 40° position.

NOTE

When the autopilot is disengaged, an audible warning tone will be heard for approximately one second. The
R AP OFF annunciator will illuminate for approximately three seconds except when the HDG INC/DEC is activated or TEST EACH FLT is pressed in which case it will remain illuminated. The AP OFF annunciator illumination may be cancelled by pressing the TRIM A/P DISC switch.

One of the following methods may be used to disengage only the autopilot while allowing the yaw damper to remain engaged.
(1) Pressing the FAST ERECT switch.
(2) Activating the RH half of the DOWN/UP pitch trim switch.

NOTE

When the autopilot is disengaged, an audible warning tone will be heard for approximately one second and the AP OFF annunciator illuminates continuously until cancelled by pressing the TRIM A/P DISC switch.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

The following malfunctions will cause automatic disengagement of the autopilot:
(1) Power loss to the system.
(2) Directional or vertical gyro failure.
(3) Failure of a torque limiter.
(4) Failure of the torque switching circuit.

b. YD (Yaw Damper) Engage Switch

The yaw damper is engaged by pressing the YD ENGAGE switch and is noted by the YD ENGAGE annunciator illumination. The yaw damper provides dutch roll damping and turn coordination throughout the flight envelope. The yaw damper can be independently engaged or will automatically engage when the autopilot is engaged.

The yaw damper may be disengaged by one of the following actions:
(1) Pressing the TRIM-A/P DISC switch on either control wheel.
(2) Selection of the Go Around mode.
(3) Selection of either the HDG INC (increase) or DEC (decrease) gyro slaving function.
(4) Pressing the TEST EACH FLT switch on the autopilot controller, except when the flaps are in the 40° position.

The following malfunctions will cause automatic disengagement of the yaw damper:
(1) Power loss to the system.
(2) Directional gyro failure.
(3) Torque limiter failure.
(4) Torque switching circuitry failure.

c. Soft Ride Switch

Smooths out abrupt pitch or roll with the autopilot engaged while maintaining stability in rough air.

d. TURN Control

Actuation of the TURN control provides bank commands to the autopilot proportional to the turn control displacement. When actuated, the lateral mode selected on the flight director controller is automatically cancelled. When the TURN control is returned to the center detent position, a lateral mode can again be selected. The autopilot will not engage if the TURN control is not in the center detent position.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

e. PITCH Control
The PITCH control on the autopilot controller allows the pilot to change the airplane pitch attitude as desired. Movement of the pitch control changes the reference pitch attitude in proportion to the movement of the pitch control wheel and automatically cancels any vertical mode selected. However, for safety, movement of the pitch control with the autopilot coupled to the glide slope has no effect.

f. Elevator TRIM Annunciator
The elevator TRIM annunciator announces out of trim condition by the illumination of UP or DN annunciators when a sustained signal is being applied to the elevator servo. The autopilot should NOT be engaged if either annunciator is illuminated.

g. TEST EACH FLT (Flight) Switch
The TEST EACH FLT switch is used to test the torque limit monitors. After engaging the autopilot, pressing the TEST switch will cause the autopilot to disengage by simulating a failure in the torque limit monitors. Pressing the TEST switch should also cause the AP TORQ annunciator to illuminate.

h. TCS (Touch Control Steering) Switch
TCS switches are located on the pilot's and copilot's control wheels. When either TCS is pressed, with the autopilot engaged and no lateral or vertical mode selected on the flight director controller, manual maneuvering of the airplane in roll and pitch may be accomplished. When the TCS switch is released, the existing roll and pitch attitudes are maintained. When the TCS switch is released at bank angles less than 6° , the airplane will return to wings level flight. If a lateral mode has been selected on the mode selector, actuation of the TCS permits roll maneuvers to be made. However, when the TCS switch is released, the autopilot resumes control to the lateral guidance signals received. If a vertical hold mode (IAS, VS, ALT) has been selected, the use of TCS resynchronizes the reference so that when the TCS switch is released, the present reference is maintained.

Use of the TCS during glide slope control or during ALTSEL CAP permits maneuvering while the TCS switch is pressed. However, when the TCS switch is released, normal glide slope control or ALTSEL CAP control is resumed.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

2. Mode Selector

The mode selector provides for various modes of operation which are common to, and available for, both the autopilot and flight director operation. Mode selection is achieved by pressing the desired mode switch. The mode select switches are alternate action switches: ON and OFF. The legend above the switch identifies each function. The legend in each switch illuminates when the selected mode is ON, ARM (armed), or CAP (captured). When the autopilot is engaged, the flight director commands are automatically coupled to the autopilot. Automatic sequencing of submodes are annunciated for NAV, APR, BC, VORAPR, and ALTSEL. This annunciator takes the form of split legends (ARM followed by CAP). The illumination of the annunciators may be checked by pressing the SBY (standby) switch. The ten mode selectors and their functions are briefly identified as follows:

a. HDG (Heading) Mode Select

When selected, allows capture of the selected heading as displayed on the HSI. Heading error gains are programmed as a function of true airspeed for proper damping during all flight conditions.

b. NAV (Navigation) Mode Select

When selected, the NAV provides lateral control for VOR en route control or localizer control, depending on the navigation receiver frequency selected. Prior to automatic capture of the lateral beam, the heading select mode is annunciated and operative, permitting control of the intercept angle. VOR operation provides for DME programming and automatic over the station sensing.

c. APR (Approach) Mode Select

When selected and the NAV receiver is tuned to an ILS frequency, the APR mode arms the flight director for automatic localizer and glide slope capture and tracking. Prior to localizer capture, the heading select mode is annunciated and operative, permitting control of the intercept angle. Prior to glide slope capture, any vertical mode may be selected for path control.

d. BC (Back Course) Mode Select

The BC provides for back course localizer control. Prior to automatic capture of the beam, the heading select mode is annunciated and operative, permitting control of the intercept angle. The back course roll commands begin down programming at 1,200 feet radio altitude to compensate for beam convergence. If the radio altimeter is inoperative, gain programming begins at capture, which results in premature roll command deprogramming and is not approved for operation.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

e. VORAPR (Approach) Mode Select
When selected and the NAV receiver is tuned to a VOR frequency, the VORAPR mode provides for optimum gains for VOR approaches. The legend ARM illuminates initially, followed by the legend CAP when the beam is captured. When the VORAPR mode is selected, the NAV mode is automatically cancelled.

f. ALT (Altitude) Mode Select
The ALT hold mode provides control to the reference altitude existing when the mode is selected. Subsequent changes in the barometric setting in the altimeter produces comparable changes in the reference altitude so that the indicated altitude is maintained.

g. ALTSEL (Altitude Select) Mode Select
The altitude preselect mode provides automatic capture of the altitude selected on the altitude alert controller after a pilot initiated climb or descent. ALTSEL remains armed during the climb or descent to the selected altitude, which may be accomplished by means of VS, IAS, or PITCH hold modes. When the computed point for flare is reached, the altitude preselect CAP mode is automatically initiated for a smooth acquisition of the selected altitude. When the capture maneuver starts, the previously selected path control mode is cancelled. After the selected altitude is captured, the system switches automatically to the altitude hold mode. Pilot selection of the altitude hold mode during climb or descent to the selected altitude automatically cancels the altitude preselect mode and establishes the altitude hold mode at the existing altitude.

h. VS (Vertical Speed), IAS (Indicated Airspeed) Mode Select
Vertical speed and airspeed hold modes are selected by pressing the corresponding pushbutton. Selection of these modes maintains the vertical speed, or airspeed which exists at the time of selection.

i. GA (Go Around) Mode Select Switch
The GA mode select switch is located in the left power lever. The GA mode initiates a fixed pitch up climb and wings level attitude command when pressed. Annunciation is provided by the illumination of the GA annunciator. Selection of the GA mode cancels all other flight director modes and disengages the autopilot. Any lateral control mode may be selected to provide steering guidance while in the GA mode of operation.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

3. Remote Switches

a. AP (Autopilot) TRIM TEST Switch

The AP TRIM TEST switch is located below the center pedestal. When pressed, the PITCH TRIM annunciator illuminates and the elevator pitch trim wheel is activated, indicating 100% pitch trim is available. This causes very mild pitch oscillations to occur above approximately 200 KIAS. Should this test be unsatisfactory, the autopilot must not be used for approaches.

R

b. Electric Pitch Trim Switches

The electric pitch trim switches are located on the outboard hand grip of the pilot and copilot control wheels and may be identified by their DOWN and UP legends above and below each respectively. Each switch is a split type switch with a left and right half. This system aids the pilot in manually trimming the airplane's pitch when the autopilot is not engaged.

Power is supplied to the pitch trim system through the TRIM ELEV circuit breaker. Movement of either half has no effect on the pitch trim. Simultaneous movement of both halves will cause the electric pitch trim to operate. Movement of the right half of either switch will disengage the autopilot.

When the TCS (touch control steering) switch is pressed, the pitch trim is disengaged and the airplane may be trimmed using the manual pitch trim wheel. The electric pitch trim system will also remain disengaged while the TRIM A/P DISC switch is pressed. This also allows for manual trimming with the wheel.

4. Barometric Encoding Altimeter

The altimeter displays barometrically corrected pressure altitude from the ADC (air data computer). Encoding information is provided by the ADC. The indicator provides the following control and displays.

a. BARO (Barometric) Pressure Set Control and BARO Counters

The barometric counters, set by means of the BARO control, display barometric pressure in inches of mercury and millibars. Setting the BARO control provides barometric pressure correction to the ADC.

b. Pointer

The pointer displays altitude between 1,000 feet levels on a scale with major indexes every 100 feet and minor indexes every 20 feet.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

c. Altitude Counter
The four drum counter displays altitude from 0 to 50,000 feet. A negative (NEG) altitude shutter obscures the 10,000 and 1,000 digits of the counter to annunciate altitudes below sea level. The zero position on the ten thousands drum is black and white crosshatch to alert the pilot to altitudes of less than 10,000 feet.

d. OFF Failure Warning Flag
The failure warning flag comes into view when the error between the altitude displayed and the altitude signal received is too great, the ADC becomes invalid, or the barometric altitude indicator loses primary power.

e. Altitude Alert Light
The altitude alert light is located in the upper right corner of the altimeter. The light illuminates to provide a visual indication when the airplane is within 1,000 feet of the preselected altitude and extinguishes when within 250 feet of the preselected altitude. After capture, the light will illuminate if the airplane deviates more than 250 feet from the selected altitude and will extinguish if the deviation is greater than 1,000 feet from the preselected altitude.

5. Flight Director Indicators

a. Attitude Director Indicator (ADI)
The attitude director indicator is similar in appearance to the conventional gyro that displays the airplane's attitude. The ADI also incorporates flight control system commands by means of a single cue inverted V bar or crosspointers.

The pitch attitude displayed is linear from 0° to 80° up or down. The roll display has a full 360° capability with earth and sky attitude indications.

The glide slope deviation pointer and scale is located in the side of the indicator and presents glide slope deviation only when tuned to an ILS frequency and a valid glide slope signal is present.

The radio altitude bar presents height above ground level below 200 feet and moves toward the symbolic airplane during descent toward the runway, contacting the bottom of the symbolic airplane at touchdown.

The expanded localizer display presents an amplified localizer signal for use during a final ILS approach.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

The ADI also has a GA (Go Around) annunciator and a DH (Decision Height) annunciator in the upper corners. The GA annunciator illuminates when the go around mode has been selected. The DH annunciator illuminates when activated by the preset radio altimeter DH during descent.

The ATT (Attitude) test switch is located in the lower left corner. When pressed, the self-test circuitry is energized, causing a pitch up attitude of approximately 10° and roll attitude of approximately 20° right bank. The ADI has two warning flags which come into view should a malfunction occur. The FD (Flight Director) warning flag indicates the absence, or loss, of power to the system or a computer/controller malfunction. The ATT (Attitude) warning flag indicates an attitude reference failure.

b. Horizontal Situation Indicator (HSI)

The HSI replaces the separate OBS and compass indicators with a combined course and heading display. The course setting incorporates a digital course display in the upper left corner in conjunction with the azimuth card setting. A four digit distance (DIST) display is located in the upper right corner which operates in conjunction with the DME. The effective range displayed is limited by the DME equipment installed. The distance displayed is the distance to the #1 or #2 VOR station as selected. The distance displayed is the same as that displayed by the DME when the #1, #2, or HOLD position is selected. The HSI distance displayed will remain unchanged should a function other than distance be selected on the DME.

The HSI has three warning flags which come into view should a malfunction occur. The HDG (heading) warning flag indicates the absence, or loss, of power, an invalid gyro signal or an error between the displayed heading and signal being received. The VERT (vertical) warning flag indicates the loss of a valid vertical deviation signal from the glide slope. The NAV (navigation) warning flag indicates the absence, or loss, of power to the NAV receiver, NAV receiver malfunction or unreliable signal being received.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

6. Altitude Alert Controller
The altitude alert controller provides a means for setting a selected altitude for altitude alerting and for the altitude preselect mode. Selection of the desired altitude is accomplished by turning the crank knob. The alerting signals are not inhibited while the altitude is being selected. The altitude alerting system provides visual and audible signals when the airplane is approximately 1,000 feet from the preselected altitude and upon any deviation of approximately 250 feet from the altitude. Changes in the selected altitude may be accomplished at any time by turning the crank knob.

The OFF warning flag is visible when there is a loss of power to the system, internal system power failure, or invalid air data computer signal.

7. Remote Annunciators/Indicator
Several remote annunciators are installed on the left side of the pilot's instrument panel. These annunciators are illuminated by various system functions to indicate system status. Some annunciators illuminate during function off periods or to warn of malfunctions.

a. AP (Autopilot) OFF
The AP OFF annunciator illuminates momentarily when the autopilot is disengaged. Should the AP OFF annunciator illuminate due to a system malfunction, it will remain illuminated until cancelled by pressing the TRIM A/P DISC switch on either control wheel.

b. SOFT RIDE
The SOFT RIDE annunciator illuminates when the SOFT RIDE mode has been selected while the autopilot is engaged.

c. AP TORQ (Torque)
The AP TORQ annunciator must illuminate during the autopilot test function. It will illuminate should a malfunction occur in the air data computer or autopilot computer torque switching for the roll axis. Should this annunciator illuminate, the autopilot will disengage. The autopilot may be reengaged if the annunciator extinguishes in flight.

d. PITCH TRIM
The PITCH TRIM annunciator must illuminate when the AP TRIM TEST switch is pressed, indicating that 100% trim is operative. Should the PITCH TRIM annunciator fail to illuminate during test, the autopilot must not be used for approaches.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

e. RUDDER TRIM Annunciation
The RUDD TRIM or R TRIM INOP annunciator (dependent upon installation) illuminates when a malfunction occurs in the rudder trim computer. Should this annunciator illuminate, the autopilot must be disengaged.

f. ROLL TRIM Indicator
The ROLL TRIM indicator is located below the center pedestal. The horizontal bar indicates an out of trim condition for the roll axis. The pilot may retrim the roll axis without disengaging the autopilot.

8. Lighting
The ADI, HSI, barometric altimeter and altitude select controller are internally illuminated. Intensity is controlled by the PILOT FLT INST rheostat located in the overhead switch panel.

The ADI GA and DH annunciator lights, mode selector annunciator lights, and autopilot controller annunciator lights are controlled by the ANN NORM/DIM switch located in the upper left side of the pilot instrument panel.

The legends of the mode selector and autopilot controller are back (edge) lighted. Intensity is controlled by the PILOT FLT INST rheostat located in the overhead switch panel.

The HSI distance and course repeater displays are controlled by the HSI DIM rheostat located in the pilot instrument panel to the right of the pilot's control column.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

RCA/SPERRY PRIMUS 300 WXD WEATHER RADAR SYSTEM

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 09-05-78

REISSUED DATE: 9-24-85

Don P. Watson

Don P. Watson, Manager
Aircraft Certification Division
Federal Aviation Administration
Southwest Region,
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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the RCA/Sperry Primus 300 WXD Weather Radar System is installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

GROUND OPERATIONS

1. During fueling operations ..... DO NOT OPERATE WEATHER RADAR

CAUTION

DO NOT OPERATE WEATHER RADAR WITHIN 100 YARDS, MINIMUM, OF ANY FUELING OPERATIONS.

2. Preflight Checks
   a. Mode of Operation ..... STBY (STANDBY)
   b. Near large objects (hangers, aircraft, etc.) ..... 100 YARDS, MINIMUM 60° LEFT AND RIGHT OF AIRPLANE NOSE. TILT ANTENNA FULL UP
   c. Ground Personnel ..... NO CLOSER THAN 6 FEET RADIUS AND 135° LEFT AND RIGHT OF THE AIRPLANE NOSE

WARNING

PERSONNEL CLOSER THAN 6 FEET RADIUS OF THE AIRPLANE NOSE MAY BE EXPOSED TO HEAT AND RADIATION.

SECTION 2 OPERATING LIMITATIONS (CONT)

GROUND OPERATIONS (CONT)

3. All Other Ground Operations ..... STANDBY or OFF

IN-FLIGHT OPERATIONS

1. Operate system for weather detection and ground mapping only.

WARNING

DO NOT USE THE WEATHER RADAR AS A PROXIMITY WARNING, FOR ANTI-COLLISION PROTECTION OR WARNING SYSTEM.

SECTION 3 EMERGENCY PROCEDURES

No Change

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

PREFLIGHT CHECK

1. Electrical Power ..... OFF
   Weather Radar
   a. OFF Button ..... DEPRESSED
   b. GAIN Control ..... PRESET (FULL CCW)
   c. STAB (Stabilization) Control ... ON
   d. INT (Intensity) Control ..... APPROXIMATE MIDPOINT
   e. Antenna TILT Control ..... FULL UP
   f. RANGE Control ..... TEST
2. Electrical Power ..... ON (DC and AC)
3. Radio Master Switches ..... ON
4. Weather Radar Circuit Breakers ..... ENGAGE

NOTE

If no mode switch buttons are pressed, an all buttons out condition exists and the word **PUSH** is displayed in the mode field. Depress OFF button for normal operation.

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

5. STBY (Standby) Mode Switch ..... PRESS. **WAIT** IS DISPLAYED IN THE MODE FIELD UNTIL THE SYSTEM HAS WARMED-UP.

NOTE

Allow 4 to 5 minutes for warm-up. Should WX, CYC, or MAP mode be selected from OFF, the system will remain inoperative until the warm-up time has elapsed.

6. Normal Weather Detection Mode Test Pattern
   a. WX Button ..... PRESS. OBSERVE TEST PATTERN
   b. INT (Intensity) Control ..... ADJUST BRIGHTNESS AS DESIRED
   c. Range Lines and Numbers ..... DISPLAYED IN BLUE
   d. AZIM MKS Switch ..... PRESS. AZIMUTH LINES DISPLAYED IN BLUE
   e. Mode Field ..... DISPLAYS **TEST** IN BLUE
   f. Auxiliary Field ..... **1, 2, 3** DISPLAYED IN BLUE, WITH CORRESPONDING COLOR BARS OF GREEN, YELLOW AND RED

NOTE

If the GAIN control is not in the PRESET detent position, **VAR** will replace **1, 2, 3** in the auxiliary field.

   g. 15 to 25 Nautical Mile Range.... GREEN COLOR DISPLAYED
   h. 25 to 40 Nautical Mile Range ... YELLOW COLOR DISPLAYED

NOTE

An irregular YELLOW line may be observed at the 55 nautical mile range.

   i. 40 to 55 and 65 to 80 Nautical Mile Range ..... RED COLOR DISPLAYED
   j. Target Alert Area (80 to 100 Nautical Mile Range) ..... RED COLOR DISPLAYED

7. Contour Mode Test Pattern
   a. CYC Switch ..... PRESS
   b. INT (Intersity) Control ..... SET AS DESIRED

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

c. Range, Azimuth Lines and Numbers ..... DISPLAYED IN BLUE
d. Mode Field ..... DISPLAYS TEST IN BLUE
e. Auxiliary Field ..... 1, 2, 3 DISPLAYED IN BLUE, WITH CORRESPONDING COLOR BARS OF GREEN, YELLOW AND RED
f. 15 to 25 Nautical Mile Range ... GREEN COLOR DISPLAYED
g. 25 to 40 Nautical Mile Range ... YELLOW COLOR DISPLAYED

NOTE

An irregular YELLOW line may be observed at the 55 nautical mile range.

h. 40 to 55 and 65 to 80 Nautical Mile Range ..... RED COLOR DISPLAYED, FLASHING APPROXIMATELY EVERY 1/2 SECOND
i. Target Alert Area (80 to 100 Nautical Mile Range) ..... RED COLOR DISPLAYED, FLASHING APPROXIMATELY EVERY 1/2 SECOND

8. TGT ALRT (Target Alert) Switch ..... PRESS. THE LETTER T APPEARS IN RED BOX, THEN REPLACED BY FLASHING TGT

NOTE

The target alert test function can be checked in the WX and CYC modes and not in the MAP mode.

9. Ground Mapping Mode Test Pattern
a. MAP Button ..... PRESS
b. INT (Intensity) Control ..... SET AS DESIRED
c. MODE Field ..... DISPLAYS TEST IN GREEN
d. Range Lines, Azimuth Lines, and Numbers ..... DISPLAYED IN GREEN
e. Auxiliary Field ..... 1, 2, 3 DISPLAYED IN BLUE, WITH CORRESPONDING COLOR BARS OF LIGHT BLUE, YELLOW, AND PALE PURPLE
f. 15 to 25 Nautical Mile Range ... LIGHT BLUE COLOR DISPLAYED
g. 25 to 40 Nautical Mile Range ... YELLOW COLOR DISPLAYED
h. 40 to 55 and 65 to 80 Nautical Mile Range ..... PALE PURPLE COLOR DISPLAYED
i. Target Alert Area (80 to 100 Nautical Mile Range) ..... PALE PURPLE COLOR DISPLAYED

CAUTION

DO NOT USE THE SYSTEM IF ANY OF THE ABOVE TEST ITEMS ARE ABNORMAL.

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

10. Operation Mode ..... STBY

BEFORE TAKEOFF OR IN-FLIGHT

NORMAL WEATHER DETECTION

1. WX Button ..... PRESS
2. RANGE Control ..... SET AS REQUIRED
3. INT (Intensity) Control ..... SET AS DESIRED
4. Antenna Position ..... TILT AS REQUIRED TO ELIMINATE GROUND CLUTTER

NOTE

TGT ALRT is disabled when in the MAP mode, or GAIN switched from PRESET.

CONTOUR WEATHER DETECTION

1. CYC Mode Switch ..... PRESS
2. RANGE Control ..... SET AS REQUIRED
3. INT Control ..... SET AS DESIRED
4. Antenna Position ..... TILT AS REQUIRED TO ELIMINATE GROUND CLUTTER
5. GAIN ..... VAR (VARIABLE) AUTOMATICALLY DISABLED AND PRESET SUBSTITUTED WHEN IN CYC MODE
6. Observe Screen ..... RED DISPLAY ONLY ALTERNATES BETWEEN NORMAL AND CONTOURED MODES. THAT IS, THE RED DATA GOES DARK AND 1/2 SECOND LATER REAPPEARS RED

GROUND MAPPING

1. MAP Button ..... PRESS
2. RANGE Control ..... SET AS REQUIRED
3. INT (Intensity) Control ..... SET AS DESIRED
4. Antenna Position ..... TILT DOWN UNTIL DESIRED TERRAIN IS DISPLAYED

NOTE

The degree of down tilt depends upon airplane altitude and selected range.

5. Insufficient Terrain Detail ..... ADJUST GAIN CONTROL FROM PRESET FOR DESIRED TERRAIN DETAIL

SECTION 5 NORMAL PROCEDURES (CONT)

BEFORE TAKEOFF OR IN-FLIGHT (CONT)

APPROACH

1. Operation Mode ..... STBY (AS REQUIRED)

AFTER LANDING

1. Operation Mode ..... OFF

SYSTEM DESCRIPTION

GENERAL

The Primus 300 WXD Weather Radar System is a navigation aid which enables the pilot to detect and analyze undesirable weather conditions. This system consists of three units: an antenna, a receiver/transmitter and an alphanumerical color indicator.

OPERATION

The system is controlled by the pilot. The system's controls are located on the indicator adjacent to the display screen.

The screen displays two sets of colors. The first set is GREEN, YELLOW, and RED. The WX and CYC mode operates with GREEN as the least rainfall and RED as the heaviest rainfall. The second set is LIGHT BLUE, YELLOW and PALE PURPLE for the MAP mode operation with LIGHT BLUE being the least reflective and PALE PURPLE being the most reflective.

PUSH BUTTON SWITCHES

NOTE

If an all buttons out condition exists, the system will be in the standby mode and the word **PUSH** will be displayed in the mode field of the screen.

1. OFF
   The OFF switch is used to remove electrical power from the system.

2. STBY (Standby)
   The STBY switch is pushed to turn the system ON. When pushed, the system is in a ready condition after the warm-up period elapses, approximately 4 to 5 minutes.

   The STBY mode may also be used during taxiing, loading, etc., in order to maintain the system in a ready condition.

3. WX (Weather)
   When pushed, the system operates in a normal weather detection mode.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

PUSH BUTTON SWITCHES (CONT)

4. CYC (Cyclical)
When the CYC operation mode is selected, the screen displays 1/2 second alternating contoured and noncontoured weather presentations in RED to reflect intense weather concentrations. While in this mode, the PRESET GAIN is automatically substituted for the variable GAIN.

5. MAP
When pressed, the system may be used for ground mapping.

6. TGT ALRT (Target Alert)
This alternate action push button switch is used to enable the TGT ALRT mode function. When pressed, a light blue colored letter T appears in a red box in the upper left corner of the screen.

The target alert symbol (light blue colored **TGT** in the red box) appears and flashes when the following conditions are satisfied: (1) radar senses a target resulting in 3 level video, (2) the target is within ± 7.5° of the airplane nose centerline, and (3) a target falls within a 60 to 150 nautical mile range.

NOTE

The TGT ALRT is disabled by selecting the MAP mode or adjusting the GAIN from PRESET position.

7. AZIM MKS (Azimuth Markers)
When pressed, the screen displays radial lines in 30° increments.

CONTROL KNOBS

1. RANGE
The RANGE control is a rotary switch with 6 detent positions, used to select one of five nautical miles ranges (10, 25, 50, 100 or 200) or a TEST mode.

In the TEST mode, all colors are seen in a test pattern. There are two sets of test colors: GREEN, YELLOW, RED and BLUE for normal weather operational test and LIGHT BLUE, YELLOW, PALE PURPLE and GREEN for ground mapping operational test. The transmitter does not transmit and the range is automatically set to 100 nautical miles.

2. GAIN
The GAIN control is a rotary control with one detent position, PRESET, full counterclockwise. The GAIN is used to adjust the sensitivity of the receiver, primarily to resolve nearby strong target signals and usually during ground mapping mode of operation.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

CONTROL KNOBS (CONT)

The sensitivity increases as the control is rotated clockwise. When the control is not in the PRESET detent, **VAR** is displayed in the auxiliary field of the screen.

3. STAB (Stabilization)
The STAB control is a two position rotary switch: ON or OFF. With the STAB in the ON position, the antenna maintains a relative position to the earth during the airplane's manuevering (climbs, descents, turns or banks). With the STAB in the OFF position, the antenna maintains a relative position to the airframe.

4. INT (Intensity)
The INT control is a rotary control used to regulate the display brightness. The display retains distinguishable illumination levels throughout the control range.

5. TILT
The TILT controls the antenna transmitting beam relative to the earth with the STAB on or with relation to the airframe with STAB switch off. The control is indexed for tilt 0° to 12° up or down.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

RCA/SPERRY PRIMUS 40 WXD WEATHER RADAR SYSTEM

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 12-18-78

REISSUED DATE: 9-24-85

Don P. Watson

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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the RCA/Sperry Primus 40 WXD Weather Radar System is installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

GROUND OPERATIONS

1. During fueling ..... DO NOT OPERATE WEATHER RADAR

CAUTION

DO NOT OPERATE WEATHER RADAR WITHIN 100 YARDS, MINIMUM, OF ANY FUELING OPERATIONS.

2. Preflight Check
   a. Mode of Operation ..... STBY (STANDBY)
   b. Near large objects (hangers, aircraft, etc.) ..... 100 YARDS, MINIMUM 60° LEFT AND RIGHT OF AIRPLANE NOSE. TILT ANTENNA FULL UP
   c. Ground Personnel ..... NO CLOSER THAN 6 FEET RADIUS AND 135° LEFT AND RIGHT OF THE AIRPLANE NOSE

WARNING

PERSONNEL CLOSER THAN 6 FEET RADIUS OF THE AIRPLANE NOSE MAY BE EXPOSED TO HEAT AND RADIATION.

SECTION 2 OPERATING LIMITATIONS (CONT)

GROUND OPERATIONS (CONT)

3. All Other Ground Operations ..... STANDBY or OFF

IN-FLIGHT OPERATIONS

1. Operate system for weather detection and ground mapping only.

WARNING

DO NOT USE THE WEATHER RADAR AS A PROXIMITY WARNING, FOR ANTI-COLLISION PROTECTION OR WARNING SYSTEM.

SECTION 3 EMERGENCY PROCEDURES

No Change

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

PREFLIGHT CHECK

1. Electrical Power ..... OFF
   Weather Radar
   a. OFF Switch Button ..... DEPRESS
   b. TILT Control ..... FULL UP
   c. GAIN Control ..... PRESET (FULL CCW)
   d. INT (Intensity) Control ..... APPROXIMATE MIDPOINT
   e. STAB (Stabilization) Control ... ON
   f. SWEEP Control ..... 120°
   g. RNG (Range) Control ..... TEST
2. Electrical Power ..... ON (AC and DC)
3. Radio Master Switches ..... ON
4. Weather Radar Circuit Breakers ..... ENGAGE
5. STBY (Standby) Mode Switch ..... PRESS. ALLOW WARM-UP TIME

NOTE

Allow approximately 1 minute for warm-up. Should NORM, CTR, CYC, or MAP mode be selected from OFF, the system will remain inoperative until the warm-up time has elapsed.

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

6. NORM (Normal) Mode Button ..... PRESS. OBSERVE TEST PATTERN
   a. INTENSITY Control ..... AS DESIRED
   b. Observe one of the following test patterns:
      (1) Four level scale, target alert and RF noise band between 90 and 100 nautical miles.
      (2) Two levels of intensity at 0 to 20 nautical miles and 65 to 70 nautical miles. A brilliant scale at 20 to 65 nautical miles and 95 to 100 nautical mile (target alert area) range will cyclically alternate between contoured and noncontoured sweeps.

CAUTION

DO NOT USE IF BREAKING UP OR SKIPPING IN THE RF NOISE BAND IS INDICATED.

7. CTR (Contour) Mode Button ..... PRESS. OBSERVE TEST PATTERN
   a. INTENSITY Control ..... AS DESIRED
   b. Observe one of the following test patterns:
      (1) Three level scale, target alert and RF noise band between 90 and 100 nautical miles.
      (2) Two levels of intensity at 0 to 20 nautical miles and 65 to 78 nautical miles. A brilliant scale at 95 to 100 nautical mile (target alert area) range.

CAUTION

DO NOT USE IF BREAKING UP OR SKIPPING IN THE RF NOISE BAND IS INDICATED.

8. CYC (Cyclical) Mode Button ..... PRESS. OBSERVE TEST PATTERN, SAME AS NORM TEST PATTERN
9. MAP Mode Button ..... PRESS. OBSERVE TEST PATTERN, SAME AS NORM TEST PATTERN

BEFORE TAKEOFF OR IN-FLIGHT

NORMAL WEATHER DETECTION

1. NORM Switch Button ..... PRESS
2. RNG (Range) Control ..... AS REQUIRED
3. INT (Intensity) Control ..... AS DESIRED
4. Antenna Position ..... TILT AS REQUIRED TO ELIMINATE GROUND CLUTTER

SECTION 5 NORMAL PROCEDURES (CONT)

BEFORE TAKEOFF OR IN-FLIGHT (CONT)

NORMAL WEATHER DETECTION (CONT)

5. Antenna SWEEP ..... 60° OR 120° AS REQUIRED
6. GAIN Control ..... AS DESIRED
7. AZ MRK (Azimuth Markers) Switch ..... PRESS AS REQUIRED FOR RADIAL LINES
8. TRGT ALRT (Target Alert) Switch ..... PRESS AS REQUIRED FOR WARNING OF CONTOURABLE TARGET

NOTE

If in the FRZ (Freeze) mode, the lamp will blink as a warning of a strong target within 75 to 150 nautical miles and ± 11° ahead.

CONTOUR WEATHER DETECTION

1. CTR (Contour) ..... PRESS
2. RNG (Range) Control ..... AS REQUIRED
3. INT (Intensity) Control ..... AS DESIRED
4. Antenna Position ..... TILT AS REQUIRED TO ELIMINATE GROUND CLUTTER
5. Antenna SWEEP ..... 60° or 120° AS REQUIRED
6. GAIN ..... AUTOMATICALLY SET TO PRESET
7. AZ MRK (Azimuth Markers) Switch ..... PRESS AS REQUIRED FOR RADIAL LINES
8. TRGT ALRT (Target Alert) Switch ..... PRESS AS REQUIRED FOR WARNING OF CONTOURABLE TARGET

NOTE

If in the FRZ (Freeze) mode, the lamp will blink as a warning of a strong target within 75 to 150 nautical miles and ± 11° ahead, but the display is frozen.

9. Observe Screen ..... INTENSE WEATHER CONCENTRATION DISPLAYED IN DARK WITH LIGHTER LEVELS SURROUNDING IT

CYCLIC MODE OPERATION

1. CYC (Cyclical) Mode Switch ..... PRESS
2. RNG (Range) Control ..... AS REQUIRED
3. INT (Intensity) Control ..... AS DESIRED
4. Antenna Position ..... TILT AS REQUIRED TO ELIMINATE GROUND CLUTTER
5. Antenna SWEEP ..... 60° OR 120° AS REQUIRED
6. GAIN Control ..... AUTOMATICALLY SET TO PRESET

SECTION 5 NORMAL PROCEDURES (CONT)

BEFORE TAKEOFF OR IN-FLIGHT (CONT)

CYCLIC MODE OPERATION (CONT)

7. AZ MRK (Azimuth Markers) Switch ..... PRESS AS REQUIRED FOR RADIAL LINES
8. TRGT ALRT (Target Alert) Switch ..... PRESS AS REQUIRED FOR WARNING OF CONTOURABLE TARGET

NOTE

If in the FRZ (Freeze) mode, the lamp will blink as a warning of a strong target within 75 to 150 nautical miles and ± 11° ahead, but the display is frozen.

9. Observe Screen ..... DISPLAYS NORMAL AND CONTOUR MODES ON ALTERNATE SCANS

GROUND MAPPING

1. MAP Button ..... PRESS
2. RNG (Range) Control ..... AS REQUIRED
3. INT (Intensity) Control ..... AS DESIRED
4. Antenna Position ..... TILT DOWN UNTIL DESIRED TERRAIN IS DISPLAYED

NOTE

The degree of down tilt depends upon airplane altitude and selected range.

5. Antenna SWEEP ..... 60° or 120° AS REQUIRED
6. Insufficient Terrain Detail ..... ADJUST GAIN CONTROL FOR DESIRED TERRAIN DETAIL

APPROACH

1. Operation Mode ..... STBY, AS REQUIRED

AFTER LANDING

1. Operation Mode ..... OFF

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION

GENERAL

The Primus 40 WXD Weather Radar System is a navigation aid which enables the pilot to detect and analyze undesirable weather conditions. This system consists of three units: an antenna, a receiver/transmitter and an indicator.

OPERATION

The system is controlled by the pilot. The system's controls are located on the indicator adjacent to the display screen.

PUSH BUTTON CONTROL SWITCHES

1. OFF
   The OFF switch is used to remove electrical power from the system.

2. STBY (Standby)
   The STBY switch is pushed to apply power to the system. When pushed, the system is in a ready condition after the warm-up period elapses (approximately 1 minute).

   The STBY mode may also be used during taxiing, loading, etc., in order to maintain the system in a ready condition.

   While in STBY, the antenna does not scan nor does the transmitter transmit.

3. NORM (Normal)
   When pushed, the system operates in a normal weather detection mode.

4. CTR (Contour)
   When the CTR operation mode is selected, the screen displays contoured weather data that is delineated by a border. While in this mode, the GAIN PRESET is automatically substituted for the VAR (Variable) gain.

5. CYC (Cyclical)
   When the CYC operation mode is selected, the screen displays alternating normal and contoured modes to reflect intense weather concentrations. While in this mode, the display is automatically set to GAIN PRESET.

5. MAP
   When pressed, the system may be used for ground mapping.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

CONTROL KNOBS

1. RANGE
   The RANGE control is a rotary switch with seven detent positions used to select one of six nautical mile ranges (10, 25, 50, 100, 200 or 300) or a TEST mode.

2. TILT
   The TILT controls the antenna transmitting beam relative to the earth with the STAB on or with relation to the airframe with STAB off. The control is indexed for tilt 0° to 15° up or down.

3. INTENSITY
   The INTENSITY control is a rotary control used to regulate the brightness of the display. The display retains distinguishable illumination levels throughout the control range.

4. GAIN
   The GAIN control is a rotary control with one detent position (GAIN PRESET), at full counterclockwise. The GAIN is used to adjust the sensitivity of the receiver, primarily to resolve nearby strong target signals, usually during ground mapping mode of operation. The sensitivity increases as the control is rotated clockwise.

5. STAB (Stabilization)
   The STAB control is a two position rotary switch: ON and OFF. With the STAB in the on position, the antenna maintains a relative position to the earth during the airplane's maneuvering (climb, descent, turns, and banks). With the STAB in the off position, the antenna maintains a relative position to the airframe.

6. SWEEP
   The SWEEP control is a rotary switch with three detent positions: 60°, FRZ (freeze), and 120°. When the SWEEP control is in the 60° position, the antenna scans a 60° width at 28 scans per minute, while the 120° position scans a 120° width at 14 scans per minute. The FRZ (freeze) detent position illuminates and displays continuously the last updated data on the screen.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

RCA/SPERRY PRIMUS 400 WXD WEATHER RADAR SYSTEM

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

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Don P. Watson

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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the RCA/Sperry Primus 400 WXD Weather Radar System is installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

GROUND OPERATIONS

1. During Fueling ..... DO NOT OPERATE WEATHER RADAR

CAUTION

DO NOT OPERATE WEATHER RADAR WITHIN 100 YARDS, MINIMUM, OF ANY FUELING OPERATIONS.

2. Preflight Checks
   a. Mode of Operation ..... 100 YARDS, MINIMUM 60° LEFT AND RIGHT OF AIRPLANE NOSE. TILT ANTENNA FULL UP
   b. Near large objects (hangers, aircraft, etc.) ....., NO CLOSER THAT 6 FEET RADIUS AND 135° LEFT AND RIGHT OF THE AIRPLANE NOSE

WARNING

PERSONNEL CLOSER THAN 6 FEET RADIUS OF THE AIRPLANE NOSE MAY BE EXPOSED TO HEAT AND RADIATION.

SECTION 2 OPERATING LIMITATIONS (CONT)

GROUND OPERATIONS (CONT)

3. All Other Ground Operations ..... STANDBY or OFF

IN-FLIGHT OPERATIONS

1. Operate system for weather detection and ground mapping only.

WARNING

DO NOT USE THE WEATHER RADAR AS A PROXIMITY WARNING, FOR ANTI-COLLISION PROTECTION OR WARNING SYSTEM.

SECTION 3 EMERGENCY PROCEDURES

No Change

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

PREFLIGHT CHECK

1. Electrical Power ..... OFF
   Weather Radar
   a. OFF Button ..... DEPRESS
   b. GAIN Control ..... PRESET (FULL CCW)
   c. INT (Intensity) Control ..... APPROXIMATE MIDPOINT
   d. Antenna TILT Control ..... FULL UP (+15)
   e. STAB (Stabilization) Control ... ON
   f. RANGE Control ..... TEST
2. Electrical Power ..... ON (DC and AC)
3. Radio Master Switches ..... ON
4. Weather Radar Circuit Breakers ..... ENGAGE

NOTE

If no mode switch buttons are pressed, an all buttons out condition exists and the word **PUSH** is displayed in the mode field. Depress OFF button for normal operation.

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

5. STBY (Standby) Mode Switch ..... PRESS. ALLOW WARM-UP TIME

NOTE

Allow 1 minute for warm-up. Should WX, CYC, or MAP mode be selected from OFF, the system will remain inoperative until the warm-up time has elapsed and **WAIT** is displayed in the mode field until the system has warmed up.

6. Normal Weather Detection Mode Test Pattern
   - a. WX Button ..... PRESS. OBSERVE TEST PATTERN
   - b. INT (Intensity) Control ..... ADJUST AS DESIRED
   - c. Range Lines and Numbers ..... DISPLAYED IN BLUE
   - d. AZIM MKS Switch ..... PRESS. AZIMUTH LINES DISPLAYED IN BLUE
   - e. Mode Field ..... DISPLAYS TEST IN BLUE
   - f. Auxiliary Field ..... 1, 2, 3 DISPLAYED IN BLUE, WITH CORRESPONDING COLOR BARS OF GREEN, YELLOW AND RED
   - g. 15 to 25 Nautical Mile Range.... GREEN COLOR DISPLAYED
   - h. 25 to 40 Nautical Mile Range ... YELLOW COLOR DISPLAYED

NOTE

An irregular YELLOW line may be observed at the 55 nautical mile range.

   - i. 40 to 55 and 65 to 80 Nautical Mile Range ..... RED COLOR DISPLAYED

NOTE

The inner portion of the 65 to 80 nautical mile range will show YELLOW instead of RED if the optional 18 inch antenna is installed.

   - j. 85 to 95 Nautical Mile Range (RF Noise Band) ..... BROKEN GREEN COLOR DISPLAYED

CAUTION

SHOULD THE RF NOISE BAND BE WEAK, MISSING, OR BREAKING UP, THE SYSTEM MAY HAVE PROBLEMS AND SHOULD NOT BE USED.

   - k. Target Alert Area (80 to 100 Nautical Mile Range) ..... RED COLOR DISPLAYED

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

7. Contour Mode Test Pattern
   - a. CYC Switch ..... PRESS. OBSERVE TEST PATTERN
   - b. INT Control ..... AS DESIRED
   - c. Range, Azimuth Lines and Numbers ..... DISPLAYED IN BLUE
   - d. Mode Field ..... DISPLAYS TEST IN BLUE
   - e. Auxiliary Field ..... 1, 2, 3 DISPLAYED IN BLUE, WITH CORRESPONDING COLOR BARS OF GREEN, YELLOW AND RED
   - f. 15 to 25 Nautical Mile Range ... GREEN COLOR DISPLAYED
   - g. 25 to 40 Nautical Mile Range ... YELLOW COLOR DISPLAYED

NOTE

An irregular YELLOW line may be observed at 55 nautical mile range.

   - h. 40 to 55 and 65 to 80 Nautical Mile Range ..... RED COLOR DISPLAYED, FLASHING APPROXIMATELY EVERY 1/2 SECOND
   - i. 85 to 95 Nautical Mile Range (RF Noise Band) ..... BROKEN GREEN COLOR DISPLAYED

CAUTION

SHOULD THE RF NOISE BAND BE WEAK, MISSING, OR BREAKING UP, THE SYSTEM MAY HAVE PROBLEMS AND SHOULD NOT BE USED.

   - j. Target Alert Area (80 to 100 Nautical Mile Range) ..... RED COLOR DISPLAYED, FLASHING APPROXIMATELY EVERY 1/2 SECOND

8. TGT ALRT (Target Alert) Switch ..... PRESS. THE LETTER T APPEARS IN RED BOX, THEN REPLACED BY FLASHING TGT

NOTE

The target alert test function can be checked in the WX and CYC modes and not in the MAP mode.

9. Ground Mapping Mode Test Pattern
   - a. MAP Button ..... PRESS. OBSERVE TEST PATTERN
   - b. INT Control ..... AS DESIRED
   - c. MODE Field ..... DISPLAY TEST IN GREEN
   - d. Range Lines, Azimuth Lines, and Numbers ..... DISPLAYED IN GREEN

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

e. Auxiliary Field ..... **1, 2, 3** DISPLAYED IN BLUE, WITH CORRSPONDING COLOR BARS OF LIGHT BLUE, YELLOW AND PALE PURPLE

f. 15 to 25 Nautical Mile Range ... LIGHT BLUE COLOR DISPLAYED

g. 25 to 40 Nautical Mile Range ... YELLOW COLOR DISPLAYED

h. 40 to 55 and 65 to 80 Nautical Mile Range ..... PALE PURPLE COLOR DISPLAYED

i. 85 to 95 Nautical Mile Range (RF Noise Band) ..... BROKEN GREEN COLOR DISPLAYED

CAUTION

SHOULD THE RF NOISE BAND BE WEAK, MISSING, OR BREAKING UP, THE SYSTEM MAY HAVE PROBLEMS AND SHOULD NOT BE USED.

j. Target Alert Area (80 to 100 Nautical Mile Range) ..... PALE PURPLE COLOR DISPLAYED

10. Operation Mode ..... STBY

BEFORE TAKEOFF OR IN-FLIGHT

NORMAL WEATHER DETECTION

1. Wx Button ..... PRESS
2. RANGE Control ..... AS REQUIRED
3. INT (Intensity) Control ..... AS DESIRED
4. Antenna Position ..... TILT AS REQUIRED TO ELIMINATE GROUND CLUTTER

NOTE

TGT ALRT is disabled when in the MAP mode, or GAIN is not in PRESET.

5. Scan Width (Angle) ..... SELECT 120° OR 60° AS DESIRED BY PRESSING SEC SCAN SWITCH

NOTE

If the GAIN control is not in the PRESET detent position, **VAR** will replace **1, 2, 3** in the auxiliary field.

CONTOUR WEATHER DETECTION

1. CYC Mode Switch ..... PRESS
2. RANGE Control ..... AS REQUIRED
3. INT Control ..... AS DESIRED
4. Antenna Position ..... TILT AS REQUIRED TO ELIMINATE GROUND CLUTTER

SECTION 5 NORMAL PROCEDURES (CONT)

BEFORE TAKEOFF OR IN-FLIGHT (CONT)

CONTOUR WEATHER DETECTION (CONT)

5.	GAIN	VAR (VARIABLE) AUTOMATICALLY DISABLED AND PRESET SUBSTITUTED WHEN IN CYC MODE
6.	Scan Width (Angle)	SELECT 120° OR 60° AS DESIRED
7.	Observe Screen	RED DISPLAY ONLY ALTERNATES BETWEEN NORMAL AND CONTOURED MODES. THAT IS, THE RED DATA GOES DARK AND 1/2 SECOND LATER REAPPEARS RED

GROUND MAPPING

1.	MAP Button	PRESS
2.	RANGE Control	AS REQUIRED
3.	INT Control	AS DESIRED
4.	Antenna Position	TILT DOWN UNTIL DESIRED TERRAIN IS DISPLAYED

NOTE

The degree of down tilt depends upon airplane altitude and selected range.

5.	Scan Width (Angle)	SELECT 120° OR 60° AS DESIRED
6.	Insufficient Terrain Detail	ADJUST GAIN CONTROL FROM PRESET FOR DESIRED TERRAIN DETAIL

APPROACH

1.	Operation Mode	STBY, AS REQUIRED

AFTER LANDING

1.	Operation Mode	OFF

SYSTEM DESCRIPTION

GENERAL

The Primus 400 WXD Weather Radar System is a navigation aid which enables the pilot to detect and analyze undesirable weather conditions. This system consists of three units: an antenna, a receiver/transmitter and an alphanumerical color indicator.

OPERATION

The system is controlled by the pilot. The system's controls are located on the indicator adjacent to the display screen.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

The screen displays two sets of colors. The first set is GREEN, YELLOW, and RED. The WX and CYC mode operates with GREEN as the least rainfall and RED as the heaviest rainfall. The second set is LIGHT BLUE, YELLOW and PALE PURPLE for the MAP mode operation with LIGHT BLUE being the least reflective and PALE PURPLE being the most reflective.

PUSH BUTTON SWITCHES

NOTE

If an all buttons out condition exists, the system will be in the standby mode and the word PUSH will be displayed in the mode field of the screen.

1. OFF
   The OFF switch is used to remove electrical power from the system.

2. STBY (Standby)
   The STBY switch is pushed to turn the system ON. When pushed, the system is in a ready condition after the warm-up period elapses (approximately 1 minute). The STBY mode may also be used during taxiing, loading, etc., in order to maintain the system in a ready condition. While in STBY, the antenna does not scan nor does the transmitter transmit.

3. WX
   When pushed, the system operates in a normal weather detection mode.

4. CYC (Cyclical)
   When the CYC operation mode is selected, the screen displays 1/2 second alternating contoured and noncontoured weather in RED to reflect intense weather concentrations. While in this mode, the PRESET GAIN is automatically substituted for the variable GAIN.

5. MAP
   When pressed, the system may be used for ground mapping.

6. TGT ALRT (Target Alert)
   This alternate action push button switch is used to enable the TGT ALRT mode function. When pressed, a light blue colored letter T appears in a red box in the upper left corner of the screen.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

PUSH BUTTON SWITCHES (CONT)

The target alert symbol (light blue colored **TGT** in the red box) appears and flashes when the following conditions are satisfied: (1) radar senses a target resulting in 3 level video, (2) the target is within 7.5° of the airplane nose centerline, and (3) a target falls within a 60 to 150 nautical mile range.

NOTE

The TGT ALRT is disabled by selecting the MAP mode or adjusting the GAIN from the PRESET position.

7. FRZ (Freeze)
This alternate action push button switch is used to freeze (stop and hold) the data updating. When in the FRZ mode, the letters **FRZ** flash at 1/2 second intervals in the auxiliary field display.

8. SEC SCAN (Select Scan)
This alternate action push button switch is used to select the antenna scan width (angle): 120° or 60°. When the system is first switched on, 120° scan width is automatically operative. When the SEC SCAN switch is pressed, the antenna scan width is 60°. Pressing the switch again returns the scan width to 120°. The 60° width scans 28 times per minute whereas the 120° width scans 14 times per minute.

9. AZIM MKS (Azimuth Markers)
When pressed, the screen displays radial lines at 30° increments.

CONTROL KNOBS

1. RANGE
The RANGE control is a rotary switch with 6 detent positions used to select one of the six nautical mile ranges (10, 25, 50, 100, 200 or 300) or a TEST mode.

In the TEST mode, all colors are seen in a test pattern. There are two sets of test colors: GREEN, YELLOW, RED and BLUE for normal weather operational tests and LIGHT BLUE, YELLOW, PALE PURPLE and GREEN for ground mapping operational tests. The transmitter does not transmit and the range is automatically set to 100 nautical miles.

2. GAIN
The GAIN control is a rotary control with one detent position (PRESET), full counterclockwise. The GAIN is used to adjust the sensitivity of the receiver, primarily to resolve nearby strong target signals and usually during ground mapping mode of operation.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

CONTROL KNOBS (CONT)

The sensitivity increases as the control is rotated clockwise. When the control is not in the PRESET detent, **VAR** is displayed in the auxiliary field of the screen.

3. STAB
The STAB control is a two position rotary switch: ON and OFF. When on, the antenna maintains a relative position to the earth during the airplane's manuevering (climbs, descents, turns or banks). When off, the antenna maintains a relative position to the airframe.

4. INT (Intensity)
The INT control is a rotary control used to adjust the display brightness. The display retains distinguishable illumination levels throughout the control range.

5. TILT
The TILT controls the antenna transmitting beam relative to the earth with the STAB on or with relation to the airframe with STAB off. The control is indexed for tilt 0° to 15° up or down.

LIGHTING

The radar indicator controls, switches, and legends are internally illuminated and controlled by the PILOT FLIGHT INST rheostat in the overhead switch console.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

BENDIX RDR-1200B WEATHER RADAR

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 12-04-78

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Don P. Watson

Don P. Watson, Manager
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Southwest Region,
Ft. Worth, Texas 76101

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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the Bendix RDR-1200B Weather Radar System is installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

GROUND OPERATIONS

1. During fueling operations ..... DO NOT OPERATE WEATHER RADAR

CAUTION

DO NOT OPERATE WEATHER RADAR WITHIN 100 YARDS, MINIMUM, OF ANY FUELING OPERATIONS.

2. Preflight Checks
   - a. Mode of Operation ..... STBY (STANDBY)
   - b. Near Large Objects (Hangers, Aircraft, Etc.) ..... 100 YARDS, MINIMUM 60° LEFT AND RIGHT OF AIRPLANE NOSE. TILT ANTENNA FULL UP
   - c. Ground Personnel ..... NO CLOSER THAN 7 FEET RADIUS AND 90° LEFT AND RIGHT OF THE AIRPLANE NOSE

WARNING

PERSONNEL CLOSER THAN 7 FEET RADIUS OF THE AIRPLANE NOSE MAY BE EXPOSED TO HEAT AND RADIATION.

SECTION 2 OPERATING LIMITATIONS (CONT)

GROUND OPERATIONS (CONT)

3. All Other Ground Operations ..... STANDBY or OFF

IN-FLIGHT OPERATIONS

1. Operate system for weather detection and ground mapping only

WARNING

DO NOT USE THE WEATHER RADAR AS A PROXIMITY WARNING, FOR ANTI-COLLISION PROTECTION OR WARNING SYSTEM.

SECTION 3 EMERGENCY PROCEDURES

No Change

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

PREFLIGHT CHECK

1. Electrical Power ..... OFF
   Weather Radar
   a. RANGE Selector ..... OFF
   b. Mode Selector ..... Wx
   c. BRT (Brightness) Control ..... APPROXIMATE MIDPOINT
   d. Tilt Control ..... 4° UP
   e. STAB (Stabilization) ..... PUSH TILT KNOB FOR STAB ON
2. Electrical Power ..... ON (AC and DC)
3. Radio Master Switches ..... ON
4. Weather Radar Circuit Breakers ..... ENGAGED
5. RANGE Selector ..... STBY. ALLOW WARM-UP TIME

NOTE

Allow approximately 30 seconds for warm-up. Should TEST or a range distance be selected from OFF, the system will remain inoperative until the warm-up time has elapsed.

6. Normal Weather Detection TEST
   a. RANGE Selector ..... TEST
   b. BRT Control ..... AS DESIRED

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

c.	Fault Monitor Lamp	ILLUMINATES
d.	Mode Readout	DISPLAYS WORD **TEST**
e.	Range Marker Readout	DISPLAYS NUMBERS 50-10
f.	Mode Selector	Wx
g.	Observe Test Pattern Contour ...	FIVE RANGE MARKS. TWO BRIGHTNESS LEVELS (LIGHT, INTERMEDIATE, DARK OR CONTOUR AREA, INTERMEDIATE AND LIGHT)
h.	Mode Selector	WxA
i.	Observe Test Pattern Normal Video	FIVE RANGE MARKS. TWO BRIGHTNESS LEVELS WITH ALTERNATING DARK/BRILLIANT (CONTOUR AREA); LIGHT, INTERMEDIATE, DARK/BRILLIANT, INTERMEDIATE, AND LIGHT
j.	Mode Selector	MAP
k.	Observe Test Pattern MAP	FIVE RANGE MARKS. THREE BRIGHTNESS LEVELS (LIGHT, INTERMEDIATE, BRILLIANT, INTERMEDIATE, AND LIGHT)
l.	HOLD Button	PRESS. SWEEP LINE DISAPPEARS, TEST PATTERN REMAINS. WORD **HOLD** IS DISPLAYED FLASHING IN THE MODE READOUT

NOTE

The HOLD button may be pressed during any of the three modes: Wx, WxA, or MAP.

7.	RANGE Selector	25 (TRANSMITTER IS ON) FAULT MONITOR LAMP EXTINGUISHES
8.	Mode Selector	Wx
9.	Tilt Control	4° UP (INITIALLY)
10.	BRT Control	AS DESIRED
11.	STAB (Stabilization) Lamp	ILLUMINATES WHEN STAB IS DISABLED BY PULLING TILT CONTROL KNOB

NOTE

It may become necessary to vary the degree of tilt 0° to 15°. Ground clutter may be noted at low tilt, while local moisture laden weather appears at higher tilt angles.

12. RANGE Selector ..... STBY

SECTION 5 NORMAL PROCEDURES (CONT)

BEFORE TAKEOFF OR IN-FLIGHT

NORMAL WEATHER DETECTION

1. RANGE Selector ..... DESIRED RANGE
2. Mode Selector ..... Wx
3. Tilt Control ..... AS REQUIRED TO ELIMINATE GROUND CLUTTER

NOTE

If no target images are displayed, select another range or adjust the antenna tilt angle.

4. BRT Control ..... AS DESIRED
5. Contoured/Noncontoured Display ..... WxA

GROUND MAPPING

1. Mode Selector ..... SET GAIN AS REQUIRED FOR SENSITIVITY
2. RANGE Control ..... AS REQUIRED
3. BRT Control ..... AS DESIRED
4. Antenna Position ..... TILT DOWN UNTIL DESIRED TERRAIN IS DISPLAYED

NOTE

The degree of down tilt depends upon airplane altitude and selected range.

5. Insufficient Terrain Detail ..... ADJUST GAIN MANUALLY FOR DESIRED TERRAIN DETAIL

APPROACH

1. RANGE Selector ..... STBY

AFTER LANDING

1. RANGE Selector ..... OFF

SYSTEM DESCRIPTION

GENERAL

The Bendix RDR-1200B Weather Radar System is a navigation aid which enables the pilot to detect and analyze undesirable weather conditions. This system consists of three units: an antenna, receiver/transmitter and an alphanumerical indicator.

OPERATION

1. RANGE Selector

The RANGE Selector is a rotary switch with nine detent positions: OFF, STBY (Standby), TEST, and six (6) range positions.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

a. OFF position is selected to remove electrical power from the entire system.

b. STBY (Standby) position is utilized to apply electrical power to the system during the warm-up period (approximately 30 seconds). The STBY mode may also be used during taxiing, loading, etc., to maintain the system in ready condition.

While in STBY, the antenna does not scan nor does the transmitter transmit.

c. TEST position illuminates the display with a test pattern of multiple brightness levels. The transmitter does not transmit.

d. The range positions are 5, 10, 25, 50, 100, and 200 nautical miles with range markers at 1, 2, 5, 10, 20, and 40 nautical mile increments respectively.

Each time a different range is selected, the indicated display is erased so the old and new information will not be confused.

2. Mode Selector
The mode selector is a rotary switch with multiple detents. One detent is marked Wx, which places the system in an automatic contour weather detection mode. The WxA detent places the system in an alternating normal/contour weather detection mode. The remaining detents are marked MAP/GAIN-MIN/MAX, which places the system in a ground mapping mode. The GAIN adjusts the sensitivity.

3. HOLD Push Button
The HOLD push button freezes the last updated data on the display for viewing. The word **HOLD** is displayed in the mode readout until the button is pressed to cancel the mode.

4. Fault Monitor Lamp
The fault monitor lamp is amber and will illuminate should a malfunction occur, such as low power or a weak receiver. The lamp illuminates in STBY or any selected range.

5. BRT (Brightness) Control
The BRT control is a rheostat used to control the intensity of the display screen.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

6. STAB (Stabilization) Control
   The STAB function is ON when the TILT control knob is pushed in. The STAB function may be disabled by pulling the TILT control knob. When disabled, the **STAB OFF** light will illuminate.

7. TILT Control
   The TILT controls the antenna transmitting beam relative to the earth with STAB on or with relation to the airplane with STAB off. The control is indexed for tilt 0° to 15° up or down.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

BENDIX RDR-1200 COLORVISION WEATHER RADAR SYSTEM

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

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Don P. Watson

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Southwest Region,
Ft. Worth, Texas 76101

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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the Bendix RDR-1200 Colorvision Weather Radar System is installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

GROUND OPERATIONS

1. During Fueling Operations ..... DO NOT OPERATE WEATHER RADAR

CAUTION

DO NOT OPERATE WEATHER RADAR WITHIN 100 YARDS, MINIMUM, OF ANY FUELING OPERATIONS.

2. Preflight Checks
   a. Mode of Operation ..... STBY (STANDBY)
   b. Near large objects (hangers, aircraft, etc.) ..... 100 YARDS, MINIMUM 60° LEFT AND RIGHT OF AIRPLANE NOSE. TILT ANTENNA FULL UP
   c. Ground Personnel ..... NO CLOSER THAN 15 FEET RADIUS AND 135° LEFT AND RIGHT OF THE AIRPLANE NOSE

WARNING

PERSONNEL CLOSER THAN 15 FEET RADIUS OF THE AIRPLANE NOSE MAY BE EXPOSED TO HEAT AND RADIATION.

SECTION 2 OPERATING LIMITATIONS (CONT)

GROUND OPERATIONS (CONT)

3. All Other Ground Operations ..... STANDBY or OFF

IN-FLIGHT OPERATIONS

1. Weather Radar ..... OPERATE SYSTEM FOR WEATHER DETECTION AND GROUND MAPPING ONLY

WARNING

DO NOT USE THE WEATHER RADAR AS A PROXIMITY WARNING, FOR ANTI-COLLISION PROTECTION OR WARNING SYSTEM.

SECTION 3 EMERGENCY PROCEDURES

No Change

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

PREFLIGHT CHECK

1. Electrical Power ..... OFF
   Weather Radar
   a. Function Switch ..... OFF (FULL CCW)
   b. BRT (Brightness) Control ..... APPROXIMATE MIDPOINT
   c. GAIN Control ..... MAX (FULL CW)
   d. STAB (Stabilization) Control ... OUT POSITION FOR ON
   e. Antenna TILT Control ..... FULL UP (+15)
   f. 60° Scan Button ..... OUT POSITION FOR 120° SCAN WIDTH
   g. HOLD Button ..... OUT POSITION FOR OFF
   h. NAV Button ..... OUT POSITION FOR OFF

NOTE

NAV display function inoperative when not connected to navigation system.

The STAB, HOLD, 60°, and NAV button switches are alternate action switches and must be pressed for each IN or OUT position.

2. Electrical Power ..... ON (DC and AC)
3. Radio Master Switches ..... ON
4. Weather Radar Circuit Breakers ..... ENGAGE

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

5. Function Switch ..... STBY. ALLOW WARM-UP TIME

NOTE

Allow approximately 2 minutes for warm-up. Should TEST or ON be selected from OFF, the system will remain inoperative until the warm-up time has elapsed.

6. Normal Weather Detection Mode Test Pattern
   a. Function Switch ..... TEST
   b. BRT (Brightness) Control ..... AS DESIRED

NOTE

The word **TEST**, located in the upper right corner of the screen, and **WX** (normal weather detection), located in the lower left corner of the screen, are displayed in BLUE.

Normal weather detection (WX) mode is automatically selected when the system is switched to the TEST function from STBY.

   c. Range Lines and Numbers ..... DISPLAYED IN BLUE
   d. Range ..... 40 NAUTICAL MILES AUTOMATIC WHEN IN TEST
   e. RT FAULT Display ..... **RT FAULT** APPEARS IN LOWER RH CORNER
   f. Test Pattern ..... GREEN, YELLOW, RED, YELLOW AND GREEN COLORED BANDS DISPLAYED

NOTE

The width of the test pattern bands is not critical, nor is the position of the bands relative to the range marks.

7. Weather Alert Detection Mode Test Pattern
   a. Mode Switch ..... MOMENTARILY PRESS; INFORMATION LIST APPEARS. MOMENTARILY PRESS APPROPRIATE MODE SWITCH TO CHANGE TO WXA; LETTERS **WXA** COLOR CHANGES TO BLUE WHEN SELECTED
   b. Observe Test Pattern ..... **WXA** DISPLAYED IN LOWER LEFT SCREEN CORNER

NOTE

The test pattern is the same as the WX mode except the RED band should alternate from RED to BLACK approximately once per second.

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

8. Function Switch ..... STBY

BEFORE TAKEOFF OR IN FLIGHT

NORMAL WEATHER DETECTION

CAUTION

RT FAULT APPEARS IN THE LOWER RIGHT CORNER OF THE SCREEN TO DENOTE A MALFUNCTION IN THE RECEIVER/TRANSMITTER. WHEN **RT FAULT** APPEARS, DO NOT USE THE SYSTEM.

1. Function Switch ..... ON. EXISTING MODE AND RANGE ARE DISPLAYED IN BLUE
2. Information List ..... MOMENTARILY PRESS EITHER MODE SELECT SWITCH BUTTON. INFORMATION LIST IS DISPLAYED ON SCREEN
3. Mode Selection ..... MOMENTARILY PRESS APPROPRIATE MODE SELECT SWITCH BUTTON FOR DESIRED WX OR WXA MODE

NOTE

The selected mode letters are displayed in BLUE. The high level RED bar flashes when WXA mode is selected.

4. Range Selection ..... MOMENTARILY PRESS APPROPRIATE RANGE SELECT SWITCH BUTTON FOR DESIRED RANGE

NOTE

Range selection may be made at any time, even without the information list being displayed.

5. Information List ..... DISAPPEARS. REPLACED BY SCANNING DISPLAY, RANGE, AND LINES

NOTE

The selected mode is displayed in the lower left corner of the screen. The selected range is displayed in the upper right corner of the screen near the last range line.

6. BRT (Brightness) Control ..... AS DESIRED
7. GAIN ..... AUTOMATICALLY PRESET WHEN IN THE WX OR WXA OPERATIONAL MODE

SECTION 5 NORMAL PROCEDURES (CONT)

BEFORE TAKEOFF OR IN FLIGHT (CONT)

NORMAL WEATHER DETECTION (CONT)

8.	Antenna Position	TILT AS REQUIRED TO ELIMINATE GROUND CLUTTER
9.	Range Change Required	MOMENTARILY PRESS APPROPRIATE RANGE BUTTON
10.	Scan Width (Angle)	SELECT 120° OR 60° AS DESIRED

NOTE

The 60° button IN position allows for a 60° scan width; 60° button OUT position allows for a 120° scan width.

11.	Track Select Switch	PRESS APPROPRIATE TRACK BUTTON AS DESIRED. YELLOW TRACK CURSOR LINE APPEARS AND MOVES IN DIRECTION SELECTED, RELEASE BUTTON WHEN TRACK HAS BEEN SELECTED. DEGREES TO TURN ARE DISPLAYED IN UPPER LEFT SCREEN CORNER

GROUND MAPPING

1.	Mode Switch	MOMENTARILY PRESS. INFORMATION LIST APPEARS. MOMENTARILY PRESS APPROPRIATE MODE SWITCH TO CHANGE TO MAP
2.	Range Control	MOMENTARILY PRESS APPROPRIATE RANGE SELECT SWITCH BUTTON FOR DESIRED RANGE
3.	BRT (Brightness) Control	AS REQUIRED
4.	Antenna Position	TILT DOWN UNTIL DESIRED TERRAIN IS DISPLAYED

NOTE

The degree of down tilt depends upon airplane altitude and selected range.

5.	Scan Width (Angle)	SELECT 120° OR 60° AS DESIRED
6.	Insufficient Terrain Detail	ADJUST GAIN CONTROL FOR DESIRED TERRAIN DETAIL

APPROACH

1.	Function Switch	STBY

AFTER LANDING

1.	Function Switch	OFF

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION

GENERAL

The Bendix RDR-1200 Colorvision Weather Radar System is a navigation aid which enables the pilot to detect and analyze undesirable weather conditions. This system consists of three units: an antenna, receiver/transmitter and an alphanumerical color indicator.

OPERATION

The radar system is controlled by the pilot. The system's controls are located on the indicator adjacent to the display screen.

The screen displays one set of colors. The colors are GREEN, YELLOW, and RED for the WX, WXA, and MAP mode operations with GREEN as the least reflective and RED as the most reflective.

CONTROL SWITCH KNOBS

1. FUNCTION SELECTOR

The function selector is located in the lower left corner of the indicator and has four detent positions: OFF, STBY (Standby), TEST, and ON.

a. The OFF position removes primary power from the system.

b. The STBY (Standby) position places the system in a ready condition after the warm-up period (approximately 2 minutes). There is no display on the screen. The STBY mode may also be used during taxiing, loading, etc., in order to maintain the system in a ready condition.

c. The TEST position selects the test function to determine the operability of the system. A test pattern is displayed but no transmission exists. Also, RT FAULT is displayed in the lower right corner of the screen.

d. The ON position selects the condition for normal operation.

2. BRT

The BRT (brightness) control is located in the upper left corner of the indicator. It allows the pilot to adjust the brightness of the display for varying cockpit light conditions.

3. GAIN

The GAIN control is located in the upper right corner of the indicator. This control allows the pilot to vary the radar receiver gain when in the MAP mode of operation. The GAIN is preset when in the TEST function, WX and WXA operational modes.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

CONTROL SWITCH KNOBS (CONT)

4. TILT
The TILT control is located in the lower right corner of the indicator. The TILT controls the antenna transmitting beam relative to the earth with the STAB on or relative to the airplane with the STAB off. The control is indexed for tilt 0° to 15° up or down.

PUSH BUTTON SWITCHES

1. MODE
Two MODE switches, located on the left side of the indicator, allow the pilot to select one of the various operational modes: WX (weather detection), WXA (weather detection with alert), or MA (ground mapping). Modes appear in YELLOW on the screen with the selected mode shown in BLUE.

2. HOLD
The HOLD switch is located on the bottom left side of the indicator. This alternate action push button switch is used to freeze, (stop and hold) the data updating. When in the HOLD mode, the word **HOLD** flashes in the upper left corner of the display.

NOTE

A change in range selection, with the system in HOLD, results in a blank screen.

3. 60°
The 60° switch button is located on the bottom right side of the indicator. This alternate action push button switch is used to select an antenna scan angle width of 60° with the button IN or a 120° scan angle width with the button OUT.

4. RANGE
The RANGE switches are located on the right side of the indicator. The two switches allow the pilot to select one of six ranges: 10, 20, 40, 80, 160, or 240 nautical miles.

5. STAB
The STAB (stabilization) switch is located on the upper right side of the indicator. This alternate action push button switch controls the antenna stabilization. When the button is in the IN position, the antenna stabilization is off and the words **STAB OFF** will appear in the upper left corner of the screen. When the button is in the out position, the antenna stabilization is on. With the STAB in the on position, the antenna maintains a relative position to the earth during the airplane's maneuvering (climbs, descents, turns, or banks). With the STAB in the off position, the antenna maintains a relative position to the airframe.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

CONTROL KNOBS

6. TRACK

The TRACK buttons are located on the bottom of the indicator. When either TRACK button is pressed, a yellow track cursor line appears and moves in the direction of the button being pressed. The track cursor line stops when the button is released, and remains for approximately 15 seconds, then disappears. The differential heading will be indicated in yellow numerals in the upper left corner of the display and will disappear simultaneously with the track cursor line.

7. NAV

The NAV button, when pressed, will display the words **NO NAV** in the lower left corner of the display. The NAV function is inoperative unless the weather radar system indicator is interfaced with an optional navigation unit.

LIGHTING

The radar indicator controls, switches, and legends are internally illuminated and controlled by the PILOT FLIGHT INST rheostat in the overhead switch console.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

RCA/SPERRY PRIMUS 300SL WEATHER RADAR SYSTEM

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 12-19-80

REISSUED DATE: 9-24-85

Don P. Watson

Don P. Watson, Manager
Aircraft Certification Division
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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the RCA/Sperry Primus 300SL Weather Radar System is installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

GROUND OPERATIONS

1. During fueling operations ..... DO NOT OPERATE WEATHER RADAR

CAUTION

DO NOT OPERATE WEATHER RADAR WITHIN 100 YARDS, MINIMUM, OF ANY FUELING OPERATIONS.

2. Preflight Check
   a. Mode of Operation ..... STBY (STANDBY)
   b. Near large objects (hangers, aircraft, etc.) ..... 100 YARDS, MINIMUM 60° LEFT AND RIGHT OF AIRPLANE NOSE. TILT ANTENNA FULL UP
   c. Ground Personnel ..... NO CLOSER THAN 6 FEET RADIUS AND 135° LEFT AND RIGHT OF THE AIRPLANE NOSE

WARNING

PERSONNEL CLOSER THAN 6 FEET RADIUS OF THE AIRPLANE NOSE MAY BE EXPOSED TO HEAT AND RADIATION.

SECTION 2 OPERATING LIMITATIONS (CONT)

GROUND OPERATIONS (CONT)

3. All Other Ground Operations ..... STANDBY or OFF

IN-FLIGHT OPERATIONS

1. Weather Radar ..... OPERATE SYSTEM FOR WEATHER DETECTION AND GROUND MAPPING ONLY

WARNING

DO NOT USE THE WEATHER RADAR AS A PROXIMITY WARNING, OR FOR ANTI-COLLISION PROTECTION OR WARNING SYSTEM.

SECTION 3 EMERGENCY PROCEDURES

No Change

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

PREFLIGHT CHECK

1. Electrical Power ..... OFF
   Weather Radar
   a. INT/OFF Switch ..... OFF (FULL CCW)
   b. GAIN Control ..... PRESET (FULL CCW)
   c. STAB (Stabilization) Control ... ON
   d. Antenna TILT Control ..... FULL UP (+10)
2. Electrical Power ..... ON (DC and AC)
3. Radio Master Switches ..... ON
4. Weather Radar Circuit Breakers ..... ENGAGE
5. INT/OFF Switch ..... TURN CLOCKWISE TO APPROXIMATE MIDPOINT. **STBY** DISPLAYED IN MODE FIELD AND RANGE IDENTIFIER DISPLAYS **100**

NOTE

Allow 3 to 5 minutes for warm-up. Should any other mode function be selected, **WAIT** is displayed in mode field until warm-up time has expired.

6. System Test
   a. TEST Switch ..... PRESS
   b. INT (Intensity) Control ..... AS DESIRED
   c. Range Lines and Numbers ..... DISPLAYED IN BLUE
   d. Mode Field ..... DISPLAYS **TEST** IN BLUE

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

e.	Auxiliary Field	**1, 2, 3** DISPLAYED IN BLUE, WITH CORRESPONDING COLOR BARS OF GREEN, YELLOW AND RED
f.	AZ MK (Azimuth Marks) Switch ...	ON. AZIMUTH LINES DISPLAYED IN BLUE AT 30° INCREMENTS. SWITCH TO OFF AND OBSERVE TEST PATTERN
g.	15 to 25 Nautical Mile Range ...	GREEN COLOR DISPLAYED
h.	25 to 40 Nautical Mile Range ...	YELLOW COLOR DISPLAYED
i.	40 to 55 and 65 to 75 Nautical Mile Range	RED COLOR DISPLAYED AND FLASHES AT 1/2 SECOND INTERVALS
j.	STBY Switch	PRESS. **STBY** REPLACES **TEST** IN MODE FIELD
k.	TGT (Target) ALERT Switch	ON
l.	TEST Switch	PRESS
m.	Target Field	DISPLAYS BLUE **TGT↑**IN A RED BOX AND FLASHES AT 1/2 SECOND INTERVALS
n.	TGT ALERT Switch	OFF
o.	WX/C Switch	PRESS
p.	GAIN Control	TURN FROM PRESET DETENT. **VAR** REPLACES **1, 2, 3** IN AUXILIARY FIELD
q.	FRZ (Freeze) Switch	PRESS. **FRZ** REPLACES **VAR** IN AUXILIARY FIELD AND FLASHES AT 1/2 SECOND INTERVALS
r.	FRZ Switch	PRESS. **VAR** REAPPEARS
s.	WX/C Switch	PRESS. **CYC** REPLACES **WX** IN MODE FIELD
t.	MAP Switch	PRESS. **MAP** REPLACES **CYC** IN MODE FIELD. RANGE MARKS AND ALPHANUMERIC COLOR CHANGES TO GREEN FROM BLUE AND COLOR BARS CHANGE TO LIGHT BLUE, YELLOW AND PALE PURPLE
u.	GAIN Control	PRESET. **VAR** REPLACED BY **1, 2, 3** IN AUXILIARY FIELD
v.	WX/C Switch	PRESS. **WX** REPLACES **MAP** IN MODE FIELD, RANGE MARKS AND ALPHANUMERIC COLOR CHANGES TO BLUE AND COLOR BARS CHANGE TO GREEN, YELLOW AND RED. SELECT OTHER RANGES AND VERIFY RANGE NUMBERS CHANGE ACCORDINGLY

CAUTION

DO NOT USE THE SYSTEM IF ANY OF THE ABOVE TEST ITEMS ARE ABNORMAL.

7. Operation Mode ..... STBY

SECTION 5 NORMAL PROCEDURES (CONT)

BEFORE TAKEOFF OR IN FLIGHT

NORMAL WEATHER DETECTION

1. WX/C Button ..... PRESS
2. RANGE ..... AS REQUIRED
3. INT Control ..... AS DESIRED
4. Antenna Position ..... TILT AS REQUIRED TO ELIMINATE GROUND CLUTTER

NOTE

TGT (TARGET) ALERT is disabled when in the MAP mode or GAIN switched from PRESET

CYCLIC CONTOUR WEATHER DETECTION

1. WX/C Button ..... PRESS. RED DISPLAY FLASHES AT 1/2 SECOND INTERVALS

NOTE

The GAIN is automatically set to the PRESET level.

2. RANGE ..... AS REQUIRED
3. INT Control ..... AS DESIRED
4. Antenna Postion ..... TILT AS REQUIRED TO ELIMINATE GROUND CLUTTER

GROUND MAPPING

1. MAP Button ..... PRESS
2. RANGE Control ..... AS REQUIRED
3. INT Control ..... AS DESIRED
4. Antenna Position ..... TILT DOWN UNTIL DESIRED TERRAIN IS DISPLAYED

NOTE

The degree of down tilt depends upon airplane altitude and selected range.

5. Insufficient Terrain Detail ..... ADJUST GAIN CONTROL FROM PRESET FOR DESIRED TERRAIN DETAIL

APPROACH

1. Operation Mode ..... STBY (AS REQUIRED)

AFTER LANDING

1. INT/OFF Switch ..... OFF (FULL CCW)

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION

GENERAL

The Primus 300SL Weather Radar System is a navigation aid which enables the pilot to detect and analyze undesirable weather conditions. This system consists of three units: an antenna, receiver/transmitter and an alphanumerical color indicator.

OPERATION

The system is controlled by the pilot. The system's controls are located on the indicator adjacent to the display screen.

The screen displays two sets of colors. The first set is GREEN, YELLOW, and RED. The WX and CYC mode operates with GREEN as the least rainfall and RED as the heaviest rainfall. The second set of colors are LIGHT BLUE, YELLOW and PALE PURPLE for the MAP mode operation with LIGHT BLUE being the least reflective and PALE PURPLE being the most reflective.

PUSH BUTTON SWITCHES

1. STBY (Standby)
When pushed, the system is in a ready condition after the warm-up period has expired. The STBY mode may also be used during taxiing, leading, etc., in order to maintain the system in a ready condition. While in STBY, the antenna does not scan and the transmitter does not tansmit.

2. WX/C
This is an alternate action push button switch used to select the weather or cyclic contour mode of operation. If selected at initial turn on, the system will be in the weather mode. A second push of the switch selects the cyclic contour mode.

While in the cyclic contour mode, the red color displayed will flash at 1/2 second intervals and the gain will automatically be in the preset level.

3. MAP
When pressed, the system may be used for ground mapping. **MAP** will be displayed in the mode field in BLUE color.

4. TEST
When pressed, the system displays a test pattern. The transmitter does not transmit, 100 nautical mile range is automatically selected and the gain is at a preset level. **TEST** will be displayed in the mode field in BLUE color. Should any abnormality occur during TEST, do not use the system.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

PUSH BUTTON SWITCHES (CONT)

5. FRZ (Freeze)
This alternate action push button switch is used to freeze (stop and hold) the data updating. When in the FRZ mode, the letters FRZ flash at 1/2 second intervals in the auxiliary field.

6. RANGE SELECTOR SWITCHES
There are six push button switches used to select the desired (10, 25, 50, 100, 200 and 300) range. Each range displays five range marks.

SLIDE SWITCHES

1. TGT (Target) ALERT
This slide switch is used to enable the target alert mode function. When ON, a blue colored T appears in a red box in the target field of the screen.

The target alert symbol (blue colored TGT↑ in a red box) appears and flashes when the following conditions are satisfied: (1) radar senses a target resulting in a 3 level video, (2) the target is within ± 7.5° plus 1/2 beam width of the airplane's nose centerline, and (3) the target falls within a 60 to 160 nautical mile range.

The target alert is disabled by selecting the MAP mode or adjusting the GAIN control from the PRESET detent.

2. STAB (Stabilization)
When this switch is in the ON position, the antenna maintains a relative position to the earth during the airplane's maneuvering (climbs, descents, turns or banks). With the STAB in the OFF position, the antenna maintains a relative position to the airframe.

3. AZ MK (Azimuth Markers)
When ON selected, the screen displays radial lines at 30° increments.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

CONTROL KNOBS

1. INT/OFF (Intensity)
   This is a dual function rotary switch with one detent position. The OFF detent position, full counterclockwise, removes power from the system. Clockwise rotation powers the system and also controls the intensity (brightness) of the screen. **WAIT** is displayed in the mode field during the warm-up period (3 to 5 minutes).

2. GAIN
   This is a rotary control with one detent position (PRESET) full counterclockwise. The GAIN is used to adjust the sensitivity of the receiver, primarily to resolve nearby strong target signals and usually during ground mapping mode of operation.

   The sensitivity increases as the control is rotated clockwise. When the control is not in the PRESET detent, **VAR** is displayed in the auxiliary field of the screen.

3. TILT
   The TILT controls the antenna transmitting beam relative to the earth with the STAB on or relative to the airframe with STAB off. The control is indexed for tilt 0° to 10° up or down.

LIGHTING

The radar indicator controls, switches, and legends are internally illuminated and controlled by the RADIO PANEL rheostat in the overhead switch console.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

TELEDYNE NORMALIZED ANGLE OF ATTACK INDICATING SYSTEM

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 12-18-78

REISSUED DATE: 9-24-85

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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the Teledyne Normalized Angle of Attack Indicating System is installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

1. The Angle of Attack (AOA) indicating system must not be used as a primary instrument in place of the Airspeed Indicator.

2. The AOA system must not be used for takeoff reference.

3. AOA system indications are not valid during flap transitions.

4. Operations utilizing the AOA system, except as stated herein, are not approved.

SECTION 3 EMERGENCY PROCEDURES

No Change

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

EXTERIOR INSPECTION

1. AOA Transmitter Probe ..... FREE AND SMOOTH ROTATION
   a. Slotted Probe Openings ..... CLEAN AND UNOBSTRUCTED

PREFLIGHT CHECK

1. Electric Power ..... ON (AC and DC)
2. RADIO MASTER Switches ..... ON
3. AOA INDEX and AOA PROBE Circuit Breakers ..... CHECK ENGAGED
4. AOA Indicator OFF Flag ..... OUT OF VIEW
5. AOA Indexer OFF - BRT Switch ..... BRT (BRIGHT)
6. AOA INDEX TEST Switch ..... PRESS AND HOLD
   a. AOA Indexer Lights - RED, GREEN, YELLOW ..... ILLUMINATE
7. AOA INDEX TEST Switch ..... RELEASE

BEFORE TAKEOFF

1. AOA PROBE Anti-Ice Switch ..... ON
2. Loadmeter Select Switch ..... + AOA PROBE
   a. Loadmeter Indication ..... APPROXIMATELY .15
3. REF SET Knob ..... SET REQUIRED V/V_S RATIO FOR A FIXED REFERENCE POINT

IN FLIGHT

1. Loadmeter Select Switch ..... + AOA PROBE
   a. Loadmeter Indications ..... APPROXIMATELY .40

AIRCRAFT AOA/INDICATED RELATIONSHIPS

The following shows the relationship between the INDEXER Lights, AOA Pointer, AOA Reference Index, and F/D Speed Deviation Pointer (Optional) in respect to the airplane AOA.

NOTE

Relationships are valid for all flap positions and AOA Reference Index settings except during flap transitions.

1. Airplane AOA ..... VERY HIGH AND NEAR STALL
   a. AOA Indicator Pointer ..... NEAR 1.0 AND ABOVE REFERENCE INDEX
   b. Indexer Lights ..... RED CHEVRON ILLUMINATED
   c. F/D Speed Deviation Pointer .... VERY SLOW (OPTIONAL)
2. Airplane AOA ..... HIGH
   a. AOA Indicator Pointer ..... NEAR AND ABOVE REFERENCE INDEX
   b. Indexer Lights ..... RED CHEVRON AND GREEN CIRCLE ILLUMINATED
   c. F/D Speed Deviation Pointer .... SLOW (OPTIONAL)

SECTION 5 NORMAL PROCEDURES (CONT)

IN-FLIGHT (CONT)

AIRCRAFT AOA/INDICATED RELATIONSHIPS (CONT)

3.	Airplane AOA	ON SELECTED REFERENCE
	a. AOA Indicator Pointer	ON REFERENCE INDEX
	b. Indexer Lights	GREEN CIRCLE ILLUMINATED
	c. F/D Speed Deviation Pointer	ON DOT (OPTIONAL)
4.	Airplane AOA	LOW
	a. AOA Indicator Pointer	NEAR AND BELOW REFERENCE INDEX
	b. Indexer Lights	YELLOW CHEVRON AND GREEN CIRCLE ILLUMINATED
	c. F/D Speed Deviation Pointer	FAST (OPTIONAL)
5.	Airplane AOA	VERY LOW AND NEAR ZERO LIFT
	a. AOA Indicator Pointer	NEAR "0" AND BELOW REFERENCE INDEX
	b. Indexer Lights	YELLOW CHEVRON ILLUMINATED
	c. F/D Speed Deviation Pointer	VERY FAST (OPTIONAL)

APPROACH

1.	AOA Indexer OFF-BRT Switch	BRT (BRIGHT)
2.	AOA INDEX TEST Switch	PRESS AND HOLD
	a. AOA Indexer Lights - RED, GREEN, YELLOW	ILLUMINATED
3.	AOA INDEX TEST Switch	RELEASE
4.	REF SET Knob	SET REQUIRED V/V_S REFERENCE

AFTER LANDING

1.	AOA PROBE Anti-Ice Switch	OFF

SYSTEM DESCRIPTION

GENERAL

The Teledyne Normalized Angle of Attack (AOA) Indicating System is comprised of an angle of attack indicator, interface unit, angle of attack transmitter, and indexer. The system receives flap position settings, airflow on the side of the fuselage and local AOA. System indications are valid for all flap positions, gear up or down, combinations of airplane weight and C.G.

System information is displayed on the AOA Indicator, Indexer, and by the F/D Speed Deviation Pointer when installed.

AOA INDICATOR

The AOA indication represents the normalized (0 to 1.0) presentation of the total lift capability that is actually being used.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

Two points, ZERO LIFT and STALL, determine the usable range of the AOA for all approved flap positions. Normalization of the AOA consists of establishing zero (0) on the dial as the point ZERO LIFT, and 1.0 on the dial as the maximum usable AOA where STALL occurs.

AOA POINTER

The AOA pointer displays airplane LIFT information on a scale from zero (0) to one (1.0). Zero represents zero lift and one represents 100% LIFT or STALL. The indicator pointer position enables the pilot to retain sufficient margin from stall during all flight maneuvers.

REF SET KNOB/V/V_S SCALE

The V/V_S reference scale (1.2 to 1.5) cross-references the V/V_S ratio and corresponding normalized AOA scale points. The adjustable AOA reference index and V/V_S reference can be set by turning the lower left hand REF SET knob.

AOA INDEXER

A three light indexer is located on the airplane glare shield to provide heads up display. The indexer is continuously referenced to the AOA reference index.

The three indexer lights may be tested with the AOA INDEX TEST Push to Test switch. The OFF-DIM-BRIGHT (BRT) switch, located on the indexer back, must be in the BRIGHT position for test only. Lights may be dimmed after testing.

AOA INDEXER LIGHT INDICATORS

When the AOA indicator pointer is centered on the AOA reference index, the round, GREEN indexer light will be illuminated.

An illuminated RED chevron, above center, points downward and indicates the AOA should be decreased to obtain the AOA reference index.

An illuminated YELLOW chevron, below center, points upward and indicates the AOA should be increased to obtain the AOA reference index.

NOTE

Slight deviations from the reference index are shown by the GREEN center circle remaining illuminated when a RED or YELLOW chevron appears.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

AOA TRANSMITTER PROBE

The conical shaped probe extends through the RH side of the fuselage. The probe rotates so the air pressure is equal at each pair of slots in the probe. Electrical signals proportional to probe rotation are generated through potentiometer wipers attached to the probe. These signals are used to drive the angle of attack display on the AOA indicator.

Anti-icing and deicing is accomplished by an electrical probe heater. In addition, a case heater is provided to prevent condensation inside the case. Both heaters are thermostatically controlled and activated by the AOA PROBE Anti-Ice Switch in the overhead console.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

SPERRY SPZ-500 FLIGHT CONTROL SYSTEM AD-500 SERIES ADI, RD-500/550 SERIES HSI AND VN-212 VNAV

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 04-21-81

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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the Sperry SPZ-500 Flight Control System with AD-500 Series ADI, RD-500/550 Series HSI and VN-212 VNAV are installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

GENERAL

1. Airspeed
   a. Maximum Operating Limit ..... 250 KCAS/0.57 MACH
2. Autopilot
   a. Operation
      (1) Approved for Category I ILS approaches
      (2) NOT approved for single engine approaches
      (3) NOT approved for use with alternate static source
      (4) NOT approved for back course approaches if radio altimeter is inoperative or not installed
   b. Takeoff and Landing ..... DO NOT OPERATE (DISENGAGE)
   c. In Flight
      (1) Pilot Location ..... SEATED, SEAT BELT AND SHOULDER HARNESS FASTENED
R   (2) Approach (Two Engine) ..... FLAPS 20°

R
R
R

WARNING

AUTOPILOT NOT TO BE USED FOR APPROACH IF AP TRIM TEST UNSATISFACTORY. BOTH AP TRIM ANNUNCIATOR ILLUMINATION
R AND TRIM WHEEL ACTIVITY MUST OCCUR FOR SATISFACTORY AP TRIM TEST.

SECTION 2 OPERATING LIMITATIONS (CONT)

GENERAL (CONT)

3. Yaw Damper ..... NOT TO BE USED DURING TAKEOFF AND LANDING

4. Flight Director Operation
   a. Approved for Category I operation only
   b. NOT approved for back course approaches if radio altimeter is inoperative or not installed

5. VNAV Computer/Controller Operation
   a. VNAV Function ..... OPERATION LIMITED TO VFR CONDITIONS ONLY; NOT APPROVED FOR ANY FLIGHT BASED ENTIRELY ON USE OF VNAV

NOTE

VNAV function is inoperable (locked out) when any RNAV function has been selected.

   b. Altitude Preselect Function ..... APPROVED FOR USE WHEN COUPLED TO AUTOPILOT

6. Prior to Flight
   a. Pilot's Barometric Altimeter .... OPERABLE
   b. Copilot's Barometric Altimeter... REQUIRED AND OPERABLE
   c. Autopilot Controller TEST EACH FLT Switch ..... PRESS AND TEST AUTOPILOT SYSTEM PRIOR TO EACH FLIGHT. DO NOT USE AUTOPILOT SYSTEM IF TEST IS UNSATISFACTORY
   d. AP TRIM TEST Unsatisfactory ..... DO NOT USE AUTOPILOT FOR APPROACH

REQUIRED PLACARDS

NEAR AUTOPILOT CONTROLLER

R 1. AUTOPILOT NOT APPROVED FOR SINGLE ENGINE APPROACH
R 2. AUTOPILOT NOT APPROVED FOR USE WITH ALTERNATE STATIC SOURCE
R 3. YAW DAMPER NOT APPROVED FOR TAKE-OFF & LANDING

BELOW VNAV COMPUTER/CONTROLLER

VNAV-VFR ONLY

SECTION 3 EMERGENCY PROCEDURES

R R R R R R R R

WARNING

IN FLIGHT, DO NOT OVERPOWER THE AUTOPILOT IN PITCH OR YAW. THE TRIM WILL OPERATE IN THE DIRECTION OPPOSING THE OVERPOWER FORCE, WHICH WILL RESULT IN LARGE OUT-OF-TRIM FORCES.

1.	AP TORQ (Autopilot Torque) Annunciator	ILLUMINATES. AUTOPILOT DISENGAGES. AUTOPILOT MAY BE REENGAGED IF LIGHT EXTINGUISHES
2.	Autopilot Malfunction	
	a. Disengage	PRESS TRIM-A/P DISC OR GA SWITCH
	b. Autopilot Circuit Breakers	DISENGAGE
	c. Associated Circuit Breakers	DISENGAGE
3.	Pitch Malfunction - Maximum Altitude Loss	
	a. Cruise	300 FEET
	b. Maneuver	200 FEET
	c. Descent	500 FEET
	d. Two Engine ILS Approach	80 FEET
4.	Electric Pitch Trim Runaway	INDICATED BY CONTINUOUS ILLUMINATION OF TRIM UP OR DN ANNUNCIATOR
	a. TRIM A/P DISC Switch	PRESS
	b. Electric Trim Switch	OPERATE IN OPPOSITE DIRECTION OF RUNAWAY
	c. Manual Trim Wheel	STOP AND HOLD
	d. TRIM ELEV (Elevator) Circuit Breaker	DISENGAGE
5.	Rudder Trim Malfunction	INDICATED BY CONTINUOUS ILLUMINATION OF RTRIM INOP (OR RUDD TRIM) ANNUNCIATOR
	a. TRIM A/P DISC Switch	PRESS
	b. Autopilot Circuit Breaker	DISENGAGE
6.	Engine Failure	
	a. In Flight	DISCONNECT AUTOPILOT AND MANUALLY TRIM TO COMPENSATE FOR ASYMMETRIC POWER. REENGAGE AUTOPILOT AS DESIRED

WARNING

AUTOPILOT NOT APPROVED FOR SINGLE ENGINE APPROACHES.

SECTION 3 EMERGENCY PROCEDURES (CONT)

GENERAL

1. Red ATT (Attitude) Flag Visible	ATTITUDE REFERENCE SYSTEM FAILURE. ATTITUDE AND COMMAND INFORMATION UNUSABLE
2. Red FD (Flight Director) Flag Visible	ABSENCE OF POWER OR COMPUTER/CONTROLLER INOPERATIVE. COMMAND PRESENTATION UNRELIABLE
3. Red HDG (Heading) Flag Visible	ABSENCE OF POWER, INVALID GYRO SIGNAL OR ERROR BETWEEN DISPLAYED HEADING AND RECEIVED SIGNAL. DIRECTIONAL INFORMATION UNRELIABLE
4. Red VERT (Vertical) Deviation Flag Visible	LOSS OF VALID VERTICAL DEVIATION SIGNAL. GLIDE SLOPE PRESENTATION UNRELIABLE
5. Red NAV (Navigation) Flag Visible ...	ABSENCE OF POWER, NAV RECEIVER MALFUNCTION OR UNRELIABLE SIGNAL. VOR OR LOC DEVIATION INFORMATION UNUSABLE
6. VNAV Computer/Controller Display Goes Blank	ABSENCE OR LOSS OF POWER TO THE SYSTEM
7. Red Altimeter OFF Flag Visible	ABSENCE OR LOSS OF POWER TO SYSTEM. ALTIMETER OR AIR DATA COMPUTER NOT FUNCTIONING

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

OPERATION OF THE AUTOPILOT IN ICING CONDITIONS

NOTE

Conditions exist for icing when the outside air temperature (OAT) on the ground is +10°C or below or the indicated OAT (RAT) in flight is +10°C or below and visible moisture in any form is present.

SECTION 5 NORMAL PROCEDURES (CONT)

WARNING

DUE TO DISTORTION OF AIRFOILS, STALLING SPEEDS SHOULD BE EXPECTED TO INCREASE AS ICE ACCUMULATES ON THE AIRPLANE. STALL WARNING DEVICES MAY NOT BE ACCURATE AND SHOULD NOT BE RELIED UPON. PILOTS SHOULD BE AWARE THAT OPERATION OF THE AUTOPILOT'S VERTICAL MODES MAY RESULT IN AN UNSAFE AIRSPEED IF ICE ACCUMULATES ON THE AIRPLANE.

IN ORDER TO MINIMIZE ICE ACCUMULATIONS ON UNPROTECTED LOWER SURFACES, MAINTAIN A MINIMUM SPEED OF 180 KIAS DURING OPERATIONS IN SUSTAINED CRUISE IN ICING CONDITIONS. THIS WILL PROVIDE AN ANGLE OF ATTACK THAT REDUCES EXPOSURE (FRONTAL AREA) OF THE LOWER SURFACES TO ICE ACCUMULATION. IF UNABLE TO MAINTAIN 180 KIAS AT MAXIMUM CONTINUOUS POWER, A CHANGE OF ALTITUDE AND/OR COURSE MAY BE NECESSARY TO MAINTAIN MINIMUM AIRSPEED AND/OR EXIT THE ICING CONDITIONS.

FOR OPERATION IN ICING CONDITIONS IN OTHER THAN SUSTAINED CRUISE, INCREASE NORMAL SPEEDS BY AT LEAST 10% WITHIN OPERATIONAL AIRCRAFT LIMITS.

DURING LANDING, DO NOT SELECT 40° FLAPS WHEN OPERATING IN ICING CONDITIONS. THE FAA HAS DETERMINED THAT ICE ACCUMULATIONS ON THE TAIL PLANE OF MANY AIRCRAFT MAY RESULT IN A REDUCED DOWN FORCE ON THE HORIZONTAL STABILIZER WHEN FULL FLAPS ARE USED. THIS REDUCED DOWN FORCE MAY RESULT IN THE AIRCRAFT PITCHING NOSE DOWN.

PREFLIGHT CHECK

1.	Airplane Electrical Power	ON (AC and DC)
2.	RADIO MASTER Switches	ON
3.	Autopilot Circuit Breakers	ENGAGED
4.	Associated Circuit Breakers	ENGAGED
R 5.	ANN TEST Switch	PRESS. ANNUNCIATORS ILLUMINATE
6.	Attitude Direction Indicator	CHECK. WARNING FLAGS NOT VISIBLE
7.	Horizontal Situation Indicator	CHECK. WARNING FLAGS NOT VISIBLE
8.	Barometric Encoding Altimeter	CHECK. OFF FLAG NOT VISIBLE
9.	VNAV Computer/Controller	CHECK. DISPLAYS DASHES (---) WITH SELECTOR SET TO STAEL AND VANG DEG POSITIONS, AND 000 IN THE ALT, TO NM AND FR POISITIONS
10.	Mode Selector	CHECK. NO ANNUNCIATORS ILLUMINATED
11.	Elevator Trim Annunciators	CHECK. UP AND DN ANNUNCIATORS EXTINGUISHED

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

CAUTION

A STEADY ILLUMINATION OF THE UP OR DN ANNUNCIATOR DENOTES THAT THE AUTOMATIC PITCH TRIM IS NOT SYNCHRONIZED. THE AUTOPILOT SHOULD NOT BE ENGAGED.

12. TURN Control ..... CENTER DETENT POSITION
13. Flight Controls ..... MOVE TO APPROXIMATELY MID TRAVEL
14. AP (Autopilot) Engage Switch ..... PRESS. AP ENGAGE AND YD ENGAGE ANNUNCIATORS ILLUMINATE
15. Flight Controls ..... PUSH AND HOLD. TRIM WILL RUN NOSE UP WITHIN 3 TO 5 SECONDS. TRIM UP ANNUNCIATOR ILLUMINATES WHILE TRIM IS RUNNING

R 16. Flight Controls ..... PULL AND HOLD. TRIM WILL RUN NOSE
R DOWN WITHIN APPROXIMATELY 1 TO 2
R SECONDS. TRIM DOWN ANNUNCIATOR
R ILLUMINATES WITHIN APPROXIMATELY 3
R TO 5 SECONDS

17. TRIM A/P DISC Switch ..... PRESS. AUTOPILOT DISENGAGES. VERIFY BY FREE MOVEMENT OF CONTROL SURFACES. PITCH TRIM IS INHIBITED WHILE SWITCH IS DEPRESSED. AP OFF ANNUNCIATOR ILLUMINATES AND WARNING HORN IS MOMENTARILY AUDIBLE
18. AP Engage Switch ..... PRESS. AP ENGAGE AND YD ENGAGE ANNUNCIATORS ILLUMINATE
19. DOWN/UP Trim Switch, RH Half ..... ACTUATE UP OR DOWN. AUTOPILOT DISENGAGES, NOTED BY ILLUMINATION OF AP OFF ANNUNCIATOR AND MOMENTARY AUDIBLE WARNING HORN. YAW DAMPER REMAINS ENGAGED
20. DOWN/UP Trim Switches
    a. Outboard Switch Half ..... ACTUATE UP AND DOWN – TRIM WILL NOT OPERATE
    b. Inboard Switch Half ..... ACTUATE UP AND DOWN – TRIM WILL NOT OPERATE
    c. Outboard and Inboard Halves ..... ACTUATE SIMULTANEOUSLY UP AND DOWN – TRIM WILL OPERATE IN DIRECTION OF SWITCH MOVEMENT
21. Manual Trim Wheel ..... CHECK FREE MOVEMENT
22. AP Engage Switch ..... PRESS. AP ENGAGE AND YD ENGAGE ANNUNCIATORS ILLUMINATE

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

23. Autopilot Controller TEST EACH FLT Switch ..... PRESS. AUTOPILOT AND YAW DAMPER DISENGAGE. ENGAGE ANNUNCIATORS EXTINGUISH, AP OFF ANNUNCIATOR ILLUMINATES AND AP TORQ ANNUNCIATOR REMAINS ILLUMINATED WHILE THE TEST SWITCH IS PRESSED

CAUTION

IF THE AUTOPILOT DOES NOT DISENGAGE OR THE AP TORQ ANNUNCIATOR DOES NOT ILLUMINATE WHEN THE TEST SWITCH IS PRESSED, THE AUTOPILOT TORQUE MONITORS ARE NOT FUNCTIONING PROPERLY. DO NOT USE THE AUTOPILOT IN FLIGHT UNTIL CORRECTIVE ACTION HAS BEEN TAKEN.

24. TRIM A/P DISC Switch ..... PRESS. AP OFF ANNUNCIATOR EXTINGUISHES

25. Flight Director Indicator (ADI)
    a. Attitude Presentation ..... CHECK ATT FLAG OUT OF VIEW AND SHOULD REFLECT PRESENT ROLL AND PITCH ATTITUDE
    b. ATT (Attitude) Test Switch ..... PRESS AND HOLD
    c. Attitude Display
        (1) Roll ..... 20° RIGHT
        (2) Pitch ..... 10° UP
        (3) ATT Flag ..... VISIBLE
    d. Remaining Warning Flags ..... OUT OF VIEW
    e. ATT Test Switch ..... RELEASE

NOTE

The ADI attitude reference sphere may be unreliable if the test is unsatisfactory.

26. Flight Director Mode Selector
    a. ANN TEST Switch ..... PRESS. ALL MODE SELECT SWITCH ANNUNCIATORS ILLUMINATE AND FD FLAG MOVES INTO VIEW. VNAV WARNING TONE AUDIBLE; VNAV COMPUTER/CONTROLLER DISPLAYS 888 IN ALL MODES
    b. ANN TEST Switch ..... RELEASE. FD FLAG MOVES FROM VIEW. ALL MODE SELECT SWITCH ANNUNCIATORS EXTINGUISH; VNAV COMPUTER/CONTROLLER DISPLAY RETURNS TO NORMAL
    c. HSI Heading Reference Indicator . CENTER ON LUBBER LINE

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

d.	HDG (Heading) and ALT (Altitude) Mode Select Switches	PRESS. COMMAND CUE MOVES INTO VIEW AT WINGS LEVEL AND ZERO PITCH ATTITUDE. HDG AND ALT ON ANNUNCIATORS ILLUMINATE
e.	HSI HDG Reference Indicator	SELECT NEW HEADING. COMMANDS ROLL TO THE NEW HEADING
f.	GA (Go Around) Switch	PRESS. GA ANNUNCIATOR ILLUMINATES. COMMANDS A PITCH UP ATTITUDE, WINGS LEVEL COMMAND. ALL OTHER COMMANDS CANCELLED
g.	ANN TEST Switch	PRESS. ALL ANNUNCIATORS ILLUMINATE. ALL COMMANDS CANCELLED. VNAV WARNING TONE AUDIBLE AND VNAV COMPUTER/CONTROLLER DISPLAYS 888 IN ALL MODES

CAUTION

DO NOT USE FLIGHT DIRECTOR IF TEST IS UNSATISFACTORY.

27. VNAV Computer/Controller

a.	Pilot's Altimeter	NEAREST 1,000 FEET OF FIELD ELEVATION
b.	Selector Switch	ALT
c.	SET Control	5,000 FEET ABOVE FIELD ELEVATION
d.	Selector Switch	STAEL
e.	SET Control	000
f.	Selector Switch	FR
g.	SET Control	35.0
h.	NAV 1 Receiver	LOCAL VOR FREQUENCY
i.	HSI Course	CENTER ON VALID FROM
j.	Selector Switch	VANG DEG
k.	DME TEST Switch	PRESS AND HOLD (UNTIL ITEM p.)
l.	DME Display	INDICATES 000
m.	VNAV Display	INDICATES 1.1 TO 1.5 VANG DEG

CAUTION

1.3 IS THE COMPUTED FLIGHT ANGLE, IN DEGREES. IF 1.1 TO 1.5 IS NOT DISPLAYED DO NOT USE THE VNAV FUNCTION.

n.	HDG Mode Select Switch	PRESS
o.	VNAV Mode Select Switch	PRESS. VNAV ARM ANNUNCIATOR ILLUMINATES; VNAV CAP ANNUNCIATOR ILLUMINATES WITHIN 3 SECONDS AND AUDIBLE TONE IS HEARD. ADI COMMAND CUE COMMANDS A PITCH UP ATTITUDE, HSI GS NEEDLE MOVES INTO VIEW

SECTION 5 NORMAL PROCEDURES (CONT)

PREFLIGHT CHECK (CONT)

NOTE

If ADI does not command a pitch up attitude or the HSI GS needle is not in view, DO NOT USE the VNAV function.

p. DME TEST Switch ..... RELEASE
q. RNAV Controller ..... ON. VNAV MODE CANCELS, AUDIBLE TONE AND VNAV ARM OR CAP ANNUNCIATOR EXTINGUISHES

NOTE

VNAV operates only in RNAV VOR/LOC Mode.

28. Pilot's Altimeter ..... RESET TO CURRENT ALTIMETER SETTING

BEFORE TAKEOFF

1. Horizontal Situation Indicator
   a. Heading ..... SET TO CORRESPOND WITH RUNWAY
   b. Course ..... SET TO FIRST VOR COURSE RADIAL
2. VNAV Computer/Controller
   a. VNAV Function ..... SELECT ALT, STAEL, TO NM/FR OR VANG DEG, IF VNAV IS TO BE USED
   b. Altitude Preselect Function ..... SET SELECTOR SWITCH TO ALT AND SELECT DESIRED FLIGHT ALTITUDE
3. Airplane Centered On Runway
   a. HDG Mode Select Switch ..... PRESS. HDG ON ANNUNCIATOR ILLUMINATES
   b. Heading ..... ADJUST TO CENTER ROLL COMMAND OF FLIGHT DIRECTOR ADI

NOTE

The ADI and HSI present normal attitude and horizontal situation displays when no modes are selected.

IN-FLIGHT OPERATION

NOTE

The TCS (touch control steering) does not function when the TURN control is in a position other than center detent.

SECTION 5 NORMAL PROCEDURES (CONT)

IN-FLIGHT OPERATION (CONT)

If the electric trim is used while the autopilot is engaged, the autopilot and rudder trim systems (except yaw damper) will disengage.

Do not manually override the autopilot system during flight to change bank angle, pitch attitude, or yaw heading.

CLIMB

1. Manually fly the airplane to desired pitch attitude while holding TCS button depressed
2. TCS Button ..... RELEASE
3. AP Engage Switch ..... PRESS. AP ENGAGE AND YD ENGAGE ANNUNCIATORS ILLUMINATE

NOTE

Pitch attitude is maintained by the autopilot as displayed by the pitch command.

4. Preset VNAV Climb
   a. VNAV Mode Select Switch ..... PRESS. VNAV ARM ANNUNCIATOR ILLUMINATES
   b. Flight Angle Captured ..... VNAV ARM ANNUNCIATOR EXTINGUISHES, CAP ANNUNCIATOR ILLUMINATES AND AUDIBLE WARNING TONE IS HEARD FOR APPROXIMATELY 3 SECONDS

NOTE

The airplane will maintain flight angle until reaching a position approaching the selected altitude, or by selecting any of the vertical modes (VS, IAS, etc.).

5. Altitude Preselect Climb
   a. ALTSEL (Altitude Select) Mode Select Switch ..... PRESS. ALTSEL ARM ANNUNCIATOR ILLUMINATES
   b. IAS (Indicated Airspeed) or VS (Vertical Speed) Mode Select Switch ..... PRESS AS DESIRED DURING CLIMB TO MAINTAIN CONSTANT AIRSPEED OR VERTICAL SPEED

SECTION 5 NORMAL PROCEDURES (CONT)

IN-FLIGHT OPERATION (CONT)

CLIMB (CONT)

NOTE

Change of engine power while in the IAS mode will vary the vertical speed. Change of engine power while in the VS mode will vary the airspeed. Pitch wheel may be used to vary pitch attitude in climb but will cancel IAS or VS mode.

c. Airspeed or Vertical Speed Adjustments (If Required) ..... PRESS TCS SWITCH AND ADJUST PITCH AS REQUIRED

6. Heading Change ..... ADJUST REFERENCE INDICATOR AS REQUIRED

7. Approximately 1,000 Feet Below Selected Cruise Altitude
   a. Altimeter Altitude Alert Light .. ILLUMINATES
   b. Warning Tone ..... AUDIBLE APPROXIMATELY 1 SECOND

8. Approximately 250 Feet Below Selected Cruise Altitude
   a. Altimeter Altitude Alert Light .. EXTINGUISHES

9. Approaching Selected Cruise Altitude
   a. ALTSEL CAP Annunciator ..... ILLUMINATES
   b. Selected Vertical Mode ..... CANCELLED WHEN ALTSEL CAP ANNUNCIATOR ILLUMINATES

10. At Selected Cruise Altitude
   a. ALTSEL CAP Annunciator ..... EXTINGUISHES
   b. ALT ON Annunciator ..... ILLUMINATES

CRUISE

1. Heading Change ..... ADJUST REFERENCE INDICATOR AS REQUIRED

NOTE

Airplane will turn to acquire the new heading at a bank angle of approximately 27° .

2. VOR/RNAV Intercept and Track
   a. NAV Receiver ..... TUNE TO DESIRED VOR STATION
   b. RNAV Control Indicator ..... SELECT VOR OR RNAV AS DESIRED

NOTE

RNAV and ENRT annunciator illuminates when RNAV is selected.

SECTION 5 NORMAL PROCEDURES (CONT)

IN-FLIGHT OPERATION (CONT)

CRUISE (CONT)

c.	HSI Course	AS REQUIRED
d.	Heading Selector Indicator	DESIRED INTERCEPT ANGLE
e.	NAV Mode Selector Switch	PRESS. NAV ARM AND HDG ON ANNUNCIATORS ILLUMINATE. FLIGHT DIRECTOR COMMANDS A TURN TO THE SELECTED HEADING FOR COURSE CAPTURE AND TRACK

NOTE

If RNAV has been selected, the information presented on the HSI is in reference to the selected waypoint.

Only the altitude preselect mode function of the VNAV is operable when the RNAV mode of the flight director is selected.

f.	VOR/NAV Course Capture	NAV ARM AND HDG ON ANNUNCIATORS EXTINGUISHES (IF ILLUMINATED). NAV CAP ANNUNICATOR ILLUMINATES INDICATING COURSE CAPTURE AND TRACKING

NOTE

The autopilot, when engaged, will maintain the tracking as commanded by the flight director.

Should the NAV warning flag come into view while tracking, the autopilot will maintain the heading, but the command cue will be out of view and the NAV CAP annunciator will extinguish.

DESCENT

1. VNAV Computer/Controller

a.	VNAV Function	SELECT ALT, STAEL, TO NM/FR OR VANG DEG IF VNAV IS TO BE USED
b.	Altitude Preselect Function	SELECT SWITCH TO ALT AND DESIRED FLIGHT ALTITUDE

2. Preset VNAV Descent

a.	VNAV Mode Select Switch	PRESS. VNAV ARM ANNUNCIATOR ILLUMINATES
b.	Flight Angle Captured	VNAV ARM ANNUNCIATOR EXTINGUISHES, CAP ANNUNCIATOR ILLUMINATES AND AUDIBLE WARNING TONE IS HEARD FOR APPROXIMATELY 3 SECONDS

SECTION 5 NORMAL PROCEDURES (CONT)

IN-FLIGHT OPERATION (CONT)

DESCENT (CONT)

3. Altitude Preselect Descent
   a. ALTSEL Mode Select Switch ..... PRESS. ALTSEL ARM ANNUNCIATOR ILLUMINATES
   b. IAS or VS Mode Select Switch .... PRESS IF DESIRED DURING DESCENT TO MAINTAIN CONSTANT AIRSPEED OR VERTICAL SPEED

NOTE

Change of engine power while in the IAS mode will vary the vertical speed. Change of engine power while in the VS mode will vary the airspeed. Pitch wheel may be used to vary pitch attitude in descent but will cancel IAS or VS mode.

   c. Airspeed or Vertical Speed Adjustments (If Required) ..... PRESS TCS SWITCH, ADJUST PITCH AS REQUIRED
4. Heading Change ..... ADJUST REFERENCE INDICATOR AS REQUIRED
5. Approximately 1,000 Feet Above Selected Cruise Altitude
   a. Altimeter Altitude Alert Light .. ILLUMINATES
   b. Warning Tone ..... AUDIBLE APPROXIMATELY 1 SECOND
6. Approximately 250 Feet Above Selected Cruise Altitude
   a. Altimeter Altitude Alert Light .. EXTINGUISHES
7. Approaching Selected Cruise Altitude
   a. ALTSEL CAP Annunciator ..... ILLUMINATES
   b. Selected Vertical Mode ..... CANCELLED WHEN ALTSEL CAP ANNUNCIATOR ILLUMIATES
8. At Selected Cruise Altitude
   a. ALTSEL CAP Annunciator ..... EXTINGUISHES
   b. ALT ON Annunciator ..... ILLUMINATES

APPROACH

1. VOR/RNAV
   a. AP TRIM TEST (Prior to gear and/or flap extension) ..... PRESS. PITCH TRIM ANNUNCIATOR ILLUMINATES. TRIM WHEEL MUST BE ACTIVE TO INDICATE THAT 100% TRIM IS OPERATIVE

SECTION 5 NORMAL PROCEDURES (CONT)

IN-FLIGHT OPERATION (CONT)

APPROACH (CONT)

R
R
R

WARNING

DO NOT USE AUTOPILOT FOR APPROACH IF AP TRIM TEST IS UNSATISFACTORY.

b. NAV Receiver ..... TUNE DESIRED VOR STATION
c. DME Selector ..... NAV 1
d. RNAV Control Indicator ..... VOR OR RNAV/APR AS DESIRED

NOTE

RNAV and APPR annunciators illuminate when RNAV/APR is selected.

e. HSI Course ..... SET PUBLISHED INBOUND COURSE
f. Heading Selector Indicator ..... SET DESIRED INTERCEPT HEADING
g. VORAPR (Approach) Mode Select Switch ..... PRESS. VORAPR ARM AND HDG ON ANNUNCIATORS ILLUMINATE. FLIGHT DIRECTOR COMMANDS A TURN TO THE SELECTED HEADING FOR COURSE CAPTURE AND TRACKING

NOTE

If RNAV has been selected, the information presented on the HSI is in reference to the selected waypoint.

h. VOR/RNAV ..... VORAPR ARM AND HDG ON ANNUNCIATORS (IF ILLUMINATED) EXTINGUISH. VORAPR CAP ANNUNCIATOR ILLUMINATES INDICATING COURSE CAPTURE AND TRACKING

NOTE

The autopilot, when engaged, will maintain the tracking as commanded by the flight director.

Should the NAV warning flag come into view while tracking, the autopilot will maintain the heading but the command cue will be out of view and the VORAPR CAP annunciator will extinguish.

SECTION 5 NORMAL PROCEDURES (CONT)

IN-FLIGHT OPERATION (CONT)

APPROACH (CONT)

2. LOC Front Course

a. AP TRIM TEST (Prior to gear and/or flap extension) ..... PRESS. PITCH TRIM ANNUNCIATOR ILLUMINATES. TRIM WHEEL MUST BE ACTIVE TO INDICATE THAT 100% TRIM IS OPERATIVE

R
R
R

WARNING

DO NOT USE AUTOPILOT FOR APPROACH IF AP TRIM TEST IS UNSATISFACTORY.

b. NAV Receiver ..... TUNE DESIRED LOC FREQUENCY
c. HSI Course ..... SET TO PUBLISHED INBOUND COURSE
d. HSI Heading ..... DESIRED INTERCEPT HEADING
e. APR (Approach) Mode Select Switch ..... PRESS. NAV ARM, APR ARM AND HDG ON ANNUNCIATORS ILLUMINATE. FLIGHT DIRECTOR COMMANDS A TURN TO THE SELECTED HEADING FOR COURSE CAPTURE AND TRACKING

NOTE

The localizer and glide slope are armed.

f. Near LOC Beam ..... HDG ON ANNUNCIATOR EXTINGUISHES
g. NAV CAP Annunciator ..... ILLUMINATES WHEN LOC BEAM IS CAPTURED AND ON TRACK

NOTE

The expanded LOC pointer at the bottom of the ADI will appear when the deviation is about 1/3 dot or less.

h. After LOC Capture ..... SET HSI HEADING REFERENCE INDICATOR TO PUBLISHED MISSED APPROACH OR LANDING RUNWAY HEADING AS REQUIRED
i. Captured Glide Slope ..... APR ARM ANNUNCIATOR EXTINGUISHES AND APR CAP ANNUNCIATOR ILLUMINATES. FLIGHT DIRECTOR AND/OR AUTOPILOT (IF ENGAGED) WILL TRACK CENTER OF LOCALIZER AND GLIDE SLOPE BEAMS WITH WIND CORRECTIONS

SECTION 5 NORMAL PROCEDURES (CONT)

IN-FLIGHT OPERATION (CONT)

APPROACH (CONT)

NOTE

Any previously selected vertical mode will be automatically cancelled.

j.	VNAV Selector Switch	ALT
k.	VNAV SET Switch	SET PUBLISHED MISSED APPROACH ALTITUDE AS REQUIRED
l.	At DH (Decision Height)	DH ANNUNCIATOR ILLUMINATES
m.	TRIM A/P DISC Switch	PRESS. AUTOPILOT DISENGAGES. LAND AIRPLANE

NOTE

The rising runway bar becomes visible from 200 feet above ground level to touchdown.

Should the LOC and/or VRT (vertical) warning flag come into view, the command cue will be out of view and the NAV CAP and/or APR CAP annunciators will extinguish respectively. When the respective warning flag goes out of view, the mode will be reengaged and the command cue will return to view.

3. LOC Back Course Approach

a.	AP TRIM TEST (Prior to gear and/or flap extension)	PRESS. PITCH TRIM ANNUNCIATOR ILLUMINATES. TRIM WHEEL MUST BE ACTIVE TO INDICATE THAT 100% TRIM IS OPERATIVE

R
R
R

WARNING

DO NOT USE AUTOPILOT FOR APPROACH IF AP TRIM TEST IS UNSATISFACTORY.

b.	NAV Receiver	TUNE TO DESIRED LOC FREQUENCY
c.	HSI Course	SET TO PUBLISHED FRONT COURSE OR LOC INBOUND COURSE
d.	HSI Heading	DESIRED INTERCEPT HEADING
e.	BC (Back Course) Mode Select Switch	BC ARM AND HDG ON ANNUNCIATORS ILLUMINATE. SYSTEM ARMED FOR BACK COURSE LOC CAPTURE

SECTION 5 NORMAL PROCEDURES (CONT)

IN-FLIGHT OPERATION (CONT)

APPROACH (CONT)

NOTE

Glide slope functions are cancelled when back course mode is selected. Autopilot/Flight Director Back Course approaches not approved without operable radio altimeter.

f. Near LOC Beam ..... HDG ON ANNUNCIATOR EXTINGUISHES
g. LOC Beam Captured
   (1) BC ARM Annunciator ..... EXTINGUISHES
   (2) BC CAP Annunciator ..... ILLUMINATES
   (3) IAS (Indicated Airspeed) or VS (Vertical Speed) Mode Select Switch ..... PRESS. IAS OR VS ANNUNCIATOR ILLUMINATES
   (4) TCS (Touch Control Steering) Switch ..... MOMENTARILY PRESS TO SYNCHRONIZE RATE OF DESCENT
   (5) Rising Runway Bar ..... COMES INTO VIEW FROM ABOUT 200 FEET ABOVE GROUND LEVEL TO TOUCHDOWN
h. At MDA (Minimum Descent Altitude) ..... DH ANNUNCIATOR ILLUMINATES
i. TRIM A/P DISC Switch ..... PRESS. AUTOPILOT DISENGAGES, LAND AIRPLANE.

NOTE

Should the LOC warning flag come into view, the roll command cue will be out of view and the BC CAP annunciator will extinguish.

4. Go Around
   If Go Around required, proceed as follows:
   a. GA Switch ..... PRESS. AUTOPILOT DISENGAGES. NOTED BY MODE ANNUNCIATORS BEING EXTINGUISHED
   b. GA Annunciator ..... ILLUMINATES
   c. Command Cue ..... COMMANDS WINGS LEVEL PITCH UP ATTITUDE

NOTE

Apply engine power and retract landing gear after descent is stopped and desired airspeed is attained. Select flap position as required.

SECTION 5 NORMAL PROCEDURES (CONT)

IN-FLIGHT OPERATION (CONT)

APPROACH (CONT)

WARNING

DO NOT ATTEMPT A GO AROUND WITH 40° OF FLAPS.

d.	Missed Approached Heading	SELECT HEADING AS REQUIRED
e.	AP Engage Switch	PRESS. AP ENGAGE AND YD ENGAGE ANNUNCIATORS ILLUMINATE
f.	Missed Approach Departure	
	(1) HDG Mode Select Switch	PRESS. HDG ON ANNUNCIATOR ILLUMINATES
	(2) ALTSEL Mode Select Switch ...	PRESS. ALTSEL ARM ANNUNCIATOR ILLUMINATES
	(3) Pitch Attitude	PRESS TCS SWITCH TO SYNCHRONIZE FLIGHT DIRECTOR AND STABILIZE VS OR IAS BEFORE ENGAGING VS OR IAS MODE
	(4) Approaching Published Missed Approach Altitude ..	ALTSEL ARM ANNUNCIATOR EXTINGUISHES. CAP ANNUNCIATOR ILLUMINATES
	(5) At Published Missed Approach Altitude	ALTSEL CAP ANNUNCIATOR EXTINGUISHES. ALT ON ANNUNCIATOR ILLUMINATES

SYSTEM DESCRIPTION

GENERAL

The Sperry SPZ-500 Automatic Flight Control System with AD-500 Series ADI, RD-500/550 Series HSI and VN-212 VNAV consists of an autopilot, flight director and vertical navigation combined in an integrated system. The system also provides follow-up trim for pitch and yaw.

The cockpit components include the autopilot controller, mode selector, pilot's barometric altimeter, radio altimeter, vertical navigation computer/controller, flight director ADI (Attitude Director Indicator) and HSI (Horizontal Situation Indicator) with course and distance repeaters.

OPERATION

1. The autopilot controller is located on a remote swing up panel below the center pedestal. The controller contains the autopilot engage, yaw damper engage and soft ride pushbutton switches, manual turn and pitch controls, trim up/down indicator and system test switch.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

a. AP (Autopilot) Engage Switch

The autopilot is engaged by pressing the AP ENGAGE switch and is noted by the AP ENGAGE annunciator illuminating. The yaw damper is automatically engaged when the AP switch is pressed, and also noted by the illumination of the YD ENGAGE annunciator. The autopilot will not engage unless the TURN control is in the center detent position.

The autopilot and yaw damper may be disengaged by any one of the following actions:

(1) Pressing the TRIM A/P DISC switch on either control wheel.
(2) Selection of the Go Around mode.
(3) Selection of either the HDG INC (increase) or DEC (decrease) gyro slaving function.
(4) Pressing the TEST EACH FLT switch on the autopilot controller.

NOTE

When the autopilot is disengaged, an audible warning tone will be heard for approximately one second. The AP OFF annunciator will illuminate for approximately three seconds except when the HDG INC/DEC is activated or TEST EACH FLT is pressed in which case it will remain illuminated. The AP OFF annunciator illumination may be cancelled by pressing the TRIM A/P DISC switch.

R

One of the following methods may be used to disengage only the autopilot while allowing the yaw damper to remain engaged.

(1) Pressing the FAST ERECT switch.
(2) Activating the RH half of the DOWN/UP pitch trim switch.

NOTE

When the autopilot is disengaged, an audible warning tone will be heard for approximately one second and the AP OFF annunciator illuminates continuously until cancelled by pressing the TRIM A/P DISC switch.

The following malfunctions will cause automatic disengagement of the autopilot:

(1) Power loss to the system.
(2) Directional or vertical gyro failure.
(3) Failure of a torque limiter.
(4) Failure of the torque switching circuit.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

b. YD (Yaw Damper) ENGAGE Switch

The yaw damper is engaged by pressing the YD ENGAGE switch and is noted by the YD ENGAGE annunciator illumination. The yaw damper provides dutch roll damping and turn coordination throughout the flight envelope. The yaw damper can be independently engaged or will automatically engage when the autopilot is engaged.

The yaw damper may be disengaged by any one of the following actions:
(1) Pressing the TRIM A/P DISC switch on either control wheel.
(2) Selection of the Go Around mode.
(3) Selection of either the HDG INC (increase) or DEC (decrease) gyro slaving function.
(4) Pressing the TEST EACH FLT switch on the autopilot controller.

The following malfunctions will cause automatic disengagement of the yaw damper:
(1) Power loss to the system.
(2) Directional gyro failure.
(3) Torque limiter failure.
(4) Torque switching circuitry failure.

c. Soft Ride Switch

Smooths out abrupt pitch or roll with the autopilot engaged while maintaining stability in rough air.

d. TURN Control

Actuation of the TURN control provides bank commands to the autopilot proportional to the turn control displacement. When actuated, the lateral mode selected on the flight director controller is automatically cancelled. When the TURN control is returned to the center detent position, a lateral mode can again be selected. The autopilot will not engage if the TURN control is out of the center detent position.

e. PITCH Control

The PITCH control on the autopilot controller allows the pilot to change the airplane pitch attitude as desired. Movement of the pitch control changes the reference pitch attitude in proportion to the movement of the pitch control wheel and automatically cancels any vertical mode selected. However, for safety, movement of the pitch control with the autopilot coupled to the glide slope has no effect.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

f. Elevator TRIM Annunciator
The elevator TRIM annunciator announces out of trim condition by the illumination of UP or DN annunciators when a sustained signal is being applied to the elevator servo. The autopilot should NOT be engaged if either annunciator is illuminated.

g. TEST EACH FLT (Flight) Switch
The TEST EACH FLT switch is used to test the torque limit monitors. After engaging the autopilot, pressing the TEST switch will cause the autopilot to disengage by simulating a failure in the torque limit monitors. Pressing the TEST switch should also cause the AP TORQ annunciator to illuminate.

h. TCS (Touch Control Steering) Switch
TCS switches are located on the pilot's and copilot's control wheels. When either TCS is pressed, with the autopilot engaged and no lateral or vertical mode selected on the flight director controller, manual maneuvering of the airplane in roll and pitch may be accomplished. When the TCS switch is released, the existing roll and pitch attitudes are maintained. When the TCS switch is released at bank angles less than 6° , the airplane will return to wings level flight. If a lateral mode has been selected on the mode selector, actuation of the TCS permits roll maneuvers to be made. However, when the TCS switch is released, the autopilot resumes control to the lateral guidance signals received. If a vertical hold mode (IAS, VS, ALT) has been selected, the use of TCS resynchronizes the reference so that when the TCS switch is released, the present reference is maintained.

Use of the TCS during glide slope control or during ALTSEL CAP permits maneuvering while the TCS switch is pressed. However, when the TCS switch is released, normal glide slope control or ALTSEL CAP control is resumed.

2. Mode Selector
The mode selector provides for various modes of operation which are common to, and available for, both the autopilot and the flight director operation. Mode selection is achieved by pressing the desired mode switch. The mode select switches are alternate action switches: ON and OFF. The legend above the switch identifies each function. The legend in each switch illuminates when the selected mode is ON, ARM (armed), or CAP (captured). When the autopilot is engaged, the flight director commands are automatically coupled to the autopilot. Automatic sequencing of submodes are annunciated for NAV, APR, BC, VORAPR, and ALTSEL. This annunciation takes the form of split legends (ARM followed by CAP). The illumination of the annunciators may be checked by pressing the ANN TEST switch. The ten mode selectors and their functions are briefly identifed as follows:

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

a. HDG (Heading) Mode Select
When selected, allows capture of the selected heading as displayed on the HSI. Heading error gains are programmed as a function of true airspeed for proper damping during all flight conditions.

b. NAV (Navigation) Mode Select
When selected, the NAV provides lateral control for VOR enroute control or localizer control, depending upon the navigation receiver frequency selected. Prior to automatic capture of the lateral beam, the heading select mode is annunciated and operative, permitting control of the intercept angle. VOR operation provides for DME programming and automatic over the station sensing.

c. APR (Approach) Mode Select
When selected and the NAV receiver is tuned to an ILS frequency, the APR mode arms the flight director for automatic localizer and glide slope capture and tracking. Prior to localizer capture, the heading select mode is annunciated and operative, permitting control of the intercept angle. Prior to glide slope capture, any vertical mode may be selected for path control.

d. BC (Back Course) Mode Select
The BC provides for back course localizer control. Prior to automatic capture of the beam, the heading select mode is annunciated and operative, permitting control of the intercept angle. The back course roll commands begin down programming at 1,200 feet radio altitude to compensate for the beam convergence. If the radio altimeter is in operative, gain programming begins at capture, which results in premature roll command deprogramming and is not approved for operation.

e. VORAPR (Approach) Mode Select
When selected and the NAV receiver is tuned to a VOR frequency, the VORAPR mode provides for optimum gains for VOR approaches. The legend ARM illuminates initially, followed by the legend CAP when the beam is captured. When the VORAPR mode is selected, the NAV mode is automatically cancelled.

f. ALT (Altitude) Mode Select
The ALT hold mode provides control to the reference altitude existing when the mode is selected. Subsequent changes in the barometric setting in the altimeter produces comparable changes in the reference altitude so that the indicated altitude is maintained.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

g. ALTSEL (Altitude Select) Mode Select

The altitude preselect mode provides automatic capture of the altitude selected on the altitude preselect function of the VNAV computer/controller after a pilot initiated climb or descent. ALTSEL remains armed during the climb or descent to the selected altitude, which may be accomplished by means of VS, IAS, or PITCH hold modes. When the computed point for flare is reached, the altitude preselect CAP mode
R is automatically engaged for a smooth acquisition of the selected altitude. When the capture maneuver starts, the previously selected path control mode is cancelled. After the selected altitude is captured, the system switches automatically to the altitude hold mode. Pilot selection of the altitude hold mode during climb or descent to the selected altitude automatically cancels the altitude preselect mode and establishes the altitude hold mode at the existing altitude.

R h. VS (Vertical Speed) Mode, IAS (Indicated Airspeed) Mode Select

Vertical speed and airspeed modes are selected by pressing the corresponding pushbutton. Selection of these modes maintains the vertical speed or airspeed which exists at the time of selection.

i. VNAV (Vertical Navigation) Mode Select

The vertical navigation mode select allows the system to fly the airplane from one altitude to another at either a computed angle or a preselected angle by means of the VNAV computer/controller.

If a preselected angle has not been set when the VNAV mode is selected, the system will immediately capture the VNAV mode computed flight angle, thus illuminating the VNAV CAP annunciator and energizing an audible tone for approximately 3 seconds.

If a preselected angle has been set in the VNAV computer/controller, the system is armed in search of the flight angle. This is noted by the illumination of the VNAV ARM annunciator. When the flight angle has been captured, the ARM annunciator extinguishes, the CAP annunciator illuminates and an audible tone will be heard for approximately 3 seconds. The airplane will fly to the preselected altitude at the captured angle.

Upon reaching the preselected altitude, the airplane will level off and the system will switch to the ALT mode.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

The VNAV mode of operation is inoperative (locked out) when the RNAV or range monitor is on. The VNAV mode will cancel upon selection of the RNAV or RM mode. This is noted by the VNAV ARM or CAP annunciator extinguishing and an audible three second tone. Selection of VS or IAS mode will cancel the VNAV mode.

j. GA (Go Around) Mode Select Switch

The GA mode select switch is located in the left power lever. The GA mode initiates a fixed pitch up climb and wings level attitude command when pressed. Annunciation is provided by the illumination of the GA annunciator. Selection of the GA mode cancels all other flight director modes and disengages the autopilot. Any lateral control mode may be selected to provide steering guidance while in the GA mode of operation.

3. Remote Switch

a. AP (Autopilot) TRIM TEST Switch

R The AP TRIM TEST switch is located below the center pedestal. When pressed, the elevator pitch trim wheel is activated and the PITCH TRIM Annunciator illuminates indicating 100% pitch trim is available. This causes very mild pitch oscillations to occur above approximately 200 KIAS. Should this test be unsatisfactory, the autopilot must not be used for approaches.

b. Electric Pitch Trim Switches

The electric pitch trim switches are located on the outboard hand grip of the pilot and copilot control wheels and may be identified by their DOWN and UP legends above and below each respectively. Each switch is a split type switch with a left and right half. This

R system aids the pilot in manually trimming pitch when the autopilot is not engaged.

Power is supplied to the pitch trim system through the TRIM ELEV circuit breaker. Movement of either half has no effect on the pitch trim. Simultaneous movement of both halves will cause the electric pitch trim to operate. Movement of the right half of either switch will disengage the autopilot.

While the TCS (touch control steering) switch is pressed, the pitch trim is disengaged and the airplane may be trimmed using the manual pitch trim wheel. The electric pitch trim system will also be disengaged while the TRIM A/P DISC switch remains pressed. This also allows manual trimming with the wheel.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

4. Pilot's Altimeter
The altimeter displays barometrically corrected pressure altitude from the ADC (air data computer). Encoding information is provided by the ADC. The indicator provides the following control and displays:

a. BARO (Barometric) Pressure Set Control and BARO Counters
The barometric counters, set by means of the BARO control, display barometric pressure in inches of mercury and millibars. Setting the BARO control provides barometric pressure correction to the ADC.

b. Pointer
The pointer displays altitude between 1,000 feet levels on a scale with major indexes every 100 feet and minor indexes every 20 feet.

c. Altitude Counter
The four drum counter displays altitude from 0 to 50,000 feet. A negative (NEG) altitude shutter obscures the 10,000 and 1,000 digits of the counter to annunciate altitudes below sea level. The zero position on the ten thousands drum is black and white crosshatch to alert the pilot to altitudes of less than 10,000 feet.

d. OFF Failure Warning Flag
The failure warning flag comes into view when the error between the altitude displayed and the altitude signal received is too great, the ADC becomes invalid, or the barometric altitude indicator loses primary power.

e. Altitude Alert Light
The altitude alert light is located in the upper right corner of the altimeter. The light illuminates to provide a visual indication when the airplane is within 1,000 feet of the preselected altitude
R and extinguishes when the airplane is within 250 feet of the preselected altitude. After capture, the light will illuminate if the airplane deviates more than 250 feet from the selected altitude and will extinguish if the deviation is greater than 1,000 feet from the preselected altitude.

5. Flight Director Indicators
a. Attitude Director Indicator (ADI)
The attitude director indicator is similar in appearance to the conventional gyro that displays the airplane's attitude. The ADI also incorporates flight control system commands by means of a single cue inverted V-bar or cross pointers.

The pitch attitude displayed is linear from 0° to 80° up or down. The roll display has a full 360° capability with earth and sky attitude indications.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

The glide slope deviation pointer and scale is located in the side of the indicator and presents glide slope deviation only when tuned to an ILS frequency and a valid glide slope signal is present.

The radio altitude bar presents height above ground level below 200 feet and moves toward the symbolic airplane during descent toward the runway, contacting the bottom of the symbolic airplane at touchdown.

The expanded localizer display presents an amplified localizer signal for use during a final ILS approach.

The ADI also has a GA (Go Around) annunciator and a DH (Decision Height) annunciator in the upper corners. The GA annunciator illuminates when the go around mode has been selected. The DH annunciator illuminates when activated by the presented radio altimeter DH during descent.

An ATT (Attitude) test switch is located in the lower left corner. When pressed, the self-test circuitry is energized, causing a pitch up attitude of approximately 10° and a roll attitude of approximately 20° right bank. The ADI has two warning flags which come into view should a malfunction occur. The FD (Flight Director) warning flag indicates the absence, or loss, of power to the system or a computer/controller malfunction. The ATT (Attitude) warning flag indicates an attitude reference failure.

b. Horizontal Situation Indicator (HSI)

The HSI replaces the separate OBS and compass indicators with a combined course and heading display. The course setting incorporates a digital course display in the upper left corner in conjunction with the azimuth card setting. A four digit distance (DIST) display located in the upper right corner, operates in conjunction with the DME. The effective range displayed is limited by the DME equipment installed. The distance displayed is the distance to the #1 or #2 VOR station as selected. The distance displayed is the same as that displayed by the DME when the #1, #2 or HOLD position is selected. The HSI distance displayed will remain unchanged should a function other than distance be selected on the DME.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

The HSI has three warning flags which come into view should a malfunction occur. The HDG (heading) warning flag indicates the absence, or loss, of power, an invalid gyro signal or an error between the displayed heading and signal being received. The VERT (vertical) warning flag indicates the loss of a valid vertical deviation signal from the glide slope. The NAV (navigation) warning flag indicates the absence, or loss, of power to the NAV receiver, NAV receiver malfunction or unreliable signal being received.

6. VNAV (Vertical Navigation) Computer/Controller

The vertical navigation computer/controller provides a means for data insertions and displays for altitude alerting, altitude preselect and vertical navigation modes. The display is a three digit readout. Data is inserted by turning the selector switch to the desired position and adjusting the SET control.

a. Altitude Alerting/Preselect Function

Altitude alerting/preselect is accomplished by turning the selector switch to ALT, then turning the SET control to the desired altitude to the nearest 100 feet. The display indicates hundreds of feet with a range from 000 to 500 (0 to 50,000 feet). Selection of the ALTSEL mode arms the altitude alerting portion of the system.

The altitude alerting provides visual and audible signals when the airplane is approximately 1,000 feet from the preselected altitude along with any deviation of approximately 250 feet from that altitude. Changes may be made at any time. Any of the following pitch modes may be selected: ALT, IAS or VS.

b. Vertical Navigation Function

The vertical navigation computation may be accomplished by setting the VOR station elevation, desired flight altitude and the horizontal distance in which to climb to the desired altitude, pressing the HDG and then the VNAV mode select switches. The flight angle will be automatically computed. The following steps should be followed when inserting data for VNAV use:

(1) Turn the selector switch to ALT and adjust the SET control to the desired altitude.

(2) Turn the selector switch to STAEL (station elevation) and adjust the SET control to the nearest 100 feet.

(3) Turn the selector switch to either the TO or FR detent and adjust the SET control to the horizontal distance to the nearest 0.1 nautical mile ahead of the airplane.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

R (4) Turn the selector switch to the VANG (vertical angle) detent.
R The computed flight angle is displayed providing there is a valid VOR signal present.

NOTE

Should the data entered compute the VANG to be 6.0° or greater, the VNAV display will flash when the selector switch is in the VANG detent.

(5) The pilot may also enter a fixed flight angle by turning the selector switch to the VANG detent and then turning the SET control to the desired flight angle up to a maximum of 7.0° in lieu of presetting the horizontal distance (NM) TO or FR the VOR station.

When the computed or preselected flight angle has been captured, the VNAV CAP annunciator will illuminate until the airplane is approxi-
R mately 250 feet below the desired altitude. A tone will be heard for approximately 3 seconds at the time of angle capture. When
R nearing the desired altitude, the ALTSEL CAP annunciator will illuminate, cancelling the VNAV CAP mode. At altitude, the entered data will be cancelled by replacing the VANG DEG, NM TO/FR and STAEL digits displayed with dashes (---), thus preventing the use of erroneous VORTAC data for later VNAV use.

NOTE

Selection of any other vertical mode (VS, IAS or ALTSEL) will cancel the VNAV mode of operation.

The VNAV mode will not be operative when the RNAV or RM mode has been selected.

7. Remote Annunciators/Indicator
Several remote annunciators are installed on the left side of the pilot's instrument panel. These annunciators are illuminated by various system functions to indicate system status. Some annunciators illuminate during function off periods or to warn of malfunctions.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

a. ANN (Annunciator) TEST Switch
This switch, when pressed, tests the remote annunciators' lighting function and the VNAV audible tone. This switch is also used to test the flight director mode selector and the autopilot annunciators. Any flight director mode selected will be cancelled when the ANN TEST switch is pressed.

b. AP (Autopilot) OFF
The AP OFF annunciator illuminates momentarily when the autopilot is disengaged. Should the AP OFF annunciator illuminate due to a system malfunction, it will remain illuminated until cancelled by pressing the TRIM A/P DISC switch on either control wheel.

c. SOFT RIDE
The SOFT RIDE annunciator illuminates when the SOFT RIDE mode has been selected while the autopilot is engaged.

d. AP TORQ (Torque)
The AP TORQ annunciator must illuminate during the autopilot test function. It will illuminate should a malfunction occur in the air data computer or autopilot computer torque switching for the roll axis. Should this annunciator illuminate, the autopilot will disengage. The autopilot may be reengaged if the annunciator extinguishes in flight.

e. PITCH TRIM
The PITCH TRIM annunciator must illuminate when the AP TRIM TEST switch is pressed, indicating that 100% trim is operative. Should the PITCH TRIM annunciator fail to illuminate during test, the autopilot must not be used for approaches.

f. RUDDER TRIM Annunciation
The RUDD TRIM or RTRIM INOP annunciator (dependent upon installation) illuminates when a malfunction occurs in the rudder trim computer. Should this annunciator illuminate, the autopilot must be disengaged.

g. ROLL TRIM Indicator
The ROLL TRIM indicator is located below the center pedestal. The horizontal bar indicates an out of trim condition for the roll axis. The pilot may retrim the roll axis without disengaging the autopilot.

8. Lighting
The ADI, HSI, pilot's altimeter and vertical navigation computer/controller are internally illuminated. Intensity is controlled by the PILOT FLT INST rheostat located in the overhead switch panel.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)

OPERATION (CONT)

The ADI GA and DH annunciator lights, mode selector annunciator lights, and autopilot controller annunciator lights are controlled by the ANN NORM/DIM switch located on the upper left side of the pilot's instrument panel.

The legends of the mode selector and autopilot controller are back (edge) lighted. Intensity is controlled by the PILOT FLT INST rheostat located in the overhead switch panel.

R The HSI distance and course repeater displays are controlled by the HSI DIM rheostat located in the pilot is instrument panel to the right of the pilot's control column.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

HF COMM INTERPHONE SYSTEM

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 04-17-79

REISSUED DATE: 9-24-85

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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the HF COMM Interphone System is installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

The HF COMM Interphone System is approved for INT (intercommunication) and HF (high frequency) communication use only.

SECTION 3 EMERGENCY PROCEDURES

No Change

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

SYSTEM DESCRIPTION

GENERAL

The HF COMM Interphone System utilizes the audio system to allow communications between the flight compartment microphone/audio output and the passenger compartment interphone. The system also connects the passenger compartment interphone to the HF radio through the #2 audio system for passenger communications with other HF radio units.

INTERCOMMUNICATION OPERATION

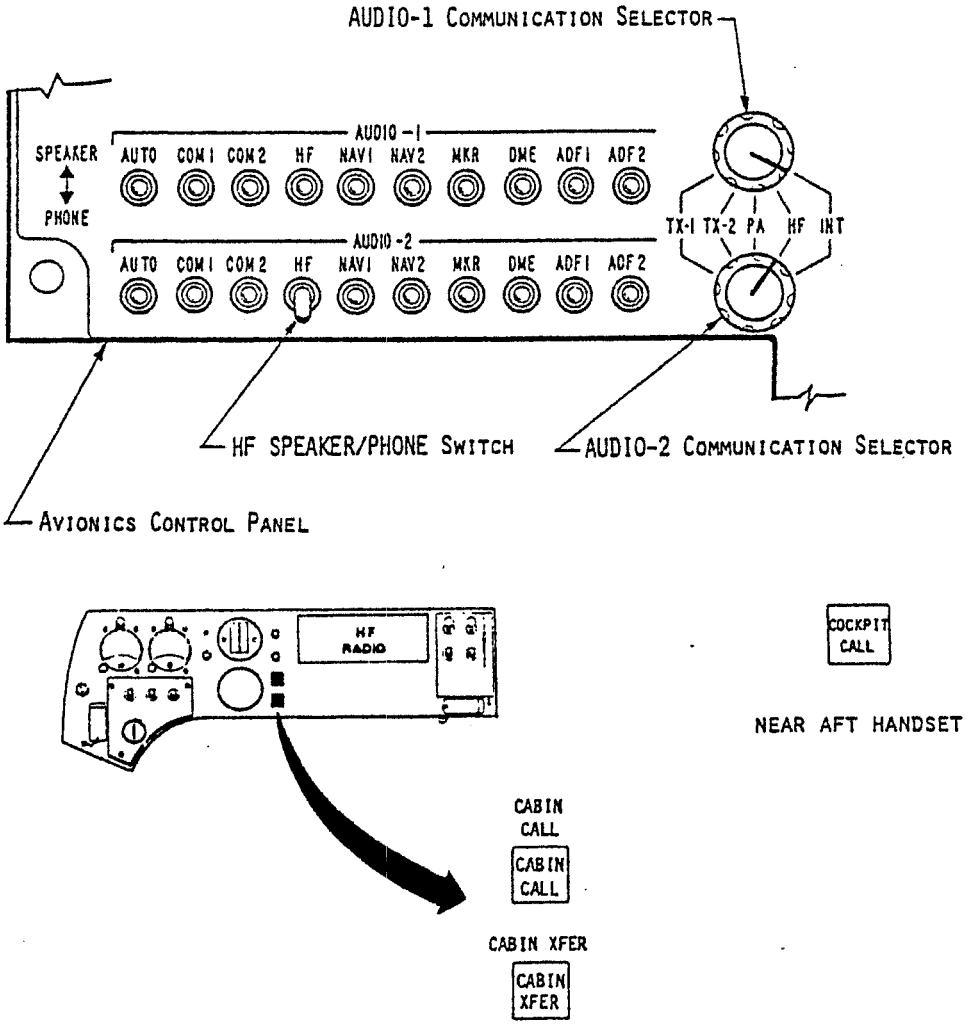
The CABIN CALL switch (located in the pilot's subpanel) and the COCKPIT CALL switch (located in the vicinity of the aft handset) illuminate, when pressed, to notify either compartment that intercommunication is desired. The pilot then places the Audio-1 or Audio-2 communication selector switch to the INT (intercommunication) position. Intercommunication is then accomplished when either Audio-1 or Audio-2 flight compartment microphone or the passenger interphone is keyed for transmission. The passenger audio is heard in the flight compartment through the speaker associated with the selected INT position.

PASSENGER HF COMMUNICATION

Place the Audio-2 communication selector switch to the HF position. Place the Audio-2 HF SPEAKER/PHONE switch to the PHONE position. The pilot must then turn the HF radio ON and select the desired frequency. The CABIN XFER (cabin transfer) switch, located in the pilot subpanel, illuminates when pressed. When the switch is pressed, the passenger interphone is connected to the HF radio and ready for use. Upon completion of communication, the CABIN XFER switch must then be pressed to disconnect the passenger interphone from the HF radio. The pilot can override passenger HF communications by pressing the CABIN XFER switch, by placing Audio-2 communication selector to another position (PA, TX-2, etc.), or by turning OFF the HF radio.

SECTION 5 NORMAL PROCEDURES (CONT)

SYSTEM DESCRIPTION (CONT)



SWITCH LOCATION (TYPICAL).

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

935A-2001 BAR & REFRESHMENT CENTER INSTALLATION

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 09-24-80

REISSUED DATE: 9-24-85

Don P. Watson

Don P. Watson, Manager
Aircraft Certification Division
Federal Aviation Administration
Southwest Region,
Ft. Worth, Texas 76101

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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the 935A-2001 Bar & Refreshment Center Installation is installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

REQUIRED PLACARD

ON BAR & REFRESHMENT CENTER

MAX CAPACITY
THIS CABINET 50 LBS

SECTION 3 EMERGENCY PROCEDURES

No Change

SECTION 4 ABNORMAL PROCEDURES

No Change

SECTION 5 NORMAL PROCEDURES

SYSTEM DESCRIPTION

GENERAL

The bar and refreshment center is installed to provide added convenience and comfort for the passengers. The center contains items and/or provisions such as hot and cold liquid containers/dispensers, ice buckets, music/sound systems, liquor dispensers and storage space. Each of the items which require electrical power to perform its specific duty will have a master switch to protect the system.

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

MITSUBISHI MU-2B-60

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR THE

DUAL AC POWER SOURCE WHEN MODIFIED BY SR034/24-002

THIS SUPPLEMENT IS APPLICABLE ONLY TO
AIRPLANE FLIGHT MANUAL MR-0273-1

SERIAL NO. _____

REGISTRATION NO. _____

FAA APPROVED: 05-08-81

REISSUED DATE: 9-24-85

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Southwest Region,
Ft. Worth, Texas 76101

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SECTION 1 INTRODUCTION

This supplement must be attached to the FAA Approved Airplane Flight Manual when the Dual AC Power Source Modified by SR034/24-002 is installed in accordance with MAI Approved Data. The information contained herein supplements or supersedes the information in the basic Airplane Flight Manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION 2 OPERATING LIMITATIONS

No Change

SECTION 3 EMERGENCY PROCEDURES

No Change

SECTION 4 ABNORMAL PROCEDURES

ELECTRICAL FAILURE

INVERTER FAIL Annunciator Illuminates:
1. Inverter Switch ..... STANDBY
2. Main Inverter POWER And CONT Circuit Breakers ..... DISENGAGE
3. 115VAC LH POWER Circuit Breaker ..... DISENGAGE
4. 26VAC LH POWER Circuit Breaker ..... DISENGAGE

INVERTER FAIL Annunciator Illuminates After Selecting STANDBY:
1. Inverter Switch ..... OFF

SECTION 4 ABNORMAL PROCEDURES

ELECTRICAL FAILURE (CONT)

INVERTER FAIL Annunciator Illuminates After Selecting STANDBY (CONT):

2. Standby Inverter POWER and CONT Circuit Breakers ..... DISENGAGE

CAUTION

POWER WILL BE LOST TO THE FOLLOWING EQUIPMENT:

a. MAIN FUEL QUANTITY INDICATOR
b. LH AND RH ENGINE FUEL PRESSURE INDICATORS
c. LH AND RH ENGINE OIL PRESSURE INDICATORS
d. TRIM POSITION INDICATOR AND INTEGRAL INSTRUMENT LIGHTING (5 VOLT LIGHTING)
e. AC POWER TO VARIOUS FLIGHT INSTRUMENTS (i.e., PILOT'S ADI AND HSI, NAVS, RADAR, AUTOPILOT)

THE FOLLOWING ITEMS WILL REMAIN OPERATIVE:

a. BOTH VHF COMMUNICATION RADIOS
b. NAV AUDIO
c. ADF AUDIO
d. ALL DC ONLY SYSTEMS

3. Fuel Quantity ..... CALCULATE APPROXIMATE FUEL REMAINING FOR FLIGHT AND PLAN ACCORDINGLY
4. Operative Engine Instruments ..... MONITOR INDICATIONS FOR POSSIBLE MALFUNCTION
5. Remainder of Flight ..... USE ALTERNATE INSTRUMENTS

NOTE

The following equipment list gives the primary instrument and its alternate:

	PRIMARY	ALTERNATE
a.	F/D ADI	Copilot Vacuum Attitude Gyro
b.	HSI's	Magnetic Compass (Center Windshield Post)
c.	Pilot Altimeter	Copilot Barometric Altimeter
d.	RMI's	None

6. Land As Soon As Possible ..... SELECT SUITABLE VFR AIRFIELD AND REPAIR PRIOR TO NEXT FLIGHT

SECTION 5 NORMAL PROCEDURES

No Change

SECTION 6 PERFORMANCE

No Change

SECTION 7 WEIGHT & BALANCE

No Change

INSTRUCTION SHEET

MITSUBISHI

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

for the

ROSEMOUNT MODEL 871CT1 SUPPLEMENTARY ICE DETECTION SYSTEM

This Supplement is applicable to the following Manual(s)

MR-0273-1

INSTRUCTIONS

1. Turn to the *SUPPLEMENTS* Section of the manual.
2. An Airplane Flight Manual Log of Supplements page for each manual affected accompanies this instruction sheet. Identify the one applicable to the particular manual being updated, and discard all other accompanying log pages.
3. Compare the existing Log of Supplements page in the manual with the corresponding applicable page accompanying this Instruction Sheet. It may occur that the Log Page already in the manual is dated later than the applicable Log Page accompanying this Instruction Sheet. In any case, retain the Log Page having the later date in the folio at the bottom-left corner of the page, and discard the older Log Page.
4. Remove from the manual the old supplement (if any exists) which bears the same Part Number as the supplement accompanying this Instruction Sheet. Discard the old supplement and insert the new one, placing it in the position indicated on the Log Page.

After compliance, this Instruction Sheet may be discarded.

MITSUBISHI

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

for the

ROSEMOUNT MODEL 871CT1 SUPPLEMENTARY ICE DETECTION SYSTEM

This Supplement is applicable to the following Manual(s)

MR-0273-1

Airplane Serial Number: _____

Airplane Registration Number: _____

FAA Approved: 05-28-92

Issued: 05-28-92

for Lawrence A. Herron, Manager
Aircraft Certification Division
Federal Aviation Administration
Wichita, Kansas

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SECTION 1 INTRODUCTION

The information in this supplement is FAA-approved material and must be attached to the FAA Approved Airplane Flight Manual when the airplane has been modified by installation of ROSEMOUNT SUPPLEMENTARY ICE DETECTION SYSTEM in accordance with Mitsubishi/Beech approved data.

The Rosemount Supplementary Ice Detection System is an alerting system which aids the crew in recognizing the presence of icing conditions. It does not replace or amend the existing procedures for ice detection and deicing. Further, it does not anticipate the possibility of ice, and hence cannot provide the lead-time needed to activate anti-icing systems (such as engine inlet heat) prior to an icing encounter.

The information in this supplement supersedes or adds to the basic FAA Approved Airplane Flight Manual only as set forth within this document. Users of the manual are advised always to refer to the supplement for possibly superseding information and placarding applicable to operation of the airplane.

SECTION 2 OPERATING LIMITATIONS

1. No Change.

SECTION 3 EMERGENCY PROCEDURES

1. No Change.

SECTION 4 ABNORMAL PROCEDURES

1. FAIL Annunciated - The ice detection is inoperative. Normal procedures for ice protection should be followed.

SECTION 5 NORMAL PROCEDURES

PREFLIGHT - CHECK

1. ICE DETECTION PROBE.....CLEAN

BEFORE TAKEOFF

1. ICE DETECTION TEST BUTTON.....PRESS AND HOLD
   a. The amber FAIL annunciator shall illuminate briefly followed by a 1/2 second aural warning and illumination of the amber ICING annunciator.

AFTER TAKEOFF/ENROUTE

1. ICING Annunciated - The aircraft is in icing conditions. Normal deicing procedures shall be followed. Anti-ice precautions shall be observed any time the airplane is in potential icing conditions.

CAUTION

Do not use the standby magnetic compass when ICING is annunciated. Errors of more than 10° may result when the probe heat is on.

SYSTEM DESCRIPTION

1. General
   a. The Rosemount ICE DETECTION SYSTEM provides an additional alert to the flight crew when the airplane has entered icing conditions so that deicing procedures may be initiated.
   b. In some light icing conditions at or near 0°C the ice detection system may not indicate icing before it is visible on the leading edges or the windshield surfaces, in which case the deicing systems should be operated appropriately.
2. Placement
   a. The sensor probe is placed in the free air stream where the air flow is not influenced by other structure surfaces. The supercooled water droplets are less likely to be carried around the sensor probe by aerodynamic forces. In this manner the probe typically will accrue ice before the other aircraft surfaces.
3. MAINTENANCE
   a. Due to the principle of design and operation the ice detection system does not require routine maintenance, calibration, or adjustment.
4. PRINCIPLE OF OPERATION
   a. The Rosemount Ice Detector employs an ultrasonic axially vibrating tube mounted inside the strut with 1 inch of the tube protruding into the airstream. The tube exhibits magnetostrictive properties, which is the ability to expand and relax under the influence of an oscillating magnetic field driven by a coil inside the strut. This tube has a natural resonant frequency of 40,000 hertz which is activated by a drive coil at its base. The natural resonant frequency of the tube decreases as the ice accumulates on the probe. The probe will be unaffected by any other weather conditions such as rain, or ice crystals and contamimants such as oil, grease, or dirt.
   b. When a frequency shift is sensed an aural warning will sound for 1/2 second and the ICING annunciator will illuminate. The ice detection probe will then deice itself through heating elements in the strut and probe. The heaters will remain energized until the frequency rises back to a predetermined point below 40,000 hertz with an additional 4 to 5 seconds to assure complete deicing.
   c. Once deiced the probe quickly cools and the ice detection system is then ready to procede through the cycle again. Once initiated the ICING annunciator will remain illuminated as long as the sensor detects ice. When the ice detection probe has remained free from ice for 60 seconds the annunicator will extinguish.
5. MODE TEST
   a. Initiate the detection mode by slowly squeezing the sensing probe between the thumb and the forefinger until the ICING annunicator illuminates. Remove the fingers when the temperature of the probe and strut have begun to rise.

CAUTION

The sensing probe will become very hot in a few seconds when the icing annunciator turns on and may inflict severe burns.

1) Verify by the sense of touch, that the probe and strut heaters are energized.
2) Verify that the ICING annunicator illuminates for 60 seconds and the aural warning sounds for an initial 1/2 second.
3) Verify that the FAIL annunciator remains off.

SECTION 6 PERFORMANCE

1. No Change.

SECTION 7 WEIGHT AND BALANCE

1. No Change.

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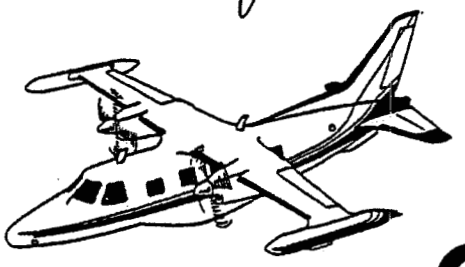
Marquise



MU-2B-60 PILOT'S OPERATING MANUAL

DOCUMENT NUMBER MR-0338-1

THE INFORMATION CONTAINED IN THIS PILOT'S OPERATING MANUAL IS NOT FAA APPROVED. IF ANY DATA INCONSISTENCY EXISTS BETWEEN THIS MANUAL AND THE FAA APPROVED AIRPLANE FLIGHT MANUAL, THE AIRPLANE FLIGHT MANUAL SHALL BE THE GOVERNING AUTHORITY.

MITSUBISHI
HEAVY INDUSTRIES, LTD.
(LOGO CHANGE 4-1-86)

ORIGINAL ISSUE SEPT 1, 1978
REISSUE DATE AUG 23, 1985
REVISION DATE July 15, 2004

APPLICABLE TO AIRPLANE SERIAL NUMBERS 700SA, 731SA THROUGH 799SA AND 1501SA THROUGH 1569SA.

MU-2B-60
PILOT'S
OPERATING
MANUAL

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REVISION INSTRUCTIONS

Revisions will be prepared and issued as required to update or correct existing material. It is the pilot's responsibility to assure revisions are incorporated and that the manual is current at all times. For this purpose, a List of Effective Pages is included with each revision.

The List of Effective Pages serves as a cross-check to validate the currency of the manual. Should the List of Effective Pages disagree with the actual pages after insertion into the manual, contact Mitsubishi Aircraft International, Engineering Technical Publications for clarification. The List of Effective Pages contains the section, page number and date of each page. Single and double asterisks are used next to the page number to identify pages which are being revised or added, respectively. Parentheses are used to identify pages deleted.

Revisions, additions, and deletions to material will be identified on individual pages by the letter **R** along the left margin adjacent to that portion of the text affected. Changes to figures will be identified by a black bar in the margin adjacent to the portion affected. The revision date and revision number will be added to the bottom of each page which has been affected.

The letter **R** in the left margin opposite the section, page number, and date will indicate the text is unchanged but relocated to a different page.

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INTRODUCTION

This manual consists of four sections and contains necessary information for the safe and efficient operation of the MU-2B-60 (Marquise). This document provides general information on the airplane, its systems, operating limitations and performance.

Section 1 provides general information such as location of control surfaces, their area dimensions, and deflection angles. Section 2 contains information on the operating limitations which affect the MU-2B-60 airplane. Section 3 contains brief descriptions and operational procedures for the airplane and its systems plus ground handling and servicing information. Section 4 contains flight planning data (tables, charts) and related information which affect the performance of the airplane.

THE AIRPLANE

The MU-2 is a high performance, twin turboprop, high wing airplane powered by two Garrett Turbine Engine Co. TPE 331 turboprop engines flat rated to 715 SHP, each driving a Hartzell four blade, constant speed, full feathering, reversible pitch, 98 inch diameter propeller.

STRUCTURAL DESCRIPTION

The fuselage is a stressed skin semi-monocoque structure, pressurized except for the nose and tail, and is assembled from front, center and rear fuselage portions. The cross-section is approximately circular with a maximum diameter of 65.4 inches and a minimum skin gauge of 0.025 inches. A substantial box beam forms the keel member which runs along the main part of the fuselage. The frames are between 10 and 11 inches apart and are formed "U" section; the heavier ones at the more highly loaded locations, such as the wing pick up and door positions, are extruded. These frames are continuous down to the skin, leaving bays which are stringerless except for intercostals and longerons for necessary reinforcement around doors and windows. The pressure bulkheads are stiffened flat panels and the floor is of sandwich construction with a plastic foamed core and metal skin exterior.

The windshield is divided by a substantial center pillar of "I" section formed by a built-up back to back rolled "U" section, while a similarly substantial built-up closed section forms the pillar between the windshield and cockpit side windows.

The wing lies inside a cutout within the top of the fuselage, attached by two single pin fittings at the front and rear spars respectively, mating with corresponding fittings on the fuselage frames. The fuselage cutout is sealed by a pressure retaining flat panel reinforced by "Z" stiffeners and heavier side members.

The rear fuselage is made with formed "U" frames approximately 10 inches apart with no stringers, except where necessary for reinforcement. The fin is of conventional two spar construction with ribs and is attached by fittings to

THE AIRPLANE (CONT)

STRUCTURAL DESCRIPTION (CONT)

two main fuselage frames. A dorsal is fitted which is completed by an exterior glass fiber reinforced plastic skin. The rudder is of spar and rib construction hung on two hinges with an external mass balance towards the top hinge. The horizontal stabilizer is continuous from tip to tip with conventional two spar construction and ribs. It is attached behind the fin near the top of the fuselage to two main fuselage frames through fittings on the front and rear spars. The elevators are of spar and rib construction connected by a torque tube on which the control quadrant is fitted. Each elevator is hung on two hinges with an external mass balance towards the outer hinges. Both the rudder and the elevators are fitted with trim tabs. These trim tabs are manually operated and have an irreversible actuator fitted close to each of the surfaces.

The wing is of conventional, two spar construction, attached to the upper fuselage as stated earlier. The major components are the wing box section, flaps, spoilers and trim aileron tabs. The engines are suspended from the wing on each side and wing tip tanks (removable for maintenance) are also fitted. The wing is continuous to outboard of the engines and is joined to the outer wing by four bolts and four shear pins (S/N 700SA or by splice connections (S/N 731SA and up). The front and rear spars are at 22% and 60% of the local wing chord respectively. Ribs are placed at 12 to 14 inch intervals.

Longerons run spanwise between spars inside the upper and lower surfaces. The wing box inboard of the engine nacelles forms an integral fuel tank. The leading edge is hinged to the front spar by a piano hinge for ease of access. The outboard wing box also has ribs and stiffeners and contains an auxiliary inboard fuel tank (S/N 700SA) or forms an integral fuel tank (S/N 731SA and up). The engines are flexibly attached to the wing through a triangulated front mounting slung from an auxiliary torsion box forward of the front spar and also from a rear fitting under the wing. The mounting and attachments are made from substantially sized forged and built-up light alloy members. The flaps are double slotted Fowler type and are almost full span. They are divided on each side into an inner and outer section. These are suspended on three tracks each side with all sections having a common drive operated by a single electric actuator. The main flaps and front inner flaps are of spar and rib construction while the front outer flaps have a metal spar with a foamed plastic core and glass reinforced plastic external skin. The trim aileron tabs are attached to the trailing edges of the outer main flaps. These tabs are driven by an electric actuator contained within the parent flap. Although the final output is through a single push-pull rod, there is an irreversible actuator close to the tab surface. The spoilers supply normal roll control by differential manual operation. These are in two portions on each wing and extend almost the full span of the outer wing upper surface behind the rear spar. They are pivoted at the front, are 2.5 inches wide, and made from extruded light alloy.

THE AIRPLANE (CONT)

STRUCTURAL DESCRIPTION (CONT)

The nose gear and the main gear retract forward. A bulge is situated along both lower sides of the fuselage, extending 172 inches aft from just behind the cockpit. The main landing gear retracts into these and lie beside the keel beam. The main gear bay is completed by a pressure constraining skin on the inside of the fuselage frames over the bay length down to floor level. The floor is pressure containing from the front of the bay back to the rear pressure bulkhead. Forward of this the pressurized area extends down to the fuselage bottom skin as before, with drainage provisions. The main door lies behind the main gear bay on the left-hand side with a folding step which is connected through a linkage to the main door so as to retract automatically into the bulge. An emergency exit is situated on the right-hand side forward of the main door. Baggage storage is provided at the rear of the cabin. The baggage is held in place by restraining straps. The fuselage external skin between the first and second cabin windows on each side is protected from ice coming off the propellers by a glass reinforced plastic shield. The center fuselage is completed by a servicing bay behind the rear pressure bulkhead with an access door on each side.

LANDING GEAR

The main landing gear retracts into bulges on the sides of the fuselage to avoid intruding into the cabin area. Both main and nose gears retract forward; the drag struts being aft of the main legs. Two fitted nose wheel doors stay down after extension.

The main landing gear consists of the wheel, tire, brake, axle, leg assembly, shock strut, drag strut, and position rod. The main gear aft door is connected mechanically to the oleo strut. The main gear forward door is operated separately during landing gear retraction or extension by means of an independent electric actuator.

The oleo strut is a standard air and oil type, consisting of a cylinder and piston. The strut absorbs landing and taxiing shock loads. The drag strut sustains ground loads and also serves as a screwjack for gear retraction. The position rod, connected to the leg assembly and axle, receives horizontal loads from the axle and allows retraction of the wheels into the fuselage by swivelling the axle during gear retraction. The ground safety switch is mounted on the left gear leg assembly and prevents the gear from retracting while the airplane is on the ground.

The nose landing gear consists of an oleo strut, drag struts, twin wheels, tires and tubes. The oleo strut includes a shimmy damper and centering roller. The straightener is installed at the top of the strut and is guided by a centering roller when the gear is retracted. Each of the two drag struts is provided with a down lock. The screw jack for gear retraction is connected to the drag strut on the right-hand side. The shimmy damper connects the trunnion with the cylinder to prevent the nose gear from shimmying while taxiing.

THE AIRPLANE (CONT)

LANDING GEAR (CONT)

The nose gear is equipped with a door actuating mechanism operated by the strut. A torque link disconnecting mechanism is located between the torque links to provide a greater steering angle for towing.

Nose wheel steering is limited to 23° left and 22° right. When the torque link is disengaged for towing there is no feedback to the rudder pedals or rudder. Since there is no control lock for the rudder system, the nose wheel providing adequate restraint, it is important to ensure that the torque link is not left disconnected when the airplane is parked. The tow bar is attached to the axle extremities.

The gear operating mechanism is electrically driven for normal operation. There is a hand operated system for emergency extension.

Each main gear is raised and lowered by extension or retraction of its drag strut, which in turn is driven by its own gearbox. The gearboxes are connected to the electric motor linked to the right box.

The nose wheel is operated by a torque tube drive connected to the left main landing gear drive box. The torque tube runs from the wheel well outside the left keel member and passes through the pressure cabin. At the forward end, the torque tube drive is transferred by a chain and sprockets to a gearbox driving a screw jack. The screw jack is attached to the right nose wheel drag strut and retraction is effected by breaking the struts. The sprockets are not guarded.

In the event of electric drive failure the landing gear may be lowered manually. This is accomplished by operating a handle stowed in the floor between the pilot's seats. Lifting the handle causes the main gear door locks and clutch to disengage, allowing the doors to swing free. The lever operates the torque tube drive which runs along the keel and about 130 full lever movements are required to lower the gear. Extension is complete when three green indicator lights illuminate and the handle cannot be moved.

The electric motor speeds are reduced to one sixteenth through two stage spur gears in the main reduction gearbox.

A clutch is provided for the prevention of overload upon the mechanism and slips when torque exceeds 380 - 560 in-lbs. The torque shaft in this system is connected at several places by means of universal joints on the splines.

A backup mechanical stop protects the mechanism in the event of torque shaft overtravel due to inertia or limit switch malfunction. The main landing gear drag struts incorporate irreversible screw jacks. Consequently, the main gear is not provided with an uplock or downlock. The main landing gear doors consist of forward and aft doors. The aft doors are mechanically connected with the main gear oleo strut and operated by the landing gear. The forward doors

THE AIRPLANE (CONT)

LANDING GEAR (CONT)

are opened before and closed after gear operation by an electric actuator. The forward door mechanism is mechanically connected to the main gear aft door lock mechanism which is unlocked when the forward doors open.

FLIGHT CONTROLS

Spoilers are used for lateral control and extend almost full span outboard of the engines. By using spoilers it has been possible to install flaps of unusually large proportions which are effectively full span.

All primary and trim tab controls, as well as engine controls, are initially routed through the keel section under the cabin floor.

A gust lock pin is used to lock the elevator and spoiler controls when parked. The pin is inserted in the control column shaft. A red flag is attached to the pin.

Elevator control is by 5/32" 7 x 19 flexible cables, with quadrants at each end. The forward quadrant is linked by a push-pull rod to the center of the T control column. Each half of the elevator is supported on two hinges and there is a combined aerodynamic and mass balance near the tip of each elevator. Two elevator down springs are fitted.

Rudder control is similar to the elevator, with the rudder attachment and balancing similar to one side of the elevator. The two sets of rudder controls each operate a quadrant by push-pull rods. The quadrants are similarly linked. Flexible 5/32" 7 x 19 cables connect to the rudder surface.

The two pilot's control wheels are joined by chains and sprockets which are linked to a quadrant below the control pedestal. From this point 5/32" 7 x 19 flexible cables run to the mixer box located in the wing center section. Thereafter the control inputs are transferred to the spoilers by a series of push-pull rods and bell cranks. Spoilers operate differentially through the action of the mixer box. With one spoiler deflected upwards to the maximum of 60° the other will depress 14° below the wing surface. The spoilers are machined from extrusions and there are two on each side of the wing. Each spoiler is attached by dual hinges and is operated by a single rod connection.

Conventional trim controls, which are cable and chain operated through actuators mounted beneath the trim surfaces, are fitted. The actuators have irreversible screwjacks. On the elevator the two trim surfaces are cross linked by a chain and sprocket arrangement.

The aileron type trim consists of inboard and outboard surfaces located in the inner section of the outboard flaps. Each pair of tabs is mechanically connected and driven by an electric actuator with an irreversible drive mounted in the flap. Trim position is sensed from the actuators.

THE AIRPLANE (CONT)

FLIGHT CONTROLS (CONT)

The left and right electrically connected aileron type trim tabs move in opposite directions to each other. Although operating speeds of the left and right actuators are usually different, accumulation of differences is avoided because the actuator is momentarily stopped through a neutral limit switch.

When the guarded TRIM AIL SELECT switch, located on the switch panel, is moved to the LH or RH position, interconnection between left and right tabs is disconnected and the control surface which has been selected can be operated independently. Trim capability remains even if the control surface on one side becomes inoperative.

Double slotted, full span flaps are fitted. They are operated through three actuators per side. The irreversible actuators are driven by an electric motor via gears and torque tubes. It is possible to stop the flaps at the UP, 5°, 20° and 40° positions shown by indicator lights located below the selector.

The electric motor and gearbox are housed in the wing center section along with the flap limiter controls. The primary actuator and main flap track are approximately in the center of each flap. There are additional smaller actuators and guides at each end. From the motor to the primary actuators, the drive is by torque tube; thereafter by flexible shafts to the outboard actuators. The electric motor incorporates an electromagnetic clutch which varies in load carrying capability with current passing through the motor. It will not slip in normal operation.

The flap limiter control will stop the flaps at any of the positions shown on the selector quadrant, provided the selector is moved to the particular position. When a position is selected the flap will move to that position and the flap indicator light will illuminate. To slow the rate of flap movement between 0° and 20° an interrupter device is installed which inches the flaps in or out.

No emergency means of operating the flaps is provided.

THE AIRPLANE (CONT)

FUEL SYSTEM

The fuel system consists of three separate sets of tanks. The main tank, which is located in the wing above the cabin is made up of three interconnected integral type tanks: center and two outboard. There are left and right
R outer wing tanks and left and right tip tanks. The tank useable capacities are as follows:

	Main tank	: 154 U.S. gallons
R	Outer wing tanks	: 34.5 U.S. gallons per side
	Tip tanks	: 90 U.S. gallons per side

Total useable fuel is 403 U.S. gallons.
(See Airplane Flight Manual Supplement Number 1 for S/N 700SA)

Check valves are fitted in the three integral tanks to ensure no fuel backflow can occur. The fuel from the outboard integral tanks flows by gravity to the center integral tank.

R The outer wing tanks transfer fuel into the center integral tank by electrically driven transfer pumps. The level of fuel in the center tank is controlled by a fuel level control valve. In the event of transfer pump
R failure, or when the outer wing tank is empty, a pressure switch actuates a warning light in the cockpit.

The tip tanks are pressurized by air tapped from the engines and fuel is transferred into the center integral tank. The transfer rate to the center tank is controlled by the fuel level control valve in the center tank.

The flow of fuel into the center tank from the tip tanks is controlled by electrically operated valves which are located in the fuel supply line to the center tank. A check valve is fitted in the outlet of each outboard tank to prevent fuel backflow when the tip tanks are transferring fuel to the center tank.

There are two electrical fuel boost pumps in the center tank: one at the front and one at the rear of the tank. The pumps feed via check valves into a common fuel manifold. From the manifold the fuel is supplied to each engine via separate lines, each having an electrically operated shut off valve.

ELECTRICAL SYSTEM

DC electrical power is supplied by two 28 volt, 200 ampere engine driven DC starter-generators, two 24 volt, nickel-cadmium batteries, and an external power source through the external power receptable. The batteries are used for engine starts and standby power for the DC system. When the battery switch is ON, both batteries are connected in parallel to the main bus. When the left and right DC generator switches are ON after engine start, the respective generators are connected to the main bus through the reverse current cutout relay, which prevents generator motoring.

THE AIRPLANE (CONT)

ELECTRICAL SYSTEM (CONT)

The output voltage of both generators is controlled by individual voltage regulators, which enables the two generators to operate in parallel. When a generator exhibits an unusually high voltage condition, the main bus and electrical equipment are protected by the over voltage relay, which automatically removes the affected generator from the line. The electrical load for each generator and the monitored bus voltage are indicated by their respective voltammeters.

AC electrical power is supplied by one of the two 115/26 volt 400 Hz single phase inverters: the main or standby, both installed in the right side of the main junction box. Each system is independent of the other. The main inverter system receives main and control power from the LH 28 VDC load bus, while the standby inverter system depends on the RH 28 VDC load bus for its main and control power. Selection is accomplished by means of the inverter select switch on the left switch panel. Normal operation of AC equipment utilizes the MAIN inverter system. Associated circuit breakers control the power distribution to the various systems requiring AC voltage.

During normal operation, DC input is supplied to the inverter through the MAIN (STBY) INV POWER circuit breaker, but during engine start, power is supplied directly from the start bus through the DC-DC converter. While starting an engine, AC output voltage from the inverter drops due to the decrease in DC power supplied to the inverter. In order to prevent this drop, the DC-DC converter is automatically operated only during engine start cycles. The DC-DC converter also operates the engine fuel flow indicators and engine torque indicators in either series or parallel starts.

An inverter failure detecting relay is provided for the 115 VAC output. Should the inverter voltage fall below a specified value, the inverter failure detecting relay actuates, illuminating the INVERTER FAIL annunciator and MASTER CAUTION light in the cockpit.

The DC power is distributed from the LH and RH main buses to the LH and RH load buses of the cockpit circuit breaker panels. The LH and RH load buses are powered respectively by the LH and RH main buses through overload sensors, feeder relays, feeders and diodes. The LH and RH radio buses are connected to the LH and RH load buses through the radio master switch on the circuit breaker panel. The overhead panel buses are powered by the LH and RH load buses through the circuit breakers No. 1 and No. 2, OVERHEAD PANEL.

Airplane Not Modified by SR034/24-002

Normal AC power distribution is accomplished through two power buses: a 115 VAC bus and a 26 VAC bus. During engine starts, these buses are automatically disconnected from the system. The fuel pressure indicators and oil pressure indicators are supplied 26 VAC through indicator power exchange relays during the start cycle only.

THE AIRPLANE (CONT)

ELECTRICAL SYSTEM (CONT)

Aircraft S/N 799SA, 1501SA and UP when modified by SR024/24-002

Normal AC power distribution is accomplished through four power buses: two 115 VAC buses and two 26 VAC buses. During the engine start cycle, these buses are automatically disconnected from the system. The fuel and oil pressure indicators are supplied 26 VAC through the indicator power exchange relays during the start cycle only.

ENVIRONMENTAL

The MU-2B-60 is pressurized to a maximum of 6.10 psi. At the maximum certificated altitude of 31,000 feet pressure altitude the cabin altitude is 9,850 feet.

Bleed air is supplied from a tap in the final compressor stage of each engine. An electrically operated bleed air shut-off valve is installed in each engine nacelle and there are one way check valves in each line. The two main supplies are fed to a common line in the center section and run above the fuselage in a fairing until aft of the rear pressure bulkhead. In the wings, the bleed air line runs behind the rear spar and is insulated with glass fiber at points where the line runs close to the structure.

Pressurization is derived from engine bleed air which is conditioned by an air cycle machine and distributed around the cabin. Cabin altitude and rate of climb or descent are controlled by a pneumatically operated control unit. The air conditioning system consists of refrigeration unit, water separator, refrigeration unit bypass valve, cooling turbine bypass valve, ram air shut-off valve, engine bleed air pressure regulator, temperature control system and air outlets.

A cabin rate of climb control is provided and is capable of controlling between 50 and 2,000 feet per minute.

The cabin altitude selector range is -1,000 feet to 10,000 feet. For a given cabin altitude selection, the maximum altitude at which the airplane can fly is also shown.

In the event of failure of the pressure control unit, a normal pressure control valve is provided to control cabin pressure. It can also be used to dump cabin pressure with the airplane on the ground or in the air.

The cabin can be ventilated using RAM air only. A ram air intake is installed at the top of the equipment bay. At normal cruising speed the supply pressure is about 2 psi. To provide a flow of air through the cabin, the outflow valve can be opened by using the manual control.

All cabin pressure is dumped on the ground by a conventional landing gear safety (squat) switch arrangement.

THE AIRPLANE (CONT)

ICE AND RAIN PROTECTION

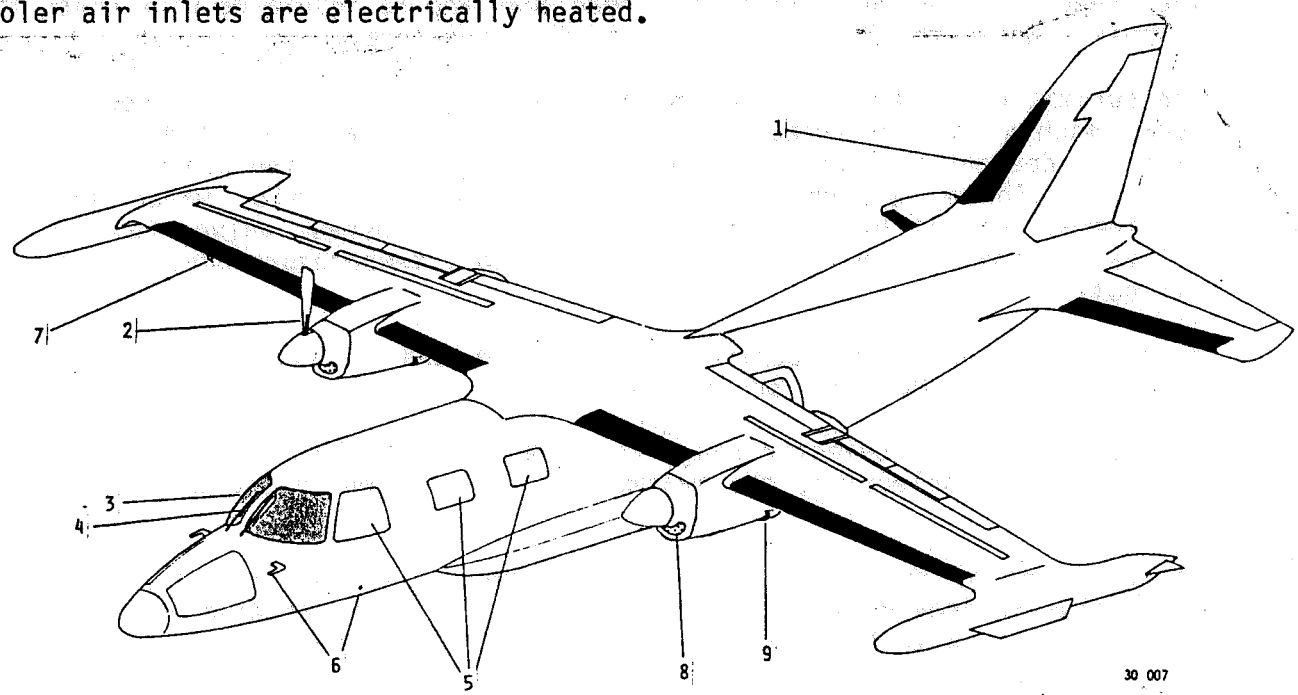
The airplane is equipped with ice protection systems and is certified for flight into known icing conditions.

Pnuematic rubber boots cover the leading edges of the wing, vertical and horizontal stabilizers, and are operated by engine bleed air. Engine bleed air is also used for engine intake anti-icing and for defogging cockpit and cabin windows.

Dual electrically heated windshields consist of 9/64 inch tempered glass plies bonded together by a unique 1/4 inch vinyl interlayer containing a 28 volt D.C. heating matte. Selecting low heat setting distributes 1.5 watts per square inch over a 300 square inch area for anti-icing, whereas the high heat setting applies 4.5 watts per square inch to a 215 square inch area for ice removal. The windshields are thermostatically controlled, fail-safe and have an anti-static conductive coating.

Heavy duty windshield wipers are provided for rain removal.

Propellers, dual pitot tubes, dual static ports, stall warning vane and oil cooler air inlets are electrically heated.



1. PNEUMATIC DEICING
2. PROPELLER ANTI-ICING
3. WINDSHIELD ANTI-ICING
4. WINDSHIELD WIPER
5. WINDSHIELD AND CABIN WINDOW DEFOGGING
6. PITOT TUBE AND STATIC POWER ANTI-ICING
7. STALL WARNING TRANSDUCER ANTI-ICING
8. ENGINE AIR INTAKE ANTI-ICING
9. OIL COOLER INLET ANTI-ICING

Figure 1-1

THE AIRPLANE (CONT)

STANDARD AVIONICS

Standard avionics on the MU-2B-60 include dual NAV-COMM, dual RMIs, dual transponders, dual audio systems, and a dual compass system with single ADF, DME, and an integrated flight control system with pilot's flight director and encoding altimeter.

GENERAL ARRANGEMENT

Exterior arrangement of the airplane is shown in Figure 1-2.

Interior arrangement is shown in Figure 1-3.

INTERIOR DESCRIPTION

Cockpit Area:

1. Pilot and copilot seats are four way adjustable with stowable inboard armrests. The outboard armrests are fixed to the side panels and contain an ashtray and drink holder.
2. A standard oxygen system regulator and two outlets are provided for the pilots.
3. Two map pockets are standard. Optional navigation chart holders are available for installation behind the pilot and copilot seats.
4. The cockpit is separated from the cabin by a divider.

Cabin Area:

1. A typical executive cabin arrangement is shown in the Interior Arrangement illustration.
2. To provide for flexibility in seating arrangements, the refreshment units, table and seats are removable. Individual passenger oxygen outlets are located in the cabin area.
3. A variety of cabin seating arrangements for 6 to 9 passengers is possible with the addition of extra seats and removal or relocation of furnishings.
4. Optional or custom furnishings and materials are available by special order.
5. The cabin area is separated from the baggage area by a divider.

Baggage Area:

1. A typical baggage area arrangement is shown on the Interior Arrangement illustration.
2. The toilet is a nonflushing type located on the right side of the baggage area assembly. An electric flushing version is available as an option.

GENERAL ARRANGEMENT (CONT)

EXTERIOR ARRANGEMENT

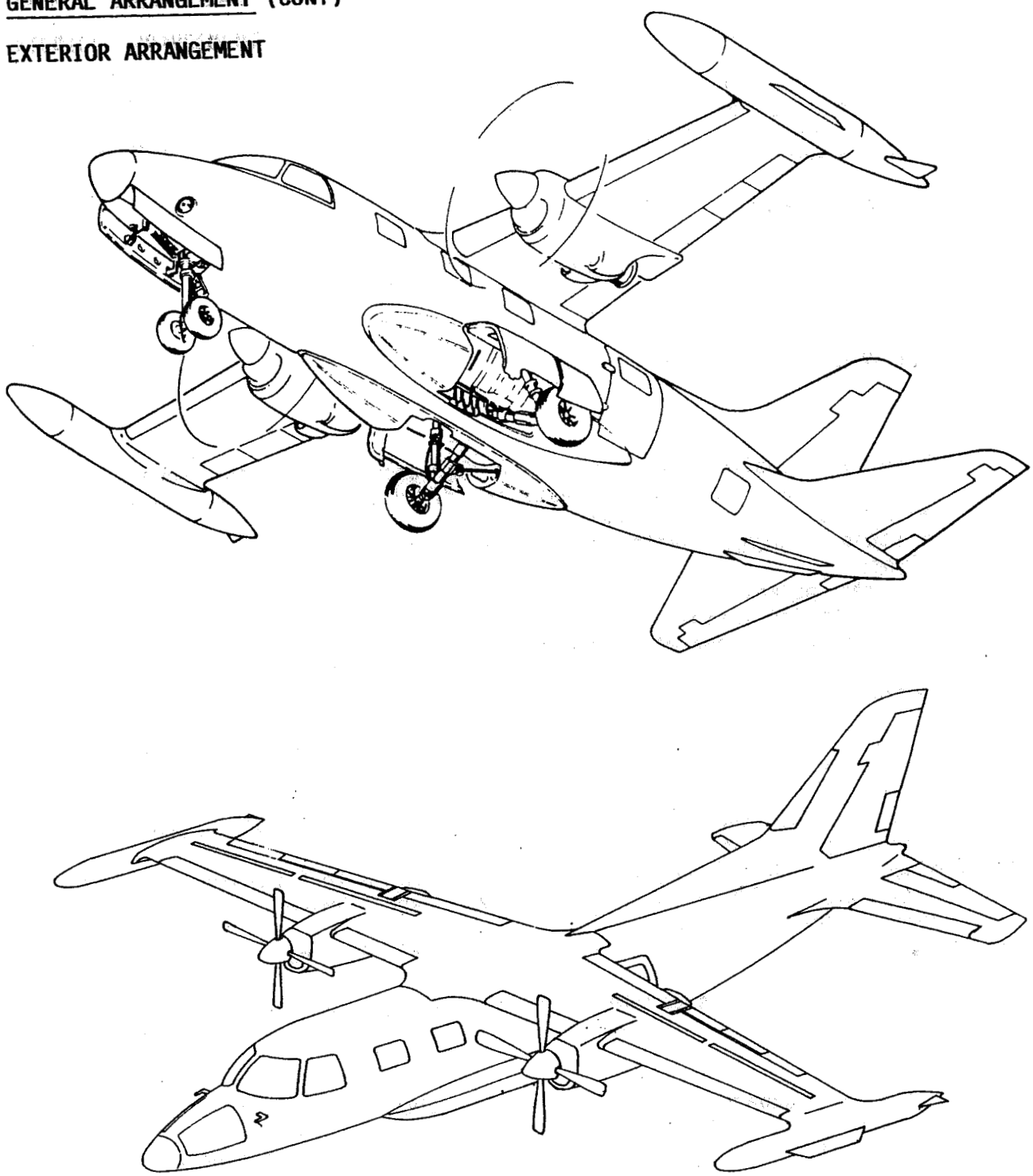


Figure 1-2

GENERAL ARRANGEMENT (CONT)

INTERIOR ARRANGEMENT (TYPICAL)

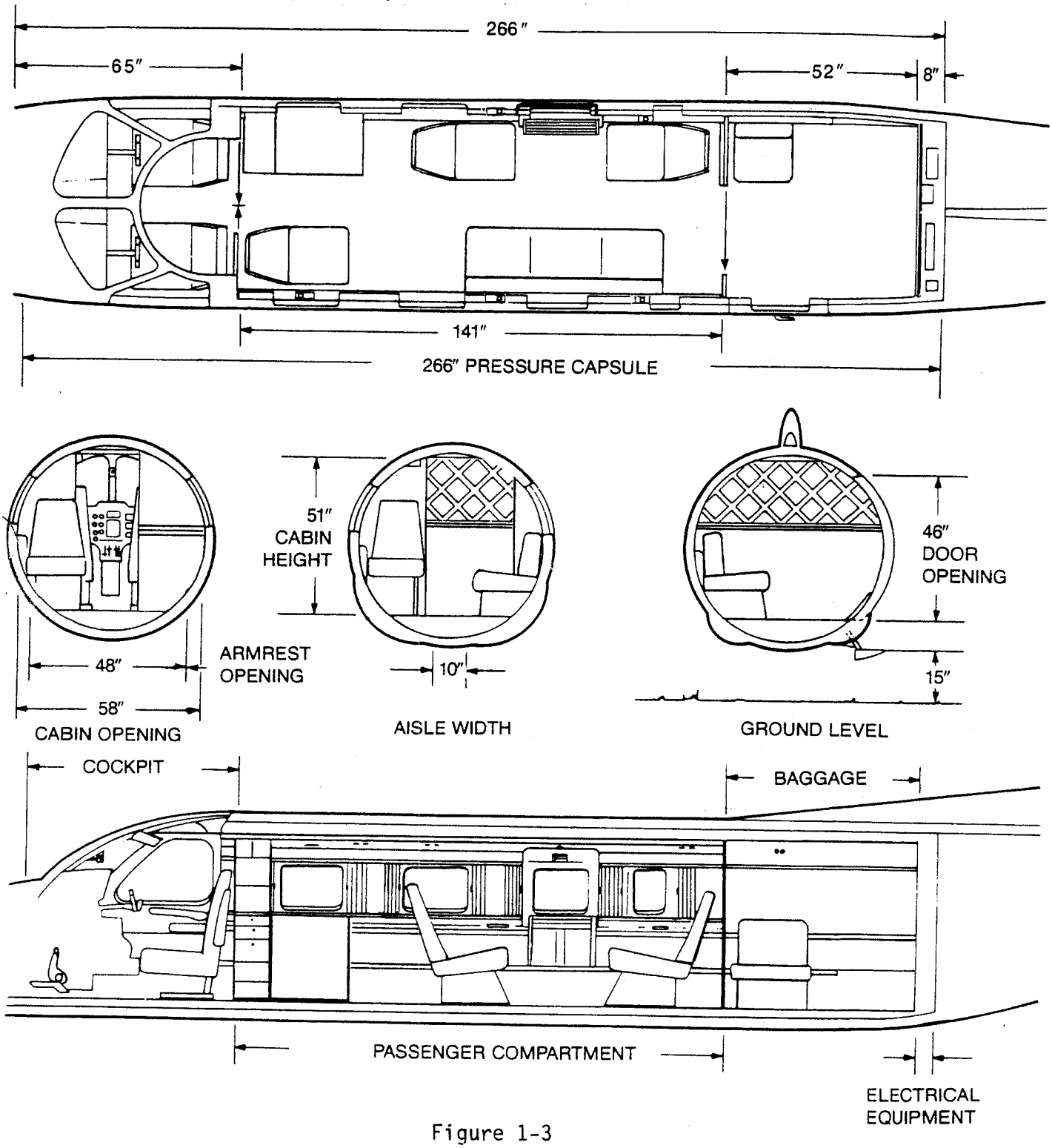
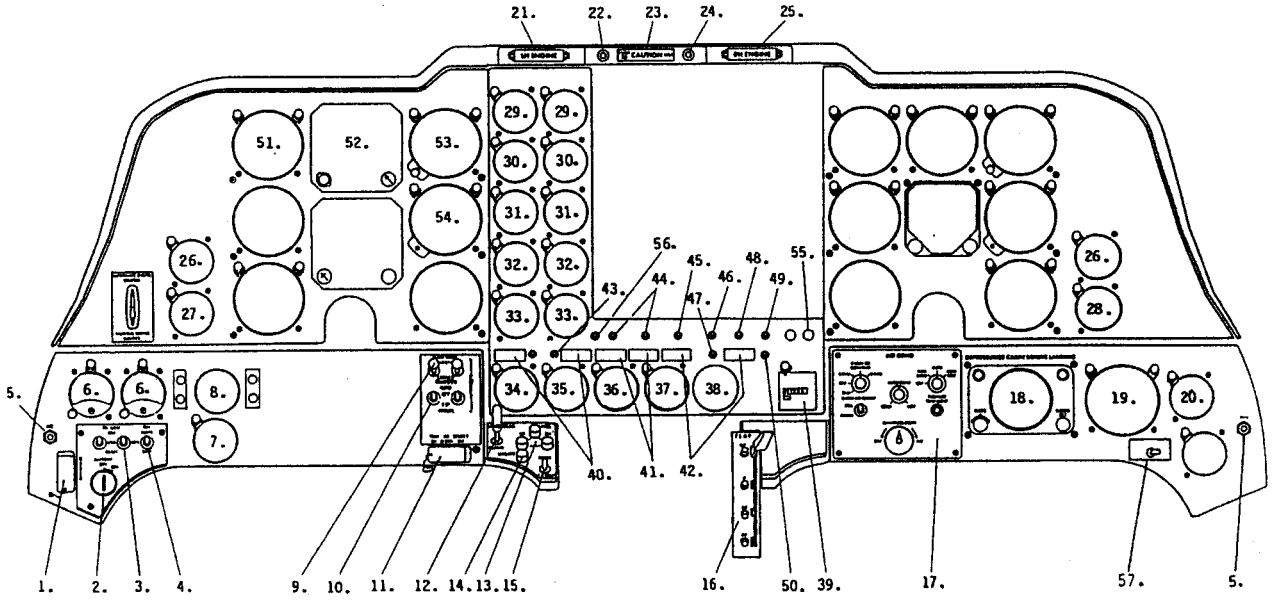


Figure 1-3

GENERAL ARRANGEMENT (CONT)

INSTRUMENT PANEL AND SHROUD PANEL

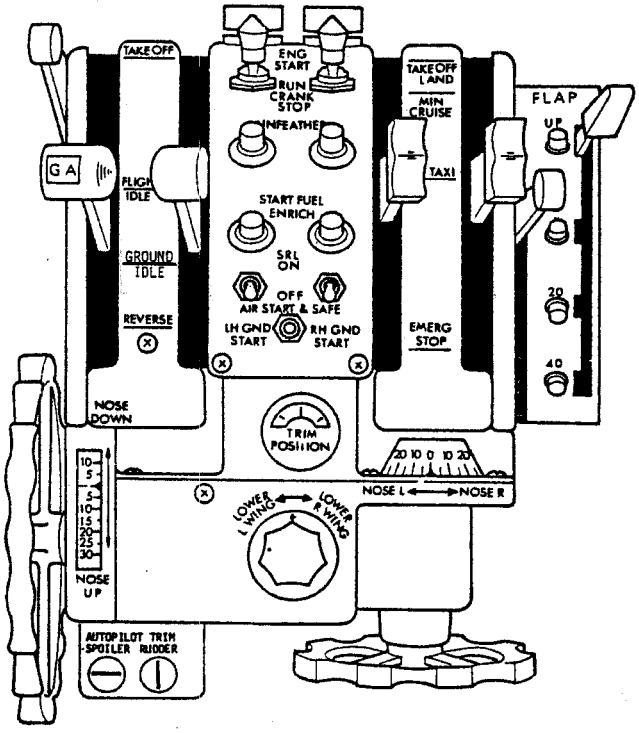


1. MASTER SWITCH
2. BATTERY KEY SWITCH
3. DC GENERATOR CONTROL SWITCHES
4. INVERTER SELECT SWITCH
5. MICROPHONE JACK
6. VOLTAMMETERS
7. OUTSIDE AIR TEMPERATURE INDICATOR
8. BATTERY TEMPERATURE INDICATOR AND ISOLATE SWITCHES
9. MAIN FUEL VALVE SWITCHES
10. FUEL TRANSFER SWITCHES
11. TRIM AILERON SELECT SWITCH
12. LANDING GEAR CONTROL SWITCH
13. LANDING GEAR POSITION INDICATOR LIGHTS
14. LANDING GEAR UNSAFE WARNING LIGHT
15. LANDING GEAR WARNING HORN CUTOUT SWITCH
16. FLAP CONTROLLER
17. AIR CONDITIONING CONTROL PANEL
18. CABIN PRESSURE CONTROLLER
19. CABIN ALTITUDE DIFF. PRESS. INDICATOR
20. CABIN RATE OF CLIMB INDICATOR
21. LH ENG. FIRE WARNING LIGHT AND ENG. FIRE EXTINGUISHER HANDLE
22. ENGINE FIRE DETECTOR TEST SWITCH
23. MASTER CAUTION LIGHT
24. MASTER CAUTION SYSTEM TEST SWITCH
25. RH ENG. FIRE WARNING LIGHT AND ENG. FIRE EXTINGUISHER HANDLE
26. CLOCKS
27. TURN AND BANK INDICATOR
28. VACUUM GAUGE
29. TORQUE METERS
30. EGT INDICATORS
31. FUEL FLOW INDICATORS
32. TACHOMETERS
33. OIL TEMPERATURE INDICATORS
34. OIL PRESSURE INDICATOR
35. FUEL PRESSURE INDICATOR
36. MAIN TANK FUEL QUANTITY INDICATOR
37. OUTER WING TANK FUEL QUANTITY INDICATOR
38. TIP TANK FUEL QUANTITY INDICATOR
39. FUEL CONSUMPTION TOTALIZER
40. BETA RANGE INDICATOR LIGHTS
41. CONTINUOUS IGNITION INDICATOR LIGHTS
42. OUTER WING TANK FUEL EMPTY WARNING LIGHTS
43. DELTA P/P TRANSDUCER TEST SWITCHES
44. CONTINUOUS IGNITION SWITCHES
45. FUEL LOW LEVEL TEST SWITCH
46. FUEL QUANTITY INDICATOR TEST SWITCH
47. OUTER PUMP TEST SWITCH
48. PANEL INDICATOR LIGHT TEST SWITCH
49. STALL WARNING TEST SWITCH
50. DEFOG AIR TEMP. WARNING TEST SWITCH
51. AIRSPEED INDICATOR
52. ATTITUDE INDICATOR
53. ALTIMETER
54. RATE OF CLIMB INDICATOR
55. PROPELLER SYNCHROPHASER SELECT SWITCH AND LIGHT
56. OUTER PUMP MANUAL TRANSFER SWITCH
57. ELT CONTROL SWITCH

Cockpit Forward View - Instrument Panel and Shroud Panel (Typical)
Figure 1-4

GENERAL ARRANGEMENT (CONT)

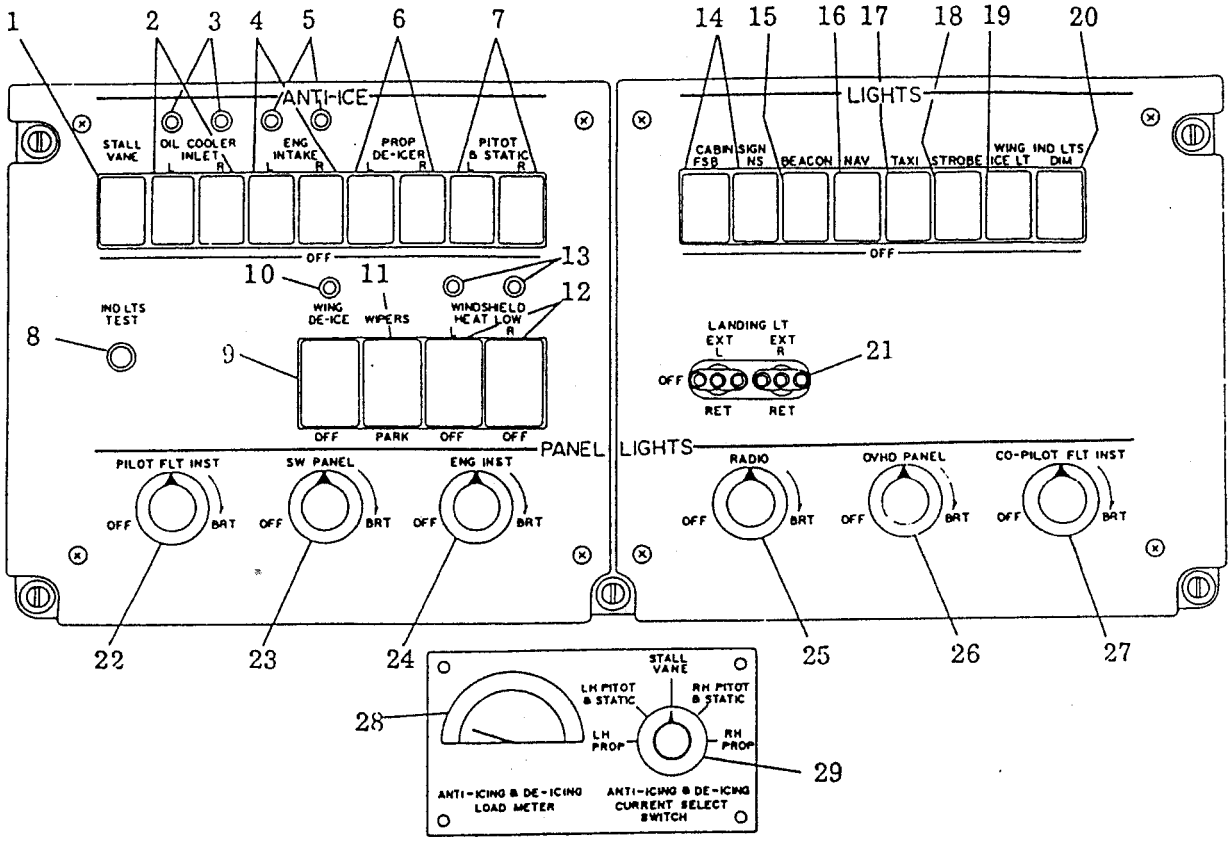
CENTER PEDESTAL



Center Pedestal
(Typical)
Figure 1-5

GENERAL ARRANGEMENT (CONT)

OVERHEAD SWITCH PANEL

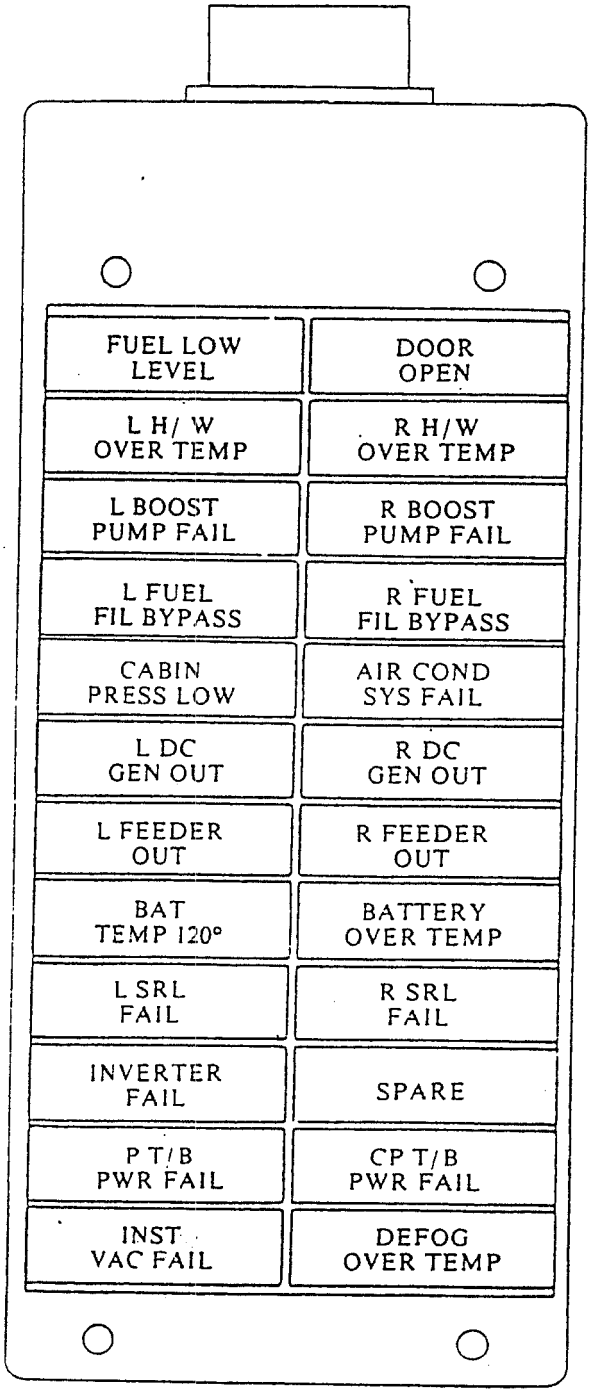


1. STALL VANE HEAT SWITCH
2. OIL COOLER AIR INTAKE HEAT SWITCHES
3. OIL COOLER AIR INTAKE HEAT INDICATING LIGHTS
4. ENGINE AIR INTAKE HEAT SWITCHES
5. ENGINE AIR INTAKE HEAT INDICATING LIGHTS
6. PROPELLER DEICER SWITCHES
7. PITOT TUBE AND STATIC PORT HEAT SWITCHES
8. INDICATOR LIGHT TEST SWITCH
9. WING DEICER SWITCH
10. WING DEICER INDICATING LIGHT
11. WIPER SWITCH
12. WINDSHIELD HEAT SWITCHES
13. WINDSHIELD HEAT INDICATING LIGHTS
14. CABIN SIGN LIGHT SWITCHES
15. BEACON LIGHT SWITCH
16. NAVIGATION LIGHT SWITCH
17. TAXI LIGHT SWITCH
18. STROBE LIGHT SWITCH
19. WING ICE INSPECTION LIGHT SWITCH
20. INDICATOR LIGHT DIMMER SWITCH
21. LANDING LIGHT SWITCHES
22. PILOT FLIGHT INSTRUMENT LIGHTING DIMMER
23. SWITCH PANEL LIGHTING DIMMER
24. ENGINE INSTRUMENT LIGHTING DIMMER
25. RADIO CONTROL PANEL LIGHTING DIMMER
26. OVERHEAD PANEL LIGHTING DIMMER
27. COPILOT FLIGHT INSTRUMENT LIGHTING DIMMER
28. ANTI-ICING AND DEICING LOAD METER
29. ANTI-ICING AND DEICING LOAD SELECTOR SWITCH

Cockpit Forward View - Overhead Switch Panel
(Typical)
Figure 1-6

GENERAL ARRANGEMENT (CONT)

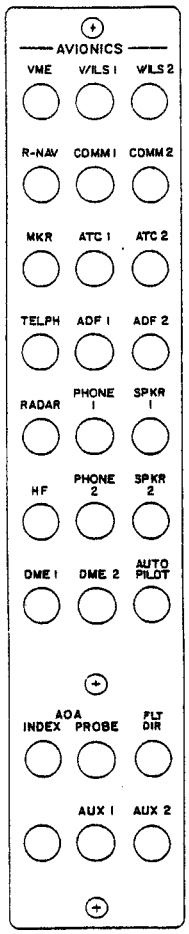
ANNUNCIATOR PANEL



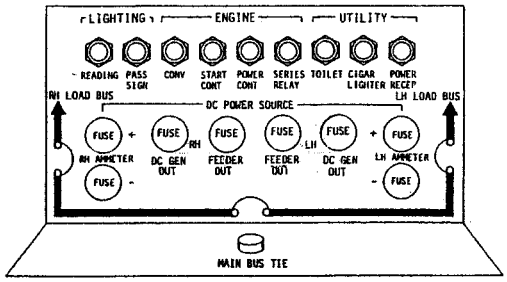
Annunciator Panel
(Typical)
Figure 1-7

GENERAL ARRANGEMENT (CONT)

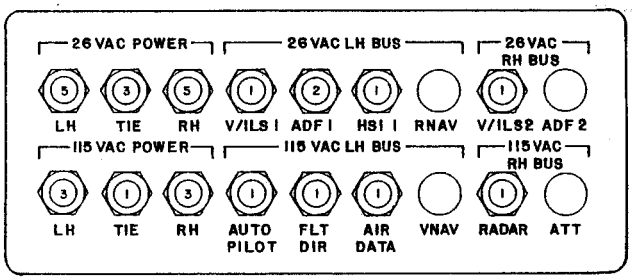
CIRCUIT BREAKER PANELS



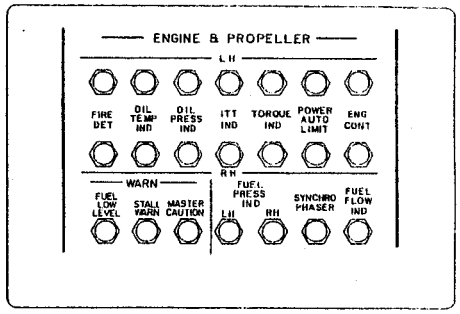
AFT CB PANEL



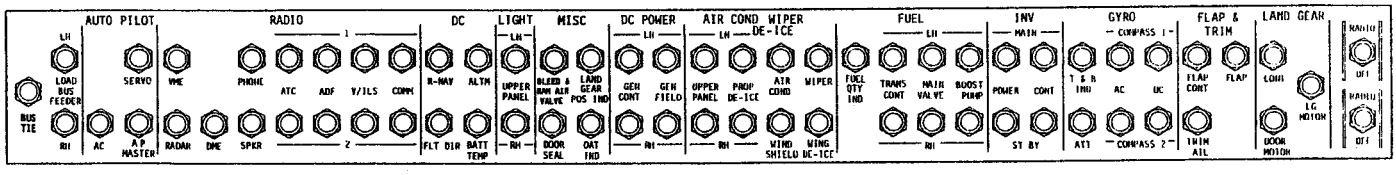
MJB CB PANEL



ARMREST LOWER CB PANEL



FORWARD CB PANEL



CENTER CB PANEL

Circuit Breaker Panels
(Typical)
Figure 1-8

DIMENSIONS, AREAS, TECHNICAL DATA

Exterior Dimensions: (overall)		
Length	39 ft. 5 in.	12.03 m.
Wing Span	39 ft. 2 in.	11.95 m.
Height	13 ft. 8 in.	4.17 m.
Seating Capacity: (includes 2 crew seats)		
Standard Arrangement	9	
Maximum FAA Certified	11	
Weights:		
Maximum Ramp Weight	11,625 lbs.	5,272 kg.
Maximum Takeoff Weight	11,575 lbs.	5,250 kg.
Maximum Landing Weight	11,025 lbs.	5,000 kg.
Standard Empty Weight	7,650 lbs.	3,470 kg.
Fuselage:		
Length	38 ft. 10 in.	11,84 m.
Outside Diameter	5 ft. 5 in.	1.66 m.
Cabin Length	21 ft. 6 in.	6.56 m.
Cabin Width	4 ft. 11 in.	1.50 m.
Cabin Height	4 ft. 3 in.	1.30 m.
Baggage Compartment		
Total Volume	69 cu. ft.	1.95 cu.m.
Usable Volume	44 cu. ft.	1.25 cu.m.
Weight	600 lbs.	272 kg.
Wing:		
Area	178 sq. ft.	16.55 sq.m.
Loading	65 lbs./sq. ft.	317 kg./sq.m.
Span	37 ft. 1 in.	11.30 m.
Mean Aerodynamic Chord	5 ft. 1 in.	1.538 m.
Aspect Ratio	7.71	
Section root	NACA 64A415	
tip	NACA 63A212 (modified)	
Incidence	2°	
Wash Out	3°	
Dihedral	0°	
Sweep Angle (25% chord line)	-0° 21'	
Landing Gear:		
Main Wheel Tire (40-74 psi)	TRA Type III 8.50-10, 10-ply rating, tubeless	
Nose Wheel Tire (55 psi)	TRA Type III 5.00-5, 6-ply rating, tube	
Wheel Base	14 ft. 5 in.	4.40 m.
Tread	7 ft. 11 in.	2.40 m.

DIMENSIONS, AREAS, TECHNICAL DATA (CONT)

Fuel Capacity:

		S/N 700SA		S/N 700SA
Wing Tanks	159 U.S. gal.	159 U.S. gal.	602 l.	602 l.
Outer Tanks	70 U.S. gal.	30 U.S. gal.	266 l.	114 l.
Tip Tanks	186 U.S. gal.	186 U.S. gal.	704 l.	704 l.
Total	415 U.S. gal.	375 U.S. gal.	1,571 l.	1,420 l.
Usable	403 U.S. gal.	364 U.S. gal.	1,526 l.	1,378 l.

Oil Capacity:

Total	3.1 U.S. gal.	11.7 l.

Airspeed Limits:

V_{MO}	(maximum operating)	250 KCAS	463 kmph
		(sea level to 21,300' P.A.)	
M_{MO}	(maximum operating mach number)	0.57 (21,300' to 31,000' P.A.)	
V_A	(maneuvering)	191 KCAS	353 kmph
V_{FO}	(flap operating)	175 KCAS flap deflection 0° to 5°	324 kmph
		155 KCAS flap deflection 5° to 20°	287 kmph
		120 KCAS flap deflection 20° and 40°	222 kmph
V_{FE}	(flap extended)	155 KCAS 20° and 40°	287 kmph
		175 KCAS 5°	324 kmph
V_{LO}	(landing gear operating)		
	Retract	175 KCAS	324 kmph
	Extend	175 KCAS	324 kmph
V_{LE}	(landing gear extended)	175 KCAS	324 kmph
V_{MC}	(minimum control)	99 KCAS	184 kmph
V_{LLO}	(landing light extended)	175 KCAS	324 kmph
V_C	(design cruising)	250 KCAS	463 kmph
V_D	(design dive)	342 KCAS	633 kmph

Flaps:

Type	Fowler, Double Slotted	
Area	21.0 sq. ft. x 2	1.95 sq.m. x 2
Deflection	5°, 20°, 40°	

Spoilers:

Area	2.9 sq. ft. x 2	0.27 sq.m. x 2
Maximum Deflection	60°	

DIMENSIONS, AREAS, TECHNICAL DATA (CONT)

Horizontal Stabilizer:		
Area	58.3 sq. ft.	5.41 sq.m.
Span	15 ft. 9 in.	4.80 m.
Mean Aerodynamic Chord	4 ft.	1.21 m.
Aspect Ratio	4.26	
Section	NACA 64A010 (With leading edge modified)	
Incidence	0 °	
Wash Out	0 °	
Dihedral	0 °	
Elevators:		
Area	7.5 sq. ft. x 2	0.70 sq.m. x 2
Maximum Deflection - up	28°	
- down	12°	
Vertical Stabilizer:		
Area	43.3 sq. ft.	4.02 sq.m.
Span	8 ft. 2 in.	2.47 m.
Mean Aerodynamic Chord	5 ft.10 in.	1.80 m.
Rudder:		
Area	12.6 sq. ft.	1.17 sq.m.
Maximum Deflection	right 22°	
	left 24°	
Trim Tab Deflections:		
Elevator Tab - nose up	30°	
R - nose down	10° (Not modified by S/B No.079/27-010.)	
R	1 ° (Modified by S/B No.079/27-010.)	
Rudder Tab - right	25°	
- left	25°	
Trim Aileron - up	20°	
- down	20°	

C.G. Range (landing gear extended):

Weight(lbs.)	Forward(in.)	Aft(in.)
10,690 or less	+190.9 (21% MAC) to	+199.4 (35% MAC)
4,850 kg.	4.850 m.	5.065 m.
11,575 (Gross Wt.)	+194.6 (27% MAC) to	+199.4 (35% MAC)
5,250 kg.	4.942 m.	5.065 m.
11,625 (Ramp Wt.)	+194.6 (27% MAC) to	+199.4 (35% MAC)
5,272 kg.	4.942 m.	5.065 m.

DIMENSIONS, AREAS, TECHNICAL DATA (CONT)

Engines:

Number:	2
Manufacturer:	Garrett Turbine Engine Company
Model:	TPE 331-10-501M (S/N 700SA, 731SA thru 799SA, 1501SA thru 1553SA, 1555SA thru 1562SA not modified by SR038/76-001 and Garrett SB TPE 331-72-0389) TPE 331-10-511M (S/N 1554SA, 1563SA and subsequent, and aircraft in compliance with SR038/76-001 and Garrett SB TPE 331-72-0389)
Type:	Single shaft turboprop engine with integral air inlet and gearbox, two stage centrifugal compressor, three stage axial turbine, single annular combustion chamber and turbine exhaust diffuser.
Power:	830 SHP Engines are flat rated to 715 SHP providing maximum performance over a wider range of operating conditions and altitudes.

Engine Specifications:

	Takeoff/Maximum Continuous	Recommended Maximum	Maximum Cruise
Engine, rpm %	100% rpm	98% rpm	96% rpm
Shaft Horsepower	715	701	686
Jet Thrust, lb.	157	155	129
Equiv. Shaft Horsepower	778	758	738
Propeller Shaft, rpm	1,591	1,559	1,527
SFC, lb/hp/hr	0.606	0.652	0.650
Equiv. SFC, lb/hp/hr	0.606	0.603	0.604
ITT Limit, ℃	650	650	650

Fuel Specifications:

Aviation Turbine Fuels: ASTM D1655-68T Types Jet A, Jet B, and Jet A-1
MIL-T-5624G-1; Turbine Fuel Grades JP-4 and JP-5
MIL-F-5616-1; Fuel Grade JP-1
MIL-F-46005A (MR)-1; Fuel Types I and II
MIL-G-5572D, Grade 80/87 Aviation Gasoline, (as emergency fuel only)
MIL-G-5572E, Grade 100/130 Low Lead Aviation Gasoline, (as emergency fuel only)

Propellers:

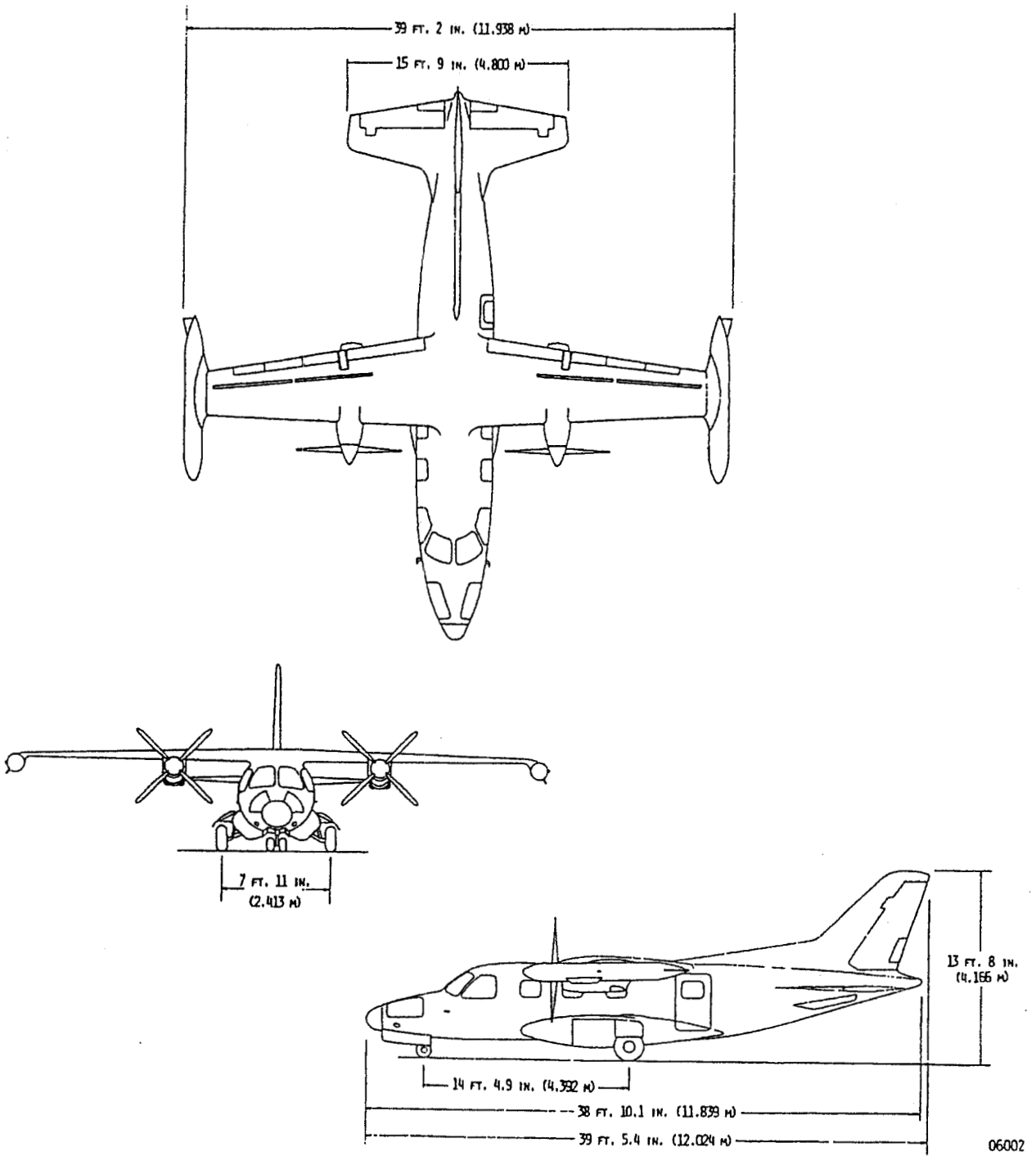
2 Hartzell Propeller Assemblies comprised of the following hub and blade combinations :

R HC-B4TN-5JL(or GL or DL)/LT10282NK(or NB or NHB or K or B or HB)-5.3R

Diameter	98 in.	2.48 m.
Ground Clearance	2 ft. 2 in.	0.67 m.
Fuselage Clearance	11 in.	0.28 m.

United States Type Certificate Number A10SW

DIMENSIONS, AREAS, TECHNICAL DATA (CONT)



General Dimensions
Figure 1-9

SERVICE BULLETINS

The MU-2B-60 was originally certified in 1978 to a combination of CAR 3 and FAR Part 23 requirements. Since that time a number of design and procedural improvements have been incorporated by MHI to standardize the airplanes, increase safety of operation and to comply with FAA issued Airworthiness Directives (AD). Current policy within the FAA requires that ADs be issued for all FAA determined mandatory changes in configuration or procedures to assure that owners/operators incorporate these safety features. MHI provides a Service Bulletin and/or an Airplane Flight Manual revision to incorporate any AD change. A complete listing of Service Bulletins and other service information is published in MHI Service News No. 034/00-001 for A10SW airplanes.

SECTION 2 OPERATING LIMITATIONS

CONTENTS

GENERAL 2- 1

REQUIRED PLACARDS/MARKINGS 2- 1

INSTRUMENT MARKINGS 2- 8

GENERAL

For operating limitations, refer to the approved airplane flight manual.

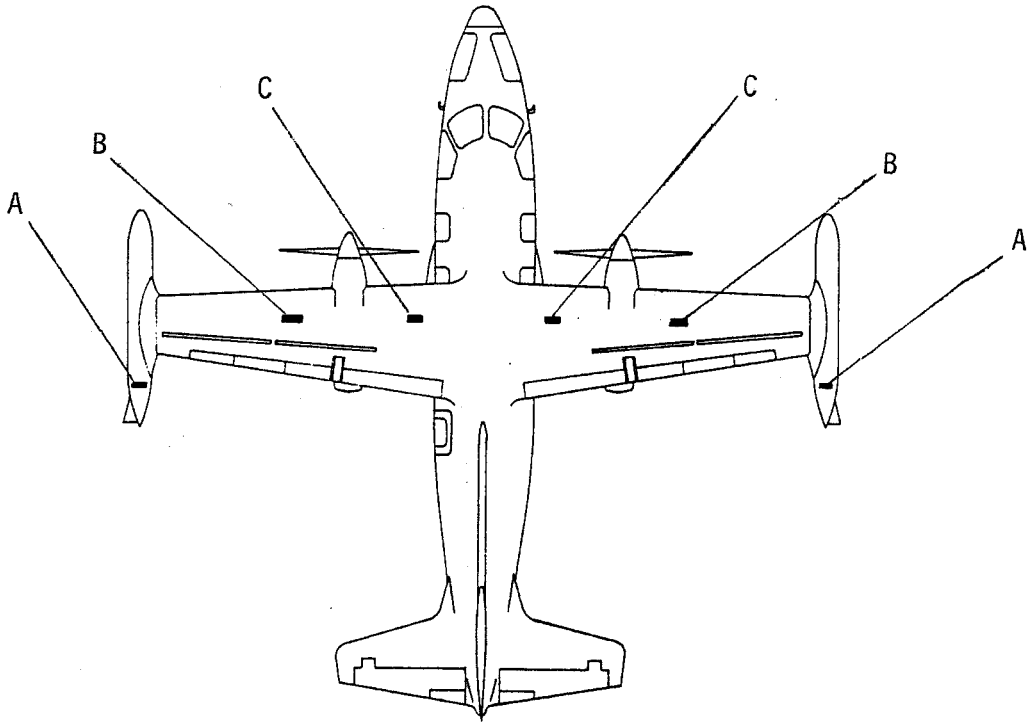
REQUIRED PLACARDS/MARKINGS

Placards/markings are required to remind the flight crew and occupants of operating limitations and safety instructions. Figures 2-1 through 2-3 illustrate typical exterior placards/markings which are of a limiting nature. Figure 2-4 illustrates those typical flight compartment placards/markings pertinent to operations and safety of flight. Refer to the approved airplane flight manual for those limiting placards/markings located in the passenger compartment.

NOTE

The placards/markings illustrated may vary slightly depending on arrangement and/or airplane configuration.

REQUIRED PLACARDS/MARKINGS (CONT)



SERVICE AIRCRAFT WITH TURBINE FUEL AND ANTI-ICE ADDITIVE PER AIRPLANE FLIGHT MANUAL 603 LBS. (90 U.S. GAL)

Detail A

SERVICE AIRCRAFT WITH TURBINE FUEL AND ANTI-ICE ADDITIVE PER AIRPLANE FLIGHT MANUAL 235 LBS. (35 U.S. GAL)

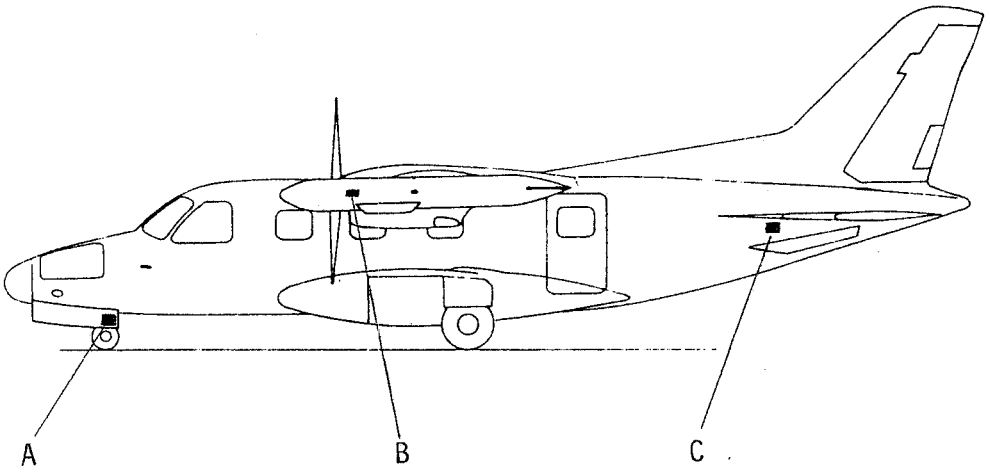
Detail B

SERVICE AIRCRAFT WITH TURBINE FUEL AND ANTI-ICE ADDITIVE PER AIRPLANE FLIGHT MANUAL TOTAL FUEL LH & RH FILLER 1032 LBS. (154 U.S. GAL)

Detail C

Typical Exterior Markings - Top Surface
Figure 2-1

REQUIRED PLACARDS/MARKINGS (CONT)



CAUTION

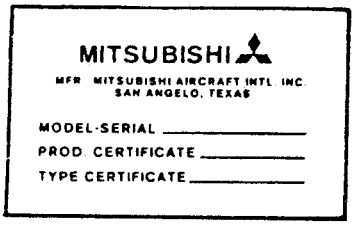
DISCONNECT TORQUE LINK
BEFORE TOWING

CONNECT AFTER
TOWING

Detail A

RELEASE TANK PRESSURE
BEFORE SERVICING

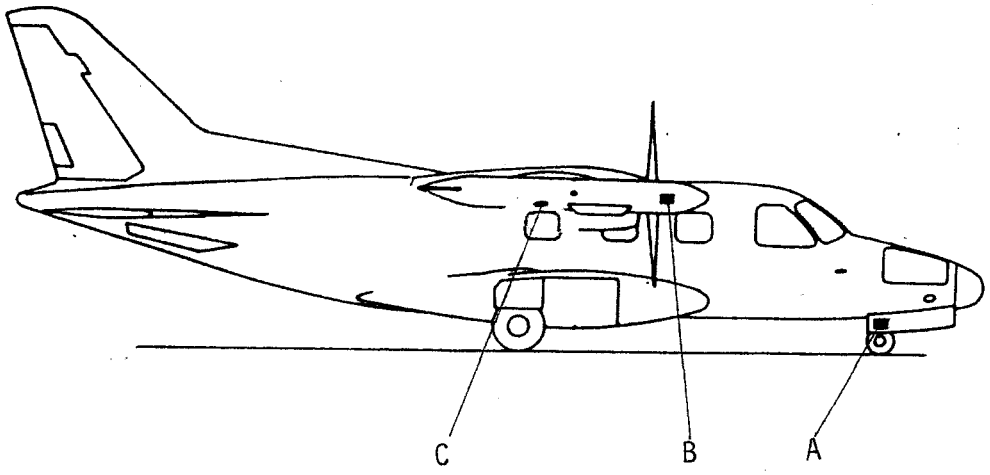
Detail B



Detail C

Typical Exterior Markings - Left Side
Figure 2-2

REQUIRED PLACARDS/MARKINGS (CONT)



RELEASE TANK PRESSURE
BEFORE SERVICING

Detail B

CAUTION

DISCONNECT TORQUE LINK
BEFORE TOWING

CONNECT AFTER
TOWING

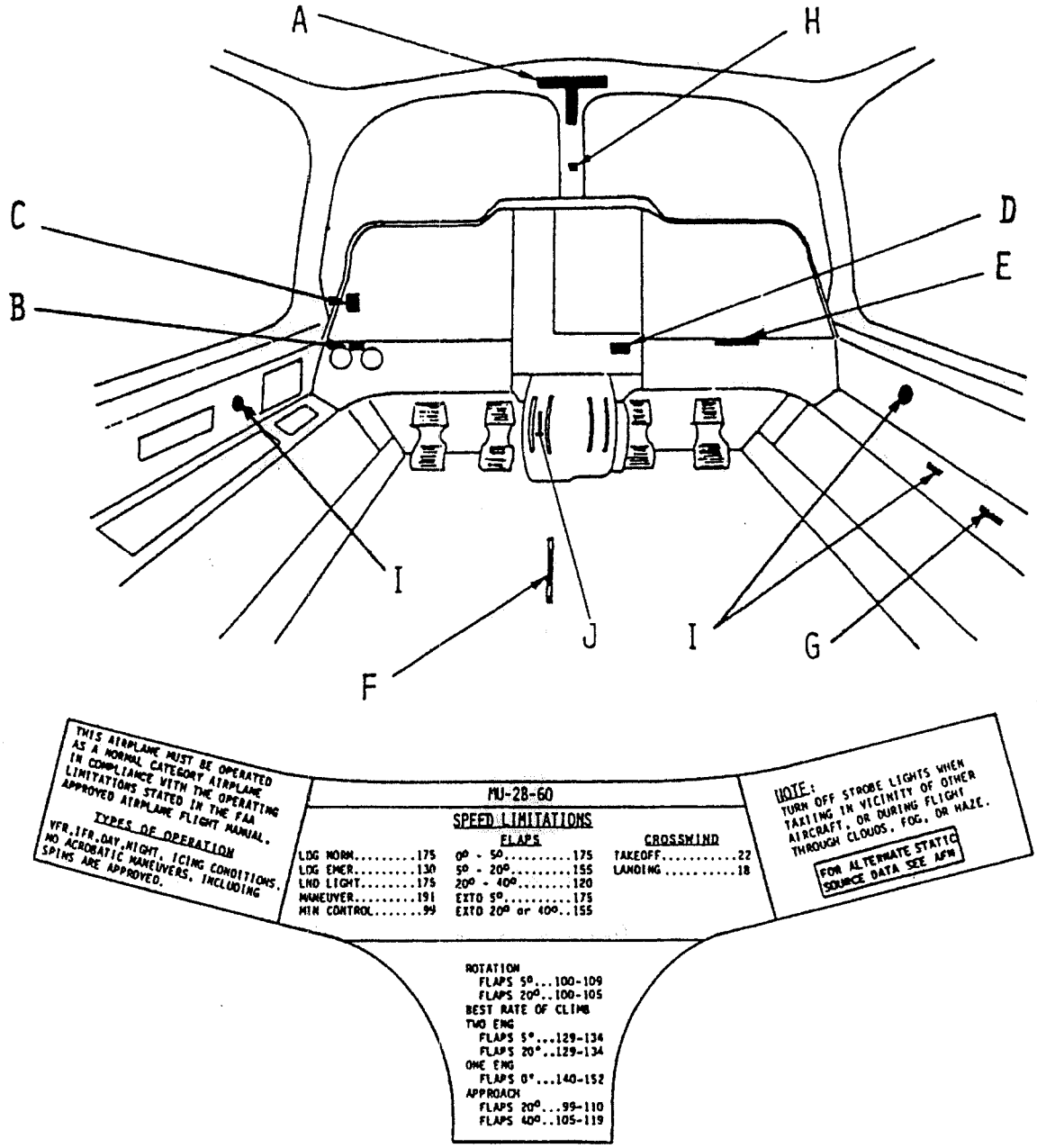
Detail A

EMERGENCY EXIT
STRIKE THROUGH ● TO
RELEASE ESCAPE HATCH

Detail C
S/N 1546SA and Subsequent,
and S/N modified by SR036/11-001

Typical Exterior Markings - Right Side
Figure 2-3

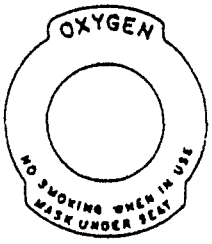
REQUIRED PLACARDS/MARKINGS (CONT)



DETAIL A

Typical Flight Compartment Markings
Figure 2-4 (Sheet 1 of 3)

REQUIRED PLACARDS/MARKINGS (CONT)



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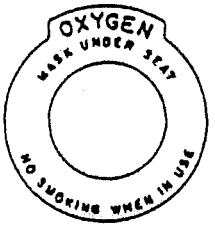
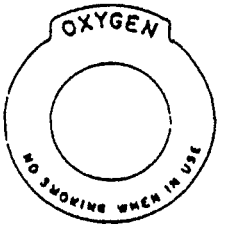




OXYGEN MASK UNDER SEAT
NO SMOKING WHILE IN USE

S/N 700SA, 731SA - 799SA
1501SA - 1553SA, 1555SA - 1561SA

OXYGEN MASK ON SEAT BACK
NO SMOKING WHILE IN USE

S/N 1554SA, 1562SA, and Subsequent

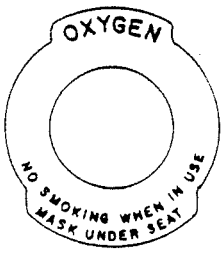
DETAIL 'I'

DETAIL 'J'

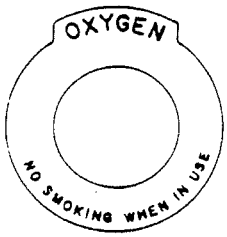
Airplane modified by S/B 102/11-009

Typical Flight Compartment Markings
Figure 2-4 (Sheet 2 of 3)

REQUIRED PLACARDS/MARKINGS (CONT)



OR



OXYGEN MASK UNDER SEAT NO SMOKING WHILE IN USE

S/N 700SA, 731SA - 799SA
1501SA - 1553SA, 1555SA -
1561SA

OXYGEN MASK ON SEAT BACK NO SMOKING WHILE IN USE

S/N 1554SA, 1562SA, and
Subsequent

DETAIL 'I'

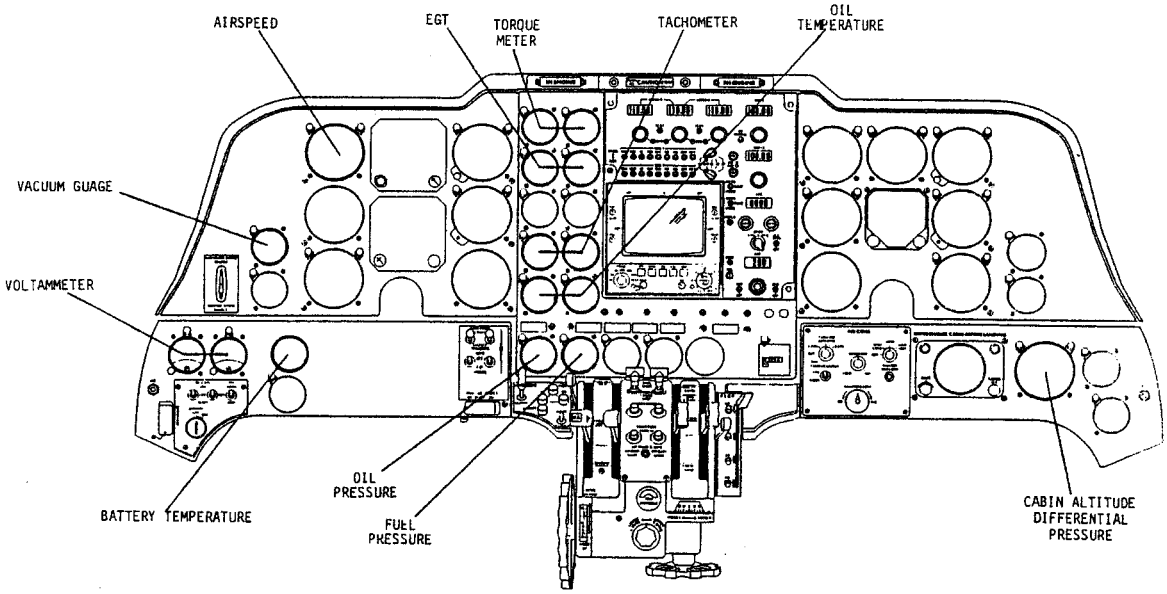
Typical Flight Compartment Markings
Figure 2-4 (Sheet 3 of 3)

INSTRUMENT MARKINGS

Various flight compartment instruments require periodic monitoring for the safe operation of the airplane. These instruments contain specific color markings for easier identification of a system's or the airplane's conditional operating limitation.

CAUTION

NON-OBSERVANCE OF THESE INSTRUMENTS COULD RESULT IN DAMAGE TO THE SYSTEMS AND/OR AIRPLANE.

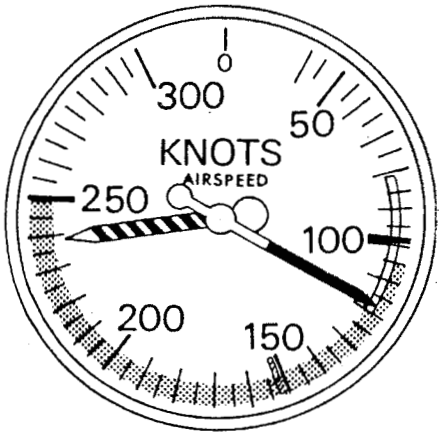


G - GREEN
Y - YELLOW
R - RED
W - WHITE
B - BLUE

Typical Instrument Markings
Figure 2-5 (Sheet 1 of 4)

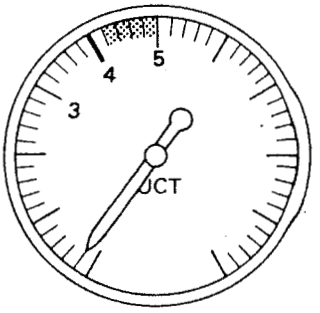
INSTRUMENT MARKINGS (CONT)

AIRSPEED INDICATOR



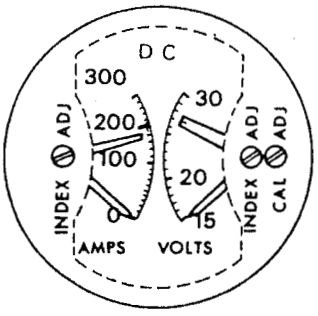
99 (RED)
81 TO 120 (WHITE)
106 TO 250 (GREEN)
152 (BLUE)
250 (RED)

VACUUM GAUGE (IN-HG)



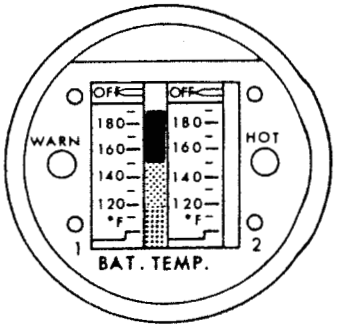
4.0 (RED)
4.2 TO 5.0 (GREEN)

VOLTAMMETER



0 TO 175 (GREEN)
175 TO 200 (YELLOW)
200 (RED)

BATTERY TEMPERATURE (°F)

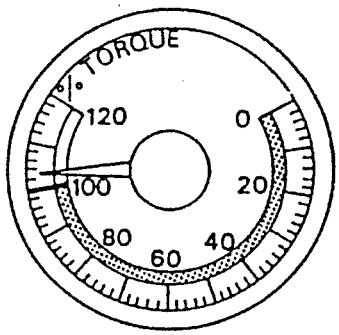


0 TO 120 (GREEN)
120 TO 150 (YELLOW)
150 TO 190 (RED)

Typical Instrument Markings
Figure 2-5 (Sheet 2 of 4)

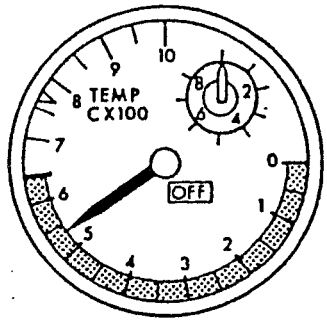
INSTRUMENT MAKINGS (CONT)

TORQUEMETER (% Tq)



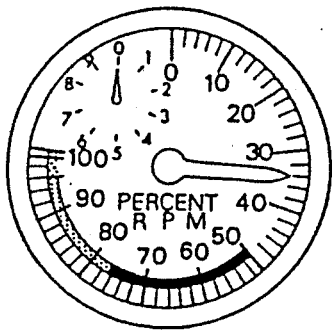
0 TO 100 (GREEN)
100 (RED)

EGT (°C)



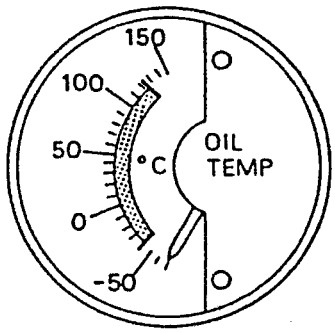
0 TO 650 (GREEN)
650 (RED)
770 (WHITE)

TACHOMETER (% RPM)



50 TO 76.5 (RED)
76.5 TO 96 (YELLOW)
96 TO 100 (GREEN)
100 TO 101 (YELLOW)
101 (RED)

OIL TEMPERATURE (°C)

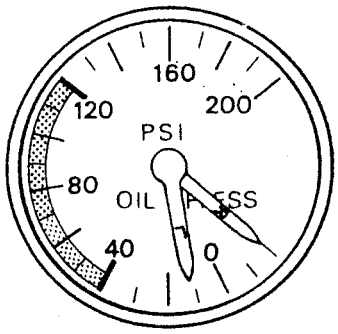


-40 (RED)
-40 TO 55 (YELLOW)
55 TO 110 (GREEN)
110 TO 127 (YELLOW)
127 (RED)

Typical Instrument Markings
Figure 2-5 (Sheet 3 of 4)

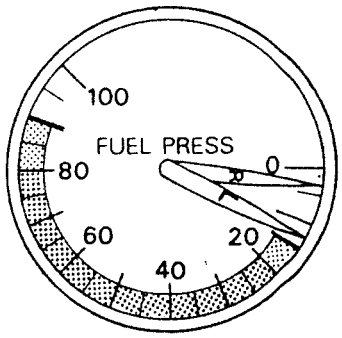
INSTRUMENT MARKINGS (CONT)

OIL PRESSURE



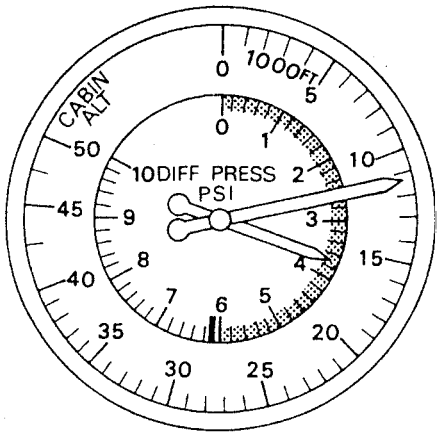
40 (RED)
40 TO 70 (YELLOW)
70 TO 120 (GREEN)
120 (RED)

FUEL PRESSURE



15 (RED)
15 TO 20 (YELLOW)
20 TO 80 (GREEN)
80 TO 90 (YELLOW)
90 (RED)

CABIN ALTITUDE DIFFERENTIAL PRESSURE



0 TO 6.0 (GREEN)
6.1 (RED)

Typical Instrument Markings
Figure 2-5 (Sheet 4 of 4)

SECTION 3 SYSTEMS DESCRIPTION

CONTENTS

SYSTEMS DESCRIPTION 3-1
GENERAL 3-1
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ENGINE 3-1
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ENGINE OIL SYSTEM 3-4
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PROPELLER OPERATION AND PITCH CONTROL 3-4
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SYSTEMS DESCRIPTION

GENERAL

The MU-2 is a high performance, twin turboprop, high wing airplane with a cruising speed of 250 KIAS. It carries a maximum of 11 passengers including the pilot. The all metal semi-monocoque airframe structure is of aluminum alloy and steel alloy, riveted and spot welded for maximum strength. (See Section 1.)

To develop good flying techniques and to obtain the optimum performance, service and flying enjoyment from the MU-2, the pilot should become familiar with the general working principles of the systems and accessories described in this section.

POWER PLANT

The MU-2 is powered by two Garrett Turbine Engine Co. TPE 331 turboprop engines flat rated to 715 SHP, each driving a Hartzell four blade, constant speed, full feathering, reversible pitch, 98 inch diameter propeller.

ENGINE

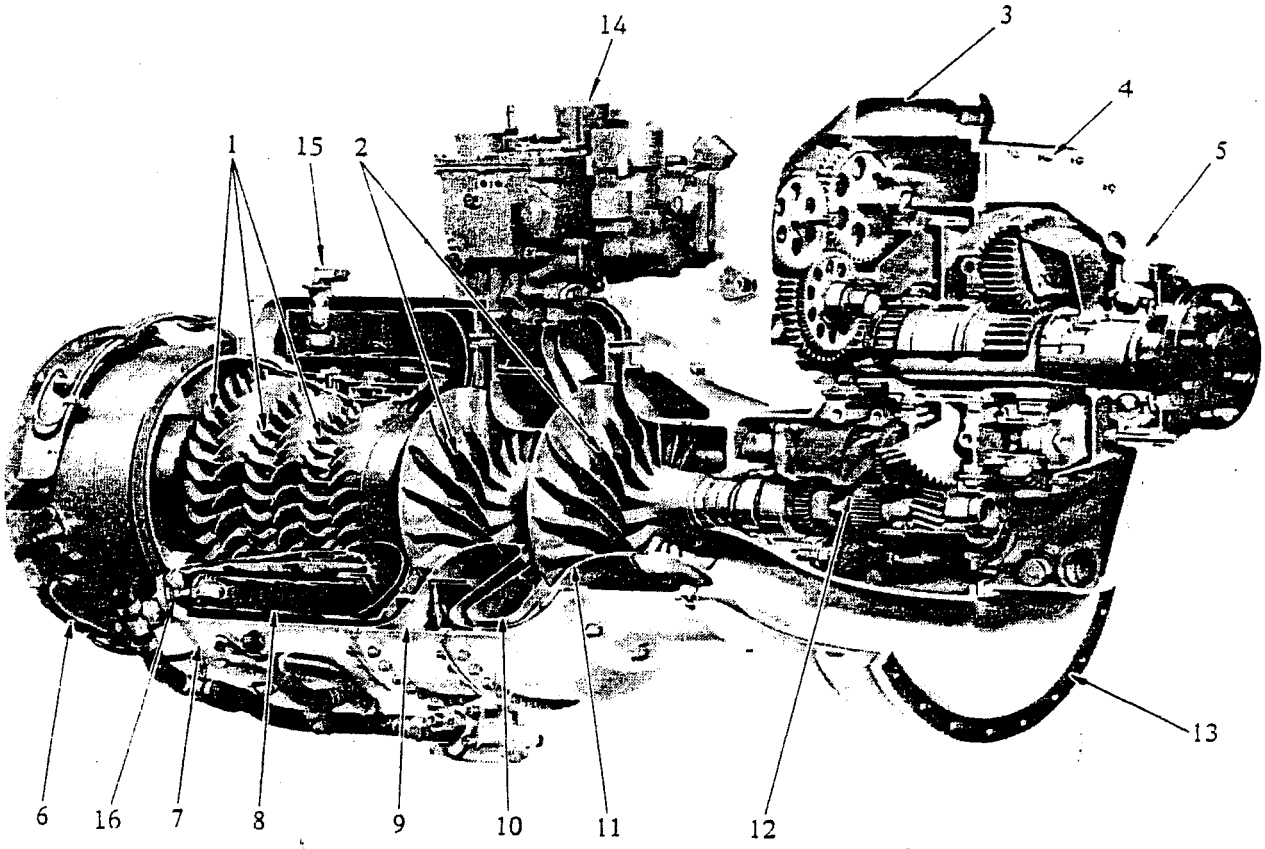
The turboprop engine is a single shaft type gas turbine engine. The major engine components from front to rear are the reduction gearbox, a two stage centrifugal compressor, an annular combustion chamber, and a three stage axial turbine. The combustion process is initiated by a spark ignition system and combustion is self-sustained after completion of the starting cycle. The combustion produced drives the turbine, which is shaft coupled to the compressor, and the gearbox. See Figure 3-1 for general engine components.

SINGLE REDLINE/AUTO START SYSTEM

The single redline/auto start system (SRL) consists of an air data computer which receives electrical input signals representing airspeed and ambient pressure, engine inlet temperature, engine rotor speed and exhaust gas temperature. The computer calculates a single corrected EGT output signal (EGT indicated) based on EGT/ITT relationships as established by engine performance calculations. This function is effective for engine operation above 80% rpm. The SRL circuitry deactivates the EGT correction function for engine operation below 80% rpm. The air data computer incorporates 10%, 80% and 90% rpm speed switches to provide signals for airplane functions and for the engine EGT limited fuel enrichment provisions for automatic starting.

This system is controlled by the SRL switch on the center pedestal and is checked prior to takeoff by the SRL switch and Delta P/P transducer test switch on the center instrument panel.

SYSTEMS DESCRIPTION (CONT)



1. TURBINE WHEELS
2. COMPRESSOR IMPELLERS
3. REDUCTION GEAR INPUT HOUSING ASSEMBLY
4. INTERMEDIATE HOUSING ASSEMBLY
5. OUTPUT HOUSING ASSEMBLY
6. TURBINE EXHAUST DIFFUSER
7. TURBINE PLENUM
8. COMBUSTION CHAMBER
9. COMPRESSOR HOUSING
10. COMPRESSOR INTERSTAGE DUCT ASSEMBLY
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12. MAIN DRIVE SHAFT
13. INLET AIR DUCT
14. FUEL CONTROL ASSEMBLY
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16. SECONDARY FUEL NOZZLES

Cross Section of Engine (Typical)
Figure 3-1

SYSTEMS DESCRIPTION (CONT)

POWER PLANT (CONT)

ENGINE FUEL CONTROL SYSTEM

The engine fuel control system consists of a fuel control assembly with integral boost pump, high pressure pump, filter, temperature controlled filter anti-ice valve, start enrichment module and the fuel control. These components are stacked together as a single assembly positioned at the rear of the reduction gear case. Additional basic components are the oil to fuel heat exchanger, fuel shutoff valve, fuel flow divider and manifold drain valve, and the primary and secondary fuel manifold and nozzle assemblies.

The fuel boost pump supplies fuel through a 40 micron filter to the high pressure pump where a portion of the high pressure fuel is routed through the fuel filter anti-ice valve (normally open) and oil to fuel heat exchanger. This heated fuel is then mixed with unheated fuel from the boost pump by the temperature controlled filter anti-ice valve up stream of the 40 micron filter. This forms a continuous loop of heated fuel which is mixed with unheated fuel as required from the boost pump to provide icing protection for the fuel control assembly.

From the fuel pump, heated fuel enters the fuel control where the engine fuel flow is established by power lever position (flight idle to takeoff) and further compensated as required by the underspeed and overspeed governor portions of the fuel control.

Fuel is routed from the fuel control to the flow divider and drain valve by passing through a fuel shutoff valve which is manually controlled by the condition lever (EMERG STOP) and electrically controlled by the run-crank-stop switch.

The flow divider adjusts fuel flow to be delivered into the engine combustion chamber through five primary nozzles and ten secondary nozzles to achieve the desired combustion system performance at all engine speeds above 80% rpm. During the start sequence (10% to 80% rpm) a primary only solenoid valve (normally closed), controlled by the engine speed switch, opens and changes the crack point of the flow divider to provide fuel flow only to the primary nozzles during ignition and acceleration when fuel atomization is critical.

An automatic start schedule enrichment is provided in the SRL computer to enrich the start fuel schedule to maintain a constant EGT of 690°C - 700°C throughout the start. The start fuel enrichment valve is a normally closed solenoid valve which is placed in parallel with the fuel controller. Upon opening, the valve provides a fixed quantity of fuel which is added to the basic fuel from the controller when engine speed is within 10% - 60% rpm.

SYSTEMS DESCRIPTION (CONT)

POWER PLANT (CONT)

ENGINE FUEL CONTROL SYSTEM (CONT)

The start fuel enrichment valve is also actuated by the start fuel enrich switch, which may be used above 25% rpm, if engine accelerates slowly, to improve acceleration. Slow acceleration may indicate failure of the automatic start schedule enrichment system.

FUEL PURGE SYSTEM

The fuel purge system is installed in the engine to prohibit overboard draining from the fuel manifolds. This fuel purge system causes the residual fuel in the fuel manifold to burn during normal engine shutdown, thereby eliminating the emission of unburned hydrocarbons into the atmosphere.

ENGINE OIL SYSTEM

The engine lubrication system consists of an engine internal pressure pump to provide jet and mist lubrication to the engine bearings and gears, three internal scavenge pumps (two in the reduction gear section and one in the turbine section), an air to oil heat exchanger, and an oil tank with an integral fuel to heat exchanger. The lubrication system also supplies actuating oil to the propeller pitch control system and torque sensing components.

PROPELLER

The propeller blades are constructed of aluminum alloy and are anodized for protection. The blades and deice boots should be carefully inspected for damage during preflight and repaired if necessary.

PROPELLER OPERATION AND PITCH CONTROL

Propeller pitch control is accomplished hydraulically by using oil from the engine lubricating system and boosting the pressure with a pump which is part of the propeller governor. The oil moves the internal cylinder portion of the propeller hub changing the blades from the feathered position or high pitch to a lower pitch or flat blade angle. When oil pressure is released, a strong spring forces the cylinder in the opposite direction, moving the blades to the feathered position.

During cruise the fuel flow is fixed and the propeller governor increases or releases the oil pressure which changes the pitch as necessary to maintain a constant engine rpm. See paragraph, Power Plant Control, Propeller Governing Range.

SYSTEMS DESCRIPTION (CONT)

PROPELLER (CONT)

PROPELLER OPERATION AND PITCH CONTROL (CONT)

During taxi the fuel flow is adjusted in proportion to the propeller pitch as established by the power levers to maintain engine rpm limits. Positioning the power levers from flight idle to reverse will change the propeller pitch, thus allowing the pilot adequate control during taxi.

FEATHERING

Feathering is accomplished by moving the condition lever to the EMERG STOP position (aft limit of travel), which opens a port of the propeller feathering valve to dump the oil and release the oil pressure, allowing the spring and centrifugal force to feather the propeller.

UNFEATHERING PUMP

An unfeathering oil pump provides oil pressure to the propeller pitch control. This causes the propeller blades to move from their feathered position to a blade angle where the engine can be started.

NEGATIVE TORQUE SENSOR SYSTEM

In addition to the manual feathering system, the Negative Torque Sensor System (NTS) provides automatic propeller drag limiting in the event of an engine failure. If an engine fails during flight, the propeller drives the engine by aerodynamic (negative) torque, the propeller feathering valve operates to dump the oil, inducing propeller feathering as in the manual feathering operation. As soon as the negative torque is eliminated, the prop feathering valve automatically moves back to the normal position and stops dumping oil. Thus, the propeller windmilling drag will remain extremely low, with no serious effect on airplane maneuvers, even during a sudden engine failure. The NTS system is a drag reduction system only. It is not an automatic feathering system. The propeller on the affected engine must be manually feathered for minimum drag.

PROPELLER MINIMUM PITCH STOP

In the propeller governing mode of operation, high pressure oil supplied from the propeller governor is routed to the pitch control sleeve through the Beta Tube and acts against a spring pack in the propeller dome and counter weights on the blade clamps to move the blades toward a lower pitch (increase rpm). Conversely, when the rpms increase above a set point, the propeller governor allows oil pressure to be relieved and the spring pack and counter weights act to move the blades towards a higher pitch, thus reducing rpms back to the set point. The position of the pitch control sleeve in relation to the Beta Tube is a function of power lever angle. When the power lever is advanced to the takeoff position the pitch control sleeve is moved aft in relation to the oil

SYSTEMS DESCRIPTION (CONT)

PROPELLER (CONT)

PROPELLER MINIMUM PITCH STOP (CONT)

pressure ports in the Beta Tube. The Beta Tube position in relation to the propeller pitch control sleeve is determined by the pitch angle of the blades. When oil pressure is applied to move the blades toward low pitch, the propeller dome and Beta Tube move forward in relation to the pitch control sleeve. As the Beta Tube continues to move forward the oil ports in the Beta Tube are allowed to bleed oil pressure and the maximum low pitch blade angle is established for a set power lever angle. In the event of a power loss, the power lever should be left in or moved to the TAKE-OFF position in order to position the pitch control sleeve in the most aft position in relation to the Beta Tube. This hydraulically limits the low pitch stop and in turn will reduce drag on a windmilling propeller. The condition lever of the windmilling engine should be placed in the feather position as soon as practical. The condition lever when placed in the feather position will close the fuel solenoid valve and open the feather valve which relieves oil pressure to the propeller dome and allows the counterweights and spring pack to move the blades to a feathered position for additional drag reduction.

CAUTION

IF THE POWER LEVER IS RETARDED ON A FAILED ENGINE WITH AN INOPERATIVE NTS SYSTEM, THE WINDMILLING DRAG WILL INCREASE. DURING INFLIGHT SHUTDOWN, DO NOT RETARD THE FAILED ENGINE'S POWER LEVER PRIOR TO FEATHERING. THE FAILED ENGINE SHOULD BE IDENTIFIED BY POWER ASYMMETRY AND ENGINE INSTRUMENT INDICATIONS.

PROPELLER START LOCKS

When stopping the engine, engine oil pressure reduces as the engine decelerates. This allows the spring and centrifugal force to feather the propeller. To overcome this condition, a propeller pitch lock pin is installed to stop and lock the propeller blade in flat pitch. The lock utilizes the centrifugal force of the propeller. The lock will not operate if the engine is stopped with the power lever placed forward of the GROUND IDLE position. The propeller will feather after the engine stops. To unlock the start-locks after engine starts refer to NORMAL PROCEDURES, Section 5 of the FAA Approved Airplane Flight Manual. Power levers must be placed in REVERSE during engine shutdown to ensure that the propellers go on the locks, do not feather and are ready for the next start. The start locks must be fully engaged before performing the overspeed governor check, if required, after engine start. As the start locks are released by centrifugal force, it is important that the condition

SYSTEMS DESCRIPTION (CONT)

PROPELLER START LOCKS (CONT)

levers be in the TAKEOFF LAND position before moving the power levers toward REVERSE.

CAUTION

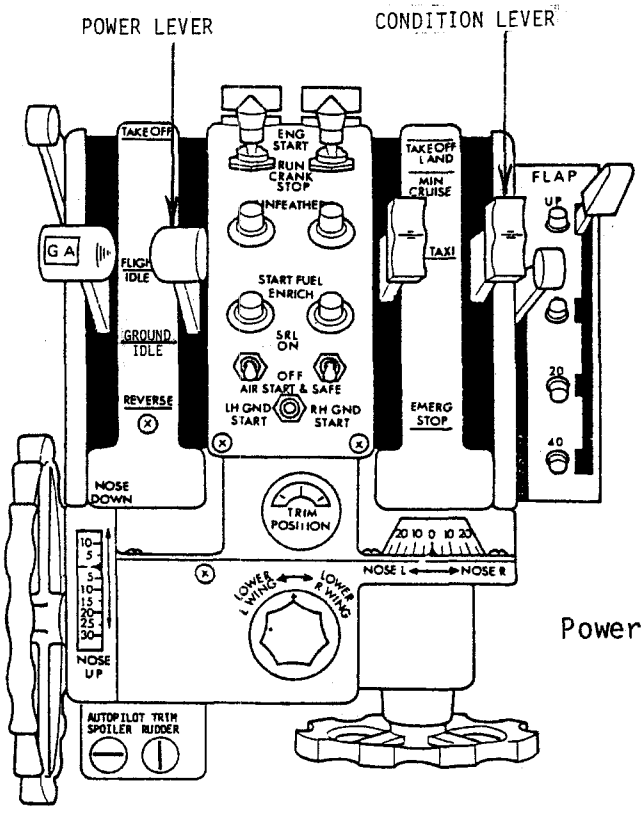
DO NOT MOVE CONDITION LEVERS FROM THE TAXI POSITION UNTIL THE ENGINE OIL TEMPERATURE IS AT THE MINIMUM OF THE GREEN ARC (55°C).

POWER PLANT CONTROL (See Figure 3-2)

The pilot is provided with two sets of control levers grouped in the center pedestal: one condition lever and power lever per engine. Friction locks on the levers may be tightened to prevent creeping after power settings are established.

CONDITION LEVER (See Figure 3-2)

A condition lever is provided for each engine rpm control and propeller feathering. This lever has four positions: TAKEOFF LAND, MIN CRUISE, TAXI and EMERG STOP. Detents are provided at the TAXI and MIN CRUISE positions. The lever is linked to the propeller governor, the underspeed governor of the fuel control, the propeller feathering valve, and the fuel shutoff valve.



Power Plant Control Levers
Figure 3-2

SYSTEMS DESCRIPTION (CONT)

POWER PLANT CONTROL (CONT)

RPM CONTROL

For engine rpm control move the condition lever to TAKEOFF LAND, MIN CRUISE or TAXI position. Relationship between engine rpm and condition lever position is as shown.

Condition	Condition Lever Position	Engine rpm (%)
	TAKEOFF LAND	100
In Flight	MINIMUM CRUISE	96
	TAXI	Not used
On Ground	TAKEOFF LAND	96 to 97
	TAXI	72 to 74

FEATHER CONTROL

Pulling the condition lever to the full aft (EMERG STOP) position allows the propeller to feather after shutting off fuel to the engine.

POWER LEVER (Figure 3-2)

The power lever for each engine has variable positions marked REVERSE, GROUND IDLE, FLIGHT IDLE, and TAKEOFF. Detents are installed at GROUND IDLE and FLIGHT IDLE positions. The power lever is linked to the propeller pitch control and to the manual fuel valve of the fuel control. Power lever travel is divided into two parts, the propeller governing range and the Beta range.

PROPELLER GOVERNING RANGE

Power lever travel between FLIGHT IDLE and TAKEOFF positions is called the propeller governing range. In this range, the power lever establishes the fuel flow and the propeller governor operates automatically to maintain a constant engine speed by changing the propeller blade angle.

BETA RANGE

Power level travel from FLIGHT IDLE to REVERSE positions is called the Beta range. In this range, the power lever establishes the blade angle and the underspeed governor of the fuel control operates automatically to maintain a constant engine speed by changing the fuel flow.

SYSTEMS DESCRIPTION (CONT)

ENGINE POWER SETTING

Engine power is limited by torque (Tq) and exhaust gas temperature (EGT) in each condition of takeoff, maximum continuous, maximum cruise and recommended cruise power. EGT limitation is specified by maximum permissible exhaust gas temperature and torque limitation is specified by maximum permissible gearbox strength. Limitations are never to be exceeded in either condition. These limitations are shown in Section 2, OPERATING LIMITATIONS of the FAA Approved Airplane Flight Manual.

Refer to Section 4 for Recommended Cruise and Max Range power settings.

FUEL SYSTEM (See Figure 3-4)

The fuel system consists of five (5) fuel tanks: (1) main tank with capacity of 159 U.S. gallons total, 154 U.S. gallons usable; (2 & 3) left and right
R outer wing tanks with capacity of 35 U.S. gallons each, 34.5 U.S. gallons usable each; (4 & 5) left and right tip tanks with a capacity of 93 U.S. gallons each, 90 U.S. gallons usable each. Total usable fuel is 403 U.S. gallons. S/N 700SA has outer tanks of 15 U.S. gallons each, all usable, and has a total usable fuel of 364 U.S. gallons.

MAIN TANK

The Main Tank is of integral type construction and is divided into center and outboard sections with flapper type check valves connecting the sections. The check valves only allow fuel to transfer (by gravity feed) from the outboard sections, which contain the filler ports, to the center section. The center section contains two fuel boost pumps (one forward, one aft) which are connected to a manifold for fuel distribution to the engines. Both engine fuel supply lines are connected to the manifold and either boost pump is capable of supplying adequate fuel for both engines. The center section also contains a fuel level control valve for the fuel transfer system as all fuel is transferred into the center section before being pumped to the engines. A fuel quantity transmitter is installed in each section and the center section has a fuel low level switch to activate a warning light.

R OUTER WING TANKS

R Each outer wing tank is of integral type construction consisting of two sections connected by flapper type check valves. S/N 700SA has all metal
R outer wing tanks. The fuel filler port is located in the outboard section and fuel transfers into the inboard section through one way flapper type check valves. A transfer pump and fuel quantity transmitter are installed in the inboard section.

SYSTEMS DESCRIPTION (CONT)

FUEL SYSTEM (CONT)

TIP TANKS

Each tip tank contains a fuel quantity transmitter in the center section, a fuel filler port in the aft section and an air pressure disc in the forward section on the air pressure line. There is a sniffle valve (pressure relief) in the center section so the air pressure in the tank can be released before servicing. All of the tank sections are open to each other with no check valves.

FUEL TRANSFER SYSTEM

The fuel transfer system will automatically transfer fuel from the tip tanks to the main tank center section until the tips are empty and then from the
R outer wing tanks until empty. The main tank will be maintained near a full level throughout the transfer process as all fuel is fed into the center section of the main tank. Switches provide for manual control of both tip and
R outer wing tank fuel transfer if necessary.

Major components of the fuel transfer system are the air shutoff valve and pressure regulator to pressurize the tip tanks, a fuel shutoff valve and screen in the fuel line from the tip tank to the main tank center section, a fuel low level switch in the tip tank which controls a timer to activate the
R transfer pump in each outer wing tank, and the fuel level control valve in the
R main tank center section. The outer wing tank and tip tank transfer lines join with both the LH and RH transfer lines connecting to the fuel level control valve.

SYSTEM OPERATION (Auto Fuel Transfer)

The fuel transfer switch in the AUTO position energizes a relay to power the bleed air shutoff valve (Open). This pressurizes the tip tanks and at the same time the tip tank fuel shutoff valve is opened. The air pressure forces fuel through the transfer line to the main tank center section where the fuel level control valve opens as required to maintain a preset fuel level in the main tank. When the tip tank is empty, a fuel low level switch opens to activate a 2 minute timer/relay. The low level switch must stay open for 2 minutes to keep the timer/relay activated and prevents the timer from prematurely activating the relay portion. At the end of the 2 minute cycle, the relay activates and completes a circuit that connects the tip fuel level relays and the outer fuel pump relays. The timer/relay remains activated regardless of the fuel transfer switch position. Should power be interrupted, by disengaging the fuel transfer control circuit breaker or entire airplane power shut-

SYSTEMS DESCRIPTION (CONT)

FUEL SYSTEM (CONT)

SYSTEM OPERATION (Auto Fuel Transfer) (Cont)

down, then the timer/relay will open. There is another 2 minute timer/relay for the opposite tip tank that functions in parallel and completes the same circuits.

NOTE

Both tip tanks must be empty with both timers completing the 2 minute cycle before the relays will activate to turn ON the outer fuel tank transfer pumps.

The outer fuel pump transfer relay starts the transfer pump and arms the outer fuel low pressure switch. At the same time, the other relays activate to close both of the tip tank fuel shutoff valves and the bleed air shutoff
R valve. When the outer wing tanks are empty or if there is a pump failure, the
R fuel low pressure switch will activate the outer wing tank fuel empty warning lights. The fuel transfer switch should then be positioned to OFF.

TIP TANK MANUAL FUEL TRANSFER

When the fuel transfer switch is in the TIP MANUAL position, only the bleed air shutoff valve activates to OPEN and the fuel shutoff valve (selected tank only) to OPEN. (See ABNORMAL PROCEDURES, Section 4 of the FAA Approved Airplane Flight Manual.)

R OUTER WING TANK MANUAL FUEL TRANSFER

R The outer pump switch in MAN position activates both outer wing tank's transfer pumps and the low pressure switches are activiated for the outer fuel empty lights. (See ABNORMAL PROCEDURES, Section 4 of the FAA Approved Airplane Flight Manual.)

NOTE

R The fuel transfer switches must be in the OFF position to transfer fuel from the outer wing tanks with the outer pump switch in the MAN position.

SWITCHES (Figure 3-3)

The fuel system is controlled by four switches installed on the left switch panel: left and right MAIN VALVE switches to control the fuel shutoff valve in the fuel supply line to each engine and left and right switches to control the air shutoff valve in the pressurized air line to each tip tank, the two fuel shutoff valves in the fuel transfer line from each tip tank to center tank,

SYSTEMS DESCRIPTION (CONT)

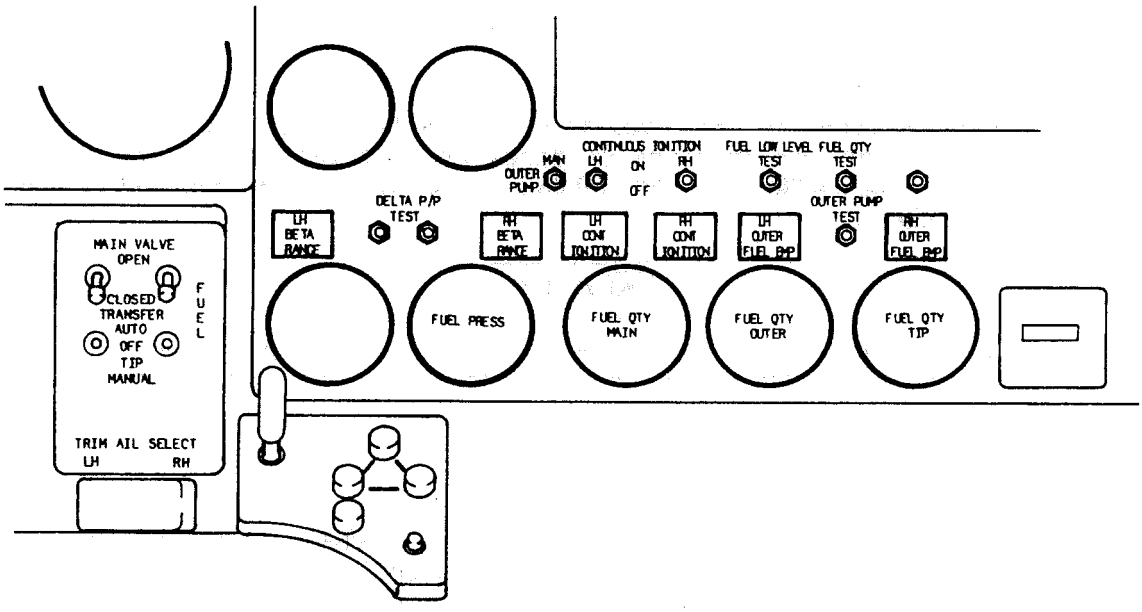
FUEL SYSTEM (CONT)

SWITCHES (CONT)

R and the transfer pump in the outer wing tank. When the fuel transfer switches
R are placed in the AUTO position, the fuel in the tip and outer wing tanks is transferred automatically to the center tank. When the fuel transfer switches are placed in the TIP MANUAL position, only the fuel in the tip tanks is transferred to the center tank.

The outer pump test switch is used to test the transfer pump during ground preflight. It should be noted that the **LH** and **RH OUTER FUEL EMP** annunciators will illuminate momentarily during ground preflight checks to indicate a functioning pump. The light may not illuminate if the switch is activated during flight. Fuel quantity decrease should be used to verify a functioning pump during flight.

The outer pump manual transfer switch is used to transfer fuel from the outer
R wing tanks in the event of an automatic fuel transfer system failure. For operation, refer to ABNORMAL PROCEDURES, Section 4 of the FAA Approved Airplane Flight Manual.



Fuel Switches & Indicators
Figure 3-3

SYSTEMS DESCRIPTION (CONT)

FUEL SYSTEM (CONT)

INDICATORS (Figure 3-3)

R Fuel quantity indicators for the main, left outer wing, right outer wing, left tip, and right tip tanks are installed on the center instrument panel. The main tank fuel quantity indicator indicates total usable fuel quantity
R remaining in the center tank, while the outer wing tank fuel quantity indicators and the tip tank fuel quantity indicators (dual indicators) indicate the amount of usable fuel remaining in these tanks. These indicators
R are operated electrically. The left and right outer wing tank fuel empty lights, on the center instrument panel, marked **LH** and **RH OUTER FUEL**
R **EMP** indicate either the outer wing tank is empty or the outer wing tank transfer pump has failed.

FUEL DRAINS

Water and solid materials are trapped by sumps in each tank and by fuel filter bowls in each feed line to the engine. Sumps for the center tank and boost pumps may be drained by opening the access plate located at the lower surface of each wing fillet and turning the handle on the drain valve. A drain hole is located in the bottom of the fuselage.

R The sump in each main tank outboard section and outer wing tank is fitted with a drain valve and may be drained by opening the valve with a screwdriver. Tip tanks and fuel filter bowls at the wing leading edge may be drained by opening the drain valves with a screwdriver.

Procedures for draining fuel in large quantities are contained in the MAINTENANCE MANUAL.

FUEL QUANTITY

TANK		MAXIMUM CAPACITY * U.S. gal	USABLE CAPACITY * U.S. gal	UNUSABLE CAPACITY * U.S. gal
R Center Wing Main		159	154	5
R Outer Wing	L	35 (15)	34.5 (15)	0.5 (0)
	R	35 (15)	34.5 (15)	0.5 (0)
Tip	L	93	90	3
	R	93	90	3
Total		415 (375)	403 (364)	12 (11)

* Figures in ( ) apply to S/N 700SA

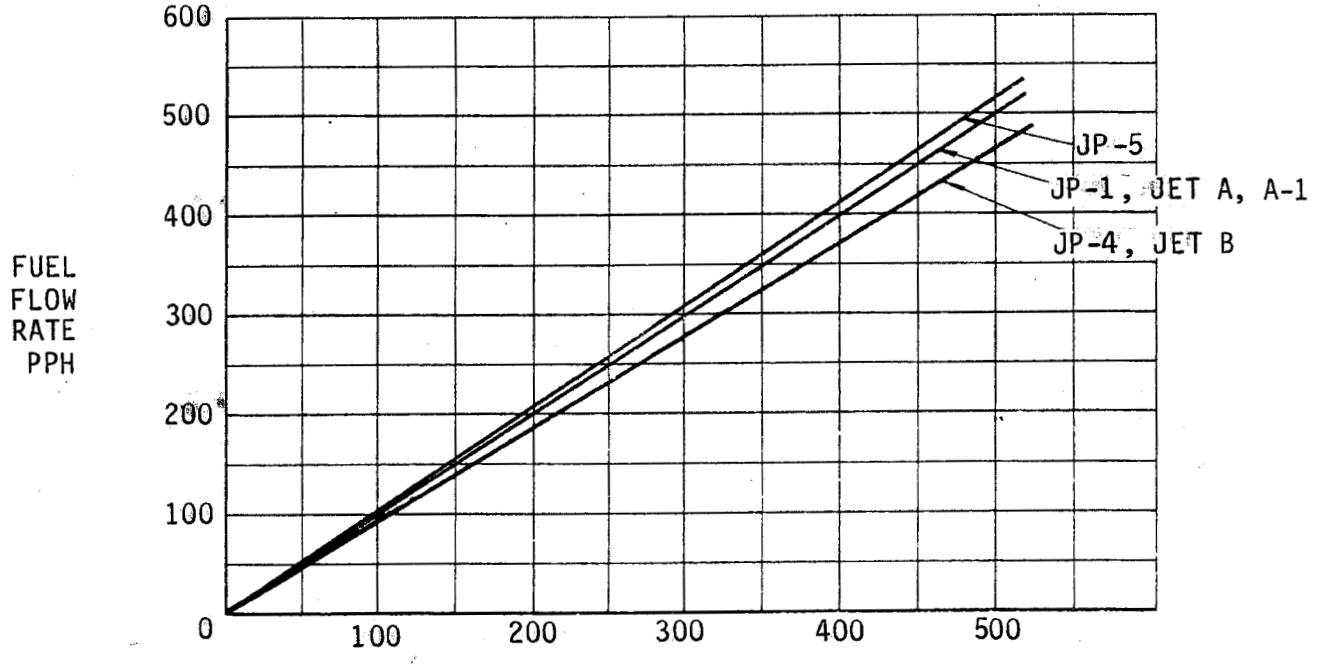
SYSTEMS DESCRIPTION (CONT)

FUEL SYSTEM (CONT)

FUEL MEASURING SYSTEM

When Jet A-1, Jet A, or JP-1 fuel is used, the value is read directly from the graduation on the dial. When JP-4, JP-5 or Jet B fuel is used, the reading should be calibrated using Graph 1 to obtain the correct value.

The totalizer reading can be converted to pounds by using Graph 2.

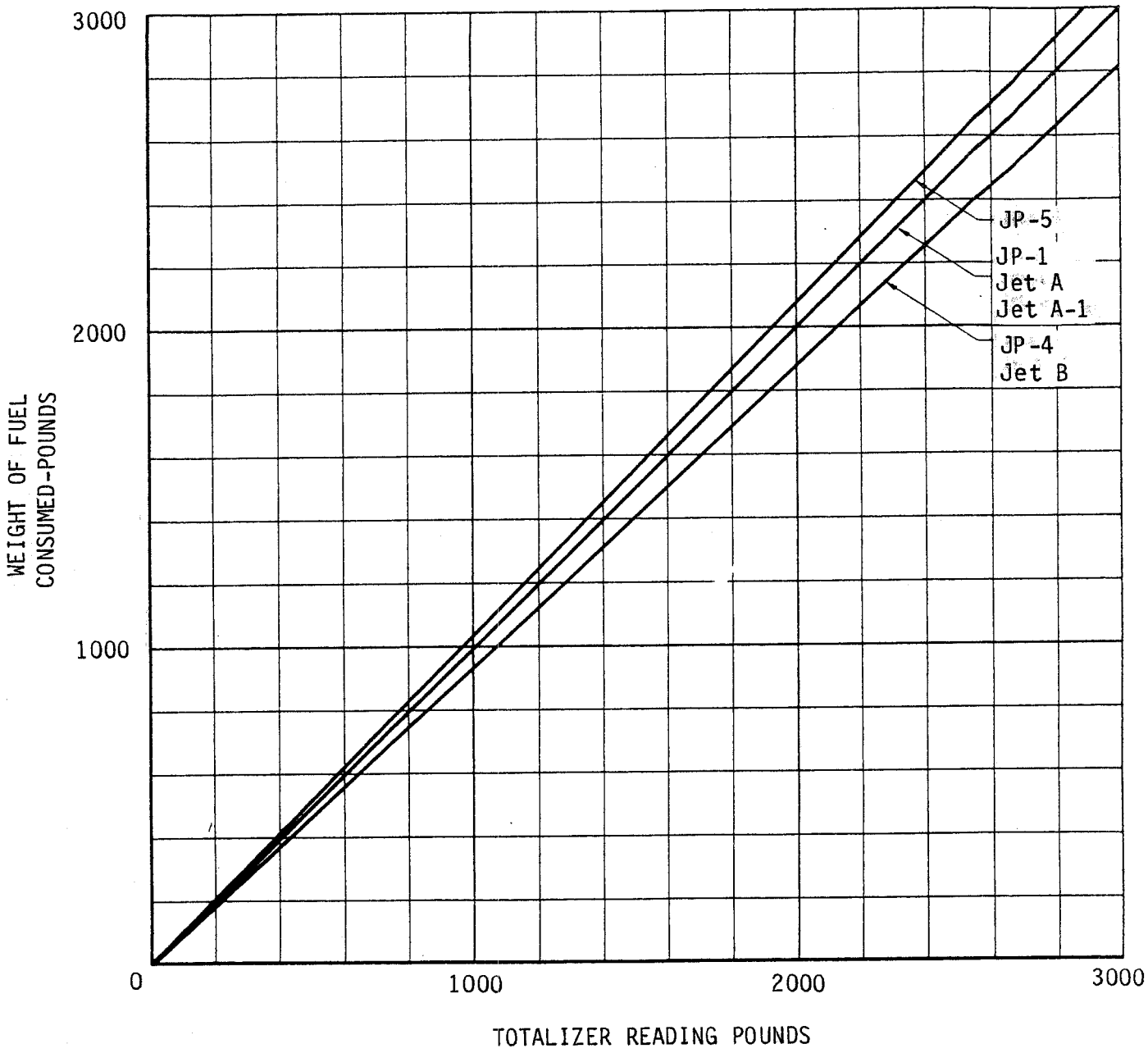


FUEL FLOW RATE CALIBRATION
BASED ON AVERAGE FUEL DENSITY AT 125°F (52°C)

GRAPH 1

SYSTEMS DESCRIPTION (CONT)

FUEL SYSTEM (CONT)

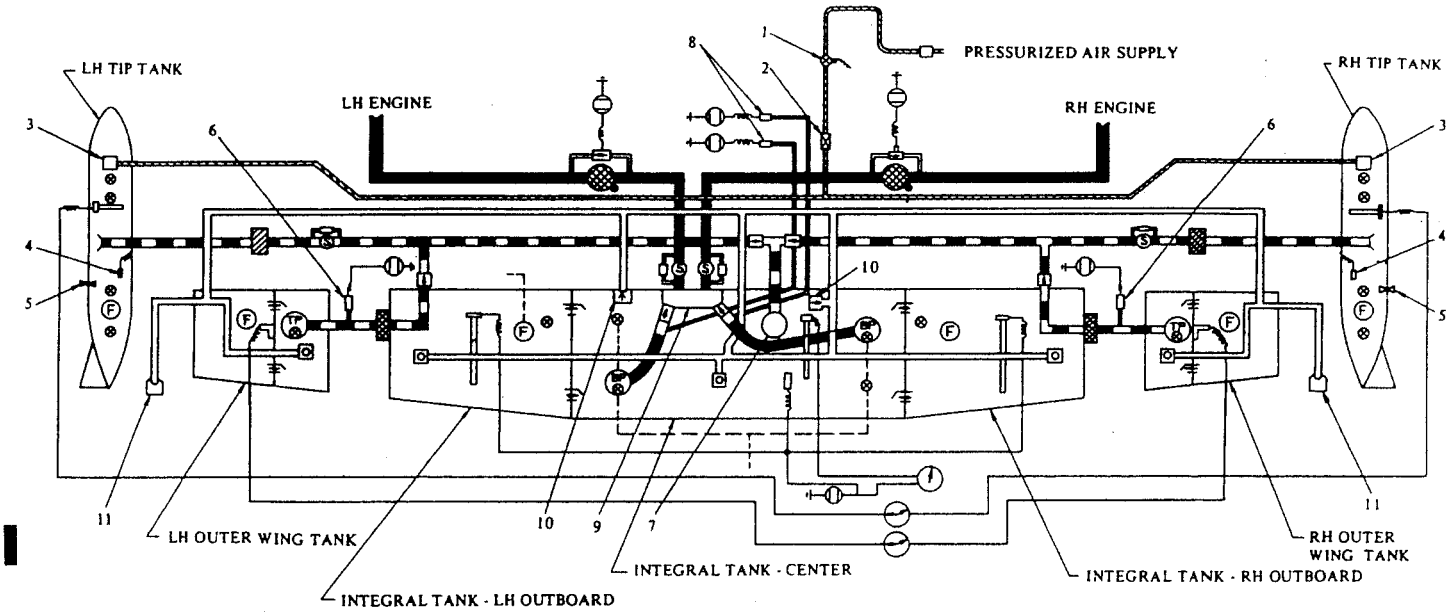


CALIBRATION OF TOTALIZER
BASED ON AVERAGE FUEL DENSITY AT 125°F (52°C)

Graph 2

SYSTEMS DESCRIPTION (CONT)

FUEL SYSTEM (CONT)



1. AIR SHUTOFF VALVE
2. AIR PRESSURE REGULATOR
3. VENT DISC
4. LOW LEVEL SWITCH
5. SNIFFLE VALVE
6. FUEL LOW PRESSURE WARNING SWITCH
7. FUEL LEVEL CONTROL VALVE
8. BOOST PUMP WARNING SWITCH
9. MANIFOLD
10. PRESSURE RELIEF VALVE
11. VENT PORT

- FUEL FILLER PORT
- FUEL QUANTITY TRANSMITTER UNIT
- FUEL QUANTITY INDICATOR - SINGLE
- FUEL QUANTITY INDICATOR - DUAL
- ELECTRICAL WIRE
- FUEL SUPPLY LINE
- FUEL SCREEN
- CHECK VALVE
- PRESSURIZED AIR LINE
- TRANSFER PUMP
- FUEL SHUTOFF VALVE
- FUEL TRANSFER LINE

- INTERCONNECT CHECK VALVE
- BOOST PUMP
- FUEL FILTER
- VENT PORT
- VENT LINE
- WARNING LIGHT
- DRAIN VALVE
- DRAIN LINE

Fuel System (Typical)
Figure 3-4

SYSTEMS DESCRIPTION (CONT)

LANDING GEAR

The fully retractable tricycle landing gear consists of two main gears with single disc brakes and a steerable nose gear. An electric motor retracts and extends the landing gear. The main gears are retracted forward into bulges on each side of the fuselage. The nose gear is retracted forward into the nose of the fuselage. The nose gear doors and the main gear aft doors are mechanically linked to the gear struts and close or open as the gear is retracted or extended. The main gear forward doors are moved by a separate electrical actuator located in the main gear wheel well. In the event of system electrical failure, the gear can be extended manually by operating the emergency gear extension handle mounted on the floor beside the pilot's seat. Refer to EMERGENCY PROCEDURES, Section 3 of the FAA Approved Airplane Flight Manual. Landing gear operation is controlled by a tire shaped switch handle, located on the LH switch panel (Figure 3-5). Retraction or extension times are approximately 17 seconds. A safety switch is provided in the main gear wheel well which breaks the gear control circuit to prevent accidental gear retraction on the ground. A warning horn will sound when a power lever is near the FLIGHT IDLE position if the landing gear is not extended and locked.

LANDING GEAR WARNING AND INDICATOR LIGHT (See Figure 3-5)

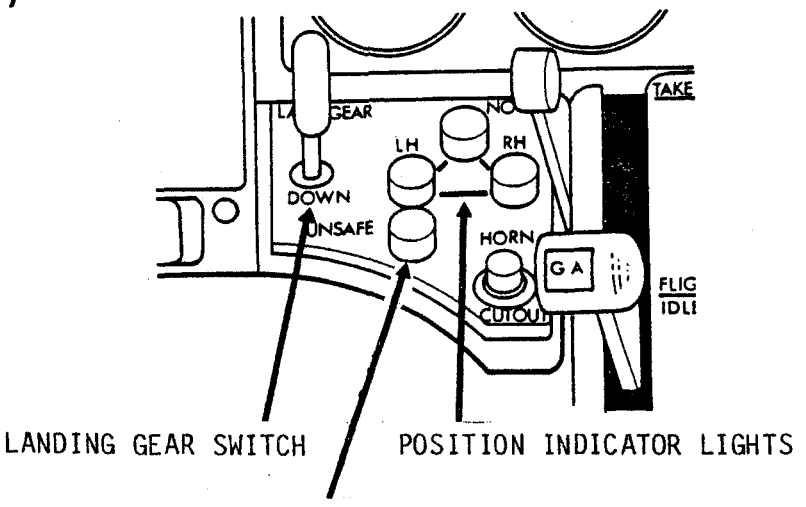
The landing gear UNSAFE warning and position indicator lights consist of three green lamps (position indicators) and a red lamp (unsafe warning). These lights are push-to-test type. The three green lamps correspond to the three wheels: nose gear and two main gears. Each lamp illuminates when the corresponding gear is fully extended. The red lamp illuminates during retraction and extension cycles and should extinguish when the gear is fully extended or retracted and the doors are closed. Lamp illumination except during retraction and extension indicates a system failure or malfunction. See WARNING SYSTEMS, Section 3, Landing Gear Warning System.

GEAR UP PROCEDURE

Place the gear switch in the LAND GEAR UP position for gear retraction. The red lamp illuminates first, indicating the main gear forward doors have begun to open. When the doors are fully opened, a limit switch operates to stop the door actuator and to start the gear motor to retract the gear. When the gear begins to move, the three green lamps extinguish. Immediately before the gear is fully retracted, the door actuator operates again to close the main gear forward doors. When the doors are closed, the red lamp extinguishes indicating the gear retraction cycle is completed and the doors are closed.

SYSTEMS DESCRIPTION (CONT)

LANDING GEAR (CONT)



Landing Gear Switch & Lights
Figure 3-5

GEAR DOWN PROCEDURE

Place the gear switch in the LAND GEAR DOWN position for gear extension. The red lamp illuminates first as in the gear up procedure to indicate the main gear forward doors are opening. When the doors are fully opened, the gear begins to extend. When the gear is fully extended and locked, the three green lamps will illuminate. Immediately before the gear reaches the fully extended position the main gear forward doors begin to close. A few seconds after the green lamps illuminate, the red lamp extinguishes, indicating the doors are closed and the gear extension cycle is completed.

EMERGENCY GEAR EXTENSION HANDLE

The emergency gear extension handle is mounted on the floor beside the pilot's seat. An unlock lever is attached to this handle for the door-lock release. If manual gear extension is required, refer to EMERGENCY PROCEDURES, Section 3 of the FAA Approved Airplane Flight Manual. When the handle is pulled upward approximately 15 degrees, the unlock lever will detach and the red gear warning light will illuminate, indicating that the main doors are unlocked.

Pull the handle further and pump approximately 130 times, through a range of 20 to 70 degrees of travel, until the handle cannot be moved.

SYSTEMS DESCRIPTION (CONT)

LANDING GEAR (CONT)

EMERGENCY GEAR EXTENSION HANDLE (CONT)

When the gear reaches the fully extended position, the green lamps will illuminate (if gear indication circuits are operative) and the red light will remain illuminated. After landing, it will be necessary to reset the handle, unlock lever cable assembly, and main gear forward door actuating clutch back to their normal position.

CAUTION

DO NOT ATTEMPT GEAR RETRACTION IN THE SAME FLIGHT AFTER MANUAL GEAR EXTENSION.

STEERING SYSTEM

The nose wheel is steerable by means of the rudder pedals: 23 degrees to the left and 22 degrees to the right of center. The steering mechanism will automatically disengage from the rudder pedals when the gear is retracted. The pedal position is ground adjustable by a mechanic two inches fore and aft. It is not cockpit adjustable.

BRAKE SYSTEM

The single disc brake on each main wheel is operated by applying toe pressure to the rudder pedals. To engage the parking brake, apply toe pressure to both rudder pedals and pull the parking brake handle. To release, manually turn and push the handle.

FLIGHT CONTROLS

Conventional dual control wheels and rudder pedals are provided. They are linked mechanically to the control surfaces. Main control surfaces are the elevators for longitudinal control, the rudder for directional control, and the spoilers for lateral control. The elevators and rudder are conventional in their design and use.

SPOILERS

The spoilers are installed on the upper wing surface approximately the full length of the wing. This design allows more available flap length. (See GENERAL, Section 1)

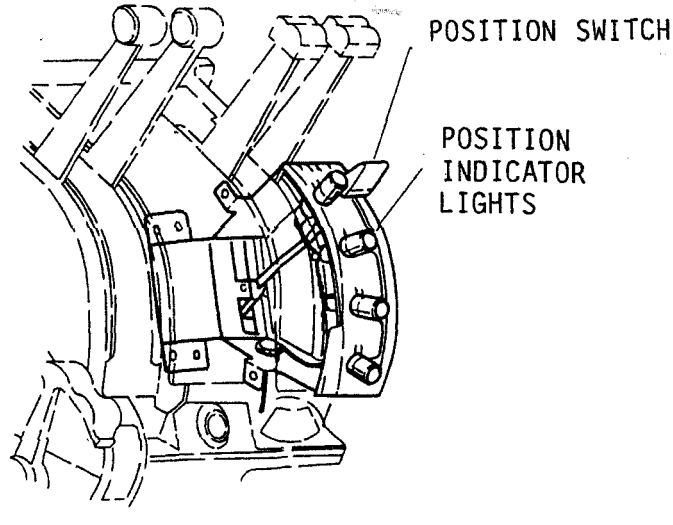
SYSTEMS DESCRIPTION (CONT)

FLIGHT CONTROLS (CONT)

WING FLAPS (Figure 3-6)

The wing flaps are mechanically interconnected and are actuated by an electric motor. The flap position switch has four positions: UP, 5°, 20°, and 40°. Place the switch in any position (5°, 20°, or 40°) and the wing flaps will move to and stop at the selected position. Place the switch to UP and the flaps will fully retract. Flap extension times are approximately as follows: UP to 5° is 17 seconds; 5° to 20° is 10 seconds; and 20° to 40° is 6 seconds. Flap retraction times are approximately as follows: 40° to 20° is 4 seconds; 20° to 5° is 10 seconds; and 5° to UP is 21 seconds. (See GENERAL, Section 1).

The flap position is indicated by four indicator lights: a green light marked UP, and three amber lights marked 5, 20, and 40 respectively.



Flap Position Switch & Lights
Figure 3-6

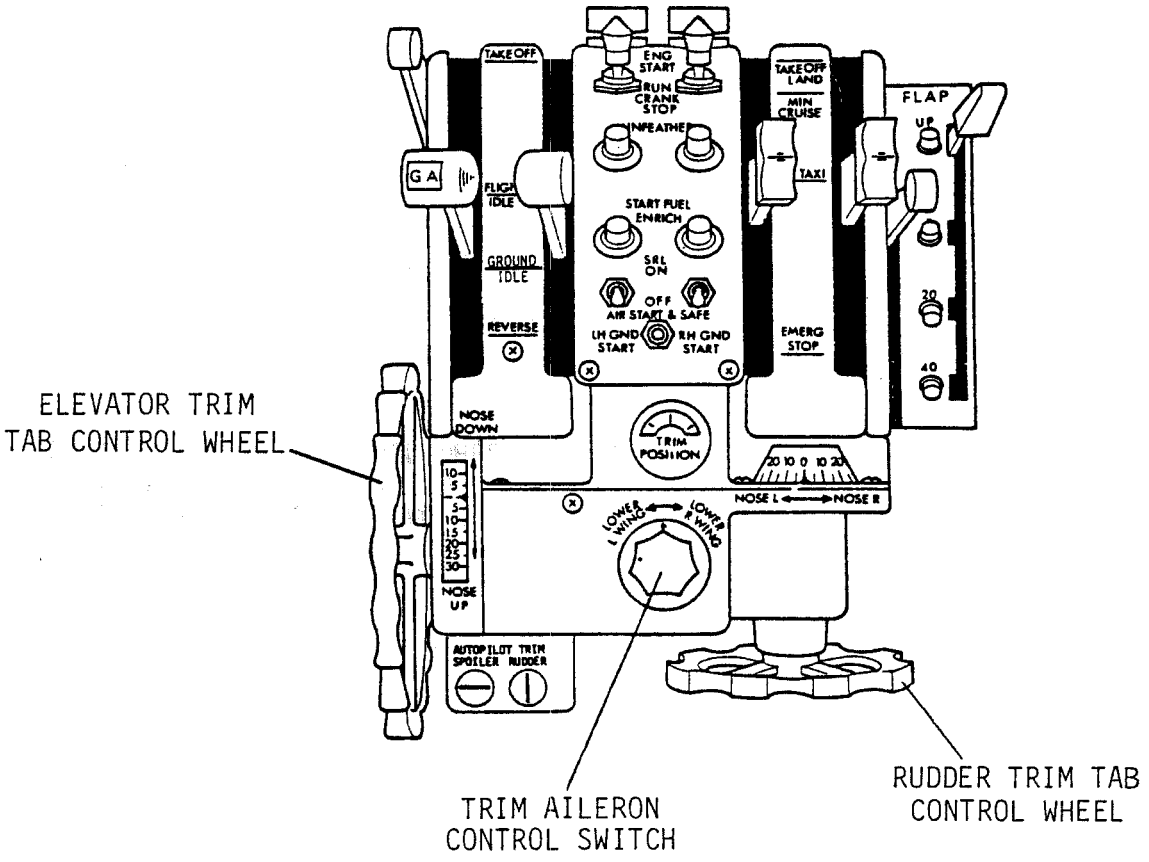
SYSTEMS DESCRIPTION (CONT)

FLIGHT CONTROLS (CONT)

TRIM TABS (Figure 3-7)

The airplane is equipped with elevator trim tabs, a rudder trim tab and trim ailerons. The elevator and rudder trim tabs are manually operated by tab control wheels located on the lower section of the center pedestal. Trim ailerons are controlled by a switch on the center pedestal. Takeoff trim position is shown on the elevator trim indicator by a green line.

The mechanical elevator trim position indicator is marked NOSE UP and NOSE DOWN on the respective sides. A mechanical rudder trim position indicator is marked NOSE L and NOSE R. Lateral trim control is established by electrically operated trim ailerons located at the trailing edge of the outer wing flaps. An electrical aileron trim indicator is marked LOWER L WING and LOWER R WING with arrows. If either the right or left trim aileron actuator fails, refer to ABNORMAL PROCEDURES, Section 4, of the FAA Approved Airplane Flight Manual.



Trim Tab Controls
Figure 3-7

SYSTEMS DESCRIPTION (CONT)

FLIGHT CONTROLS (CONT)

FLIGHT CONTROL LOCK

A gust lock pin is used to lock the elevator and spoiler systems while the airplane is parked. The pin may be stored in the map case during flight and should be installed through the control shaft of the control column before leaving the airplane. A special gust lock device is not required for the rudder since it is mechanically linked to the nose gear steering system and can not be moved easily due to friction between the nose wheel and the ground when the nose gear torque link is connected.

NOTE

If airplane is to be parked for an extended length of time see Mooring and Tie Down in OPERATING DETAILS Section 3.

INSTRUMENT AND SWITCH PANELS

The instrument and switch panels consist of left, center and right instrument panels, left and right switch panels, center pedestal switch panel, and the overhead switch panel. (See Figures 3-7, 3-8 and 3-9).

All flight instruments, engine instruments, fuel quantity indicators and fuel consumption totalizer are grouped on the left and center instrument panels just in front of the pilot seat. Necessary flight instruments are duplicated on the right instrument panel. Standard flight instrumentation includes clock, outside air temperature indicator, rate of climb indicator, airspeed indicator, turn and bank indicator, attitude indicator and altimeter.

On S/N 700SA, 731SA through 799SA, and 1501SA through 1517SA, the pilot's turn and bank indicator is vacuum operated. A vacuum gauge is installed on the right instrument panel. The copilot's turn and bank indicator is electric and receives power from the LH 28VDC load bus. On S/N 1518SA and up, both the pilot's and copilot's turn and bank indicators are electrically operated. The pilot's turn and bank indicator receives power from the LH 28 VDC load bus and the copilot's turn and bank indicator receives power from the RH 28 VDC load bus.

Engine instrumentation is conveniently grouped on the center instrument panel and includes torquemeters, EGT indicators, fuel flow indicators, tachometers, oil temperature indicators, oil pressure indicators and fuel pressure indicators. The oil pressure and fuel pressure indicators are dual pointer instruments.

Various radio controls are installed in the radio control panel located between the center and right instrument panels.

SYSTEMS DESCRIPTION (CONT)

INSTRUMENT AND SWITCH PANELS (CONT)

Voltammeter, battery temperature indicator, switches to control the electrical power source systems, main fuel valve switches, fuel transfer switches, landing gear switch, landing gear warning horn cutout switch, landing gear position indicator lights, landing gear unsafe warning light and trim aileron selector switch are on the left switch panel.

Controls and switches for the air conditioning and pressurization system, cabin altitude differential pressure indicator and cabin rate of climb indicator are on the right switch panel.

Delta P/P transducer test switches, outer pump manual switch, continuous ignition switches, fuel low level test switch, fuel quantity test switch, outer pump test switch, panel indicator lights test switch, stall warning test switch, defog warning test switch, propeller synchrophaser switch and panel annunciator lights for Beta range, continuous ignition and outer tank fuel empty are on the lower part of the center instrument panel.

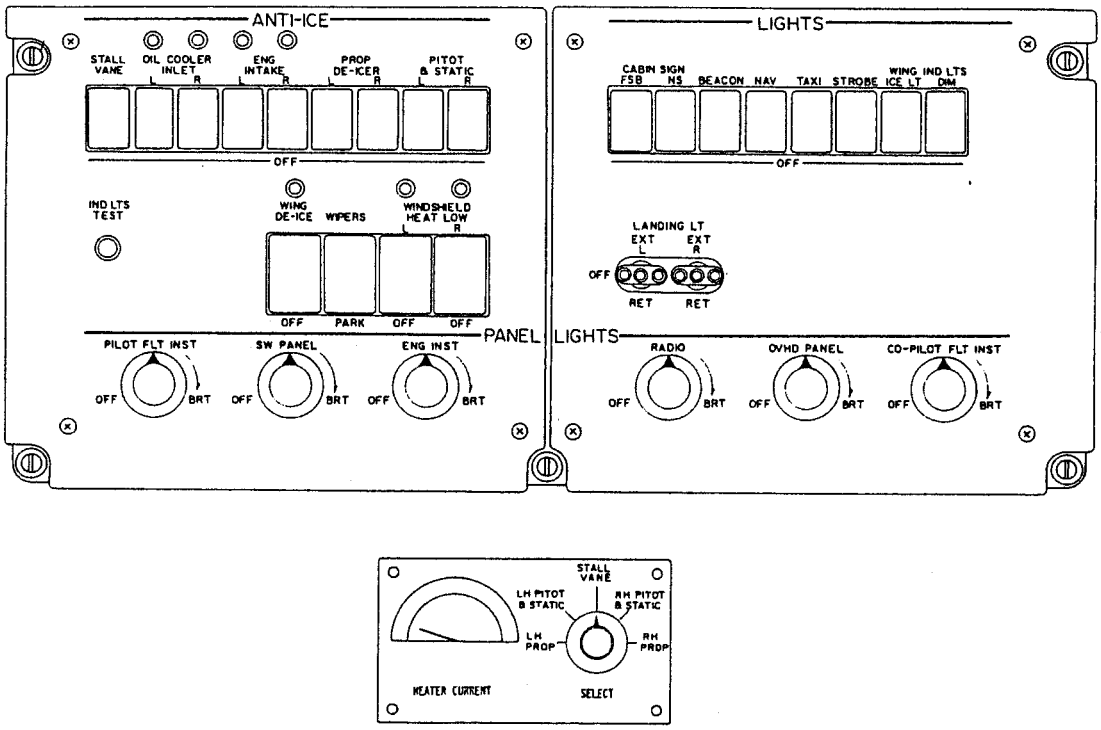
Engine start switches, run crank stop switches, unfeather switches, start fuel enrichment switches, SRL switches and start selector switch are installed on the center pedestal switch panel. The flap position switch and flap indicator lights are on the RH side of the center pedestal.

Control switches and a heater current loadmeter for monitoring or checking prop deice, stall vane anti-ice and pitot and static port anti-ice are located on the overhead switch panel. Switches and indicator lights for oil cooler inlet anti-ice, engine intake anti-ice, wing deice and windshield low heat are also located on the overhead switch panel. Lighting switches and light dimmer controls are also located there.

Autopilot, trim, ATC Ident, TCS and Windshield Hi Heat switches are located on pilot and copilot control wheels.

SYSTEMS DESCRIPTION (CONT)

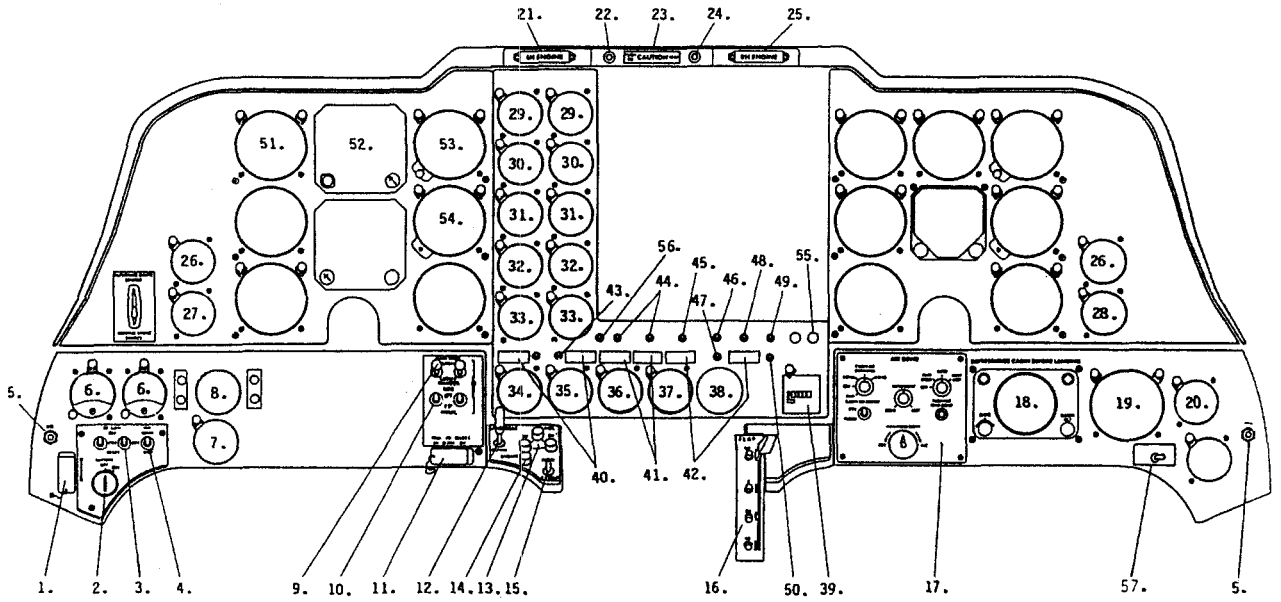
INSTRUMENT AND SWITCH PANELS (CONT)



Overhead Switch Panel
Figure 3-8

SYSTEMS DESCRIPTION (CONT)

INSTRUMENT AND SWITCH PANELS (CONT)



1. MASTER SWITCH
2. BATTERY KEY SWITCH
3. DC GENERATOR CONTROL SWITCHES
4. INVERTER SELECT SWITCH
5. MICROPHONE JACK
6. VOLTAMMETERS
7. OUTSIDE AIR TEMPERATURE INDICATOR
8. BATTERY TEMPERATURE INDICATOR AND ISOLATE SWITCHES
9. MAIN FUEL VALVE SWITCHES
10. FUEL TRANSFER SWITCHES
11. TRIM AILERON SELECT SWITCH
12. LANDING GEAR CONTROL SWITCH
13. LANDING GEAR POSITION INDICATOR LIGHTS
14. LANDING GEAR UNSAFE WARNING LIGHT
15. LANDING GEAR WARNING HORN CUTOUT SWITCH
16. FLAP CONTROLLER
17. AIR CONDITIONING CONTROL PANEL
18. CABIN PRESSURE CONTROLLER
19. CABIN ALTITUDE DIFF. PRESS. INDICATOR
20. CABIN RATE OF CLIMB INDICATOR
21. LH ENG. FIRE WARNING LIGHT AND ENG. FIRE EXTINGUISHER HANDLE
22. ENGINE FIRE DETECTOR TEST SWITCH
23. MASTER CAUTION LIGHT
24. MASTER CAUTION SYSTEM TEST SWITCH
25. RH ENG. FIRE WARNING LIGHT AND ENG. FIRE EXTINGUISHER HANDLE
26. CLOCKS
27. TURN AND BANK INDICATOR
28. VACUUM GAUGE
29. TORQUE METERS
30. EGT INDICATORS
31. FUEL FLOW INDICATORS
32. TACHOMETERS
33. OIL TEMPERATURE INDICATORS
34. OIL PRESSURE INDICATOR
35. FUEL PRESSURE INDICATOR
36. MAIN TANK FUEL QUANTITY INDICATOR
37. OUTER WING TANK FUEL QUANTITY INDICATOR
38. TIP TANK FUEL QUANTITY INDICATOR
39. FUEL CONSUMPTION TOTALIZER
40. BETA RANGE INDICATOR LIGHTS
41. CONTINUOUS IGNITION INDICATOR LIGHTS
42. OUTER WING TANK FUEL EMPTY WARNING LIGHTS
43. DELTA P/P TRANSDUCER TEST SWITCHES
44. CONTINUOUS IGNITION SWITCHES
45. FUEL LOW LEVEL TEST SWITCH
46. FUEL QUANTITY INDICATOR TEST SWITCH
47. OUTER PUMP TEST SWITCH
48. PANEL INDICATOR LIGHT TEST SWITCH
49. STALL WARNING TEST SWITCH
50. DEFOG AIR TEMP. WARNING TEST SWITCH
51. AIRSPEED INDICATOR
52. ATTITUDE INDICATOR
53. ALTIMETER
54. RATE OF CLIMB INDICATOR
55. PROPELLER SYNCHROPHASER SELECT SWITCH AND LIGHT
56. OUTER PUMP MANUAL TRANSFER SWITCH
57. ELT CONTROL SWITCH

Instrument & Switch Panel (Typical)
Figure 3-9

SYSTEMS DESCRIPTION (CONT)

ELECTRICAL SYSTEM (Figures 3-10, 3-11, 3-12, 3-13, 3-14)

DC Electrical Power

DC electrical power is supplied by two 28 volt, 200 ampere, engine driven DC starter-generators, two 24 volt, nickel cadmium batteries, and an external power source through the external power receptacle. The system's associated switches are located on the LH switch panel. The batteries are used for engine starts and as standby power for the DC system. When the battery switch is ON, both batteries are connected in parallel to the main bus. During the engine start cycle, the batteries are utilized in either series or parallel dependent upon the battery selector switch position. During engine starts in series, the batteries are automatically connected in series to the start bus from 0% rpm to approximately 60% engine rpm. When the left and right DC generator switches are ON after an engine start, the respective generators are connected to the main bus through the reverse current cutout relay, which prevents generator motoring. The output voltage of both generators is controlled by the respective voltage regulator, which enables the two generators to operate in parallel. When a generator exhibits an unusually high voltage condition, the main bus and electrical equipment is protected by the over-voltage protecting relay, which automatically removes the affected generator from the line. To restore generator operation, the generator switch may be held at RESET momentarily and then placed to the ON position. The master switch is used only in case of emergencies, such as electrical fire and is protected by a switch guard in the NORMAL position. To use, place the generator switches in the OFF position and the master switch in the EMERGENCY position. With the master switch in the EMERGENCY position, generators and batteries are disconnected from the bus regardless of the switch settings, but the engine fire detecting system, cockpit room lighting system and (On S/N 1518SA and Up, the Copilot's turn and bank indicator) remain energized directly by the battery. The cabin will depressurize. The electrical load for each generator and the monitored bus voltage are indicated by their respective voltammeter.

AC Electrical Power

AC electrical power is supplied by one of the two 115/26 volt 400 Hz single phase inverters: the main or the standby. The inverters are installed in the right side of the main junction box. Each system is independent of the other. The main inverter system receives main and control power from the LH 28 volt DC load bus, while the standby inverter system depends on the RH 28 volt DC load bus for its main and control power. Selection is accomplished by means of the inverter select switch located on the left switch panel. Normal operation of the AC equipment utilizes the MAIN inverter system. Associated circuit breakers control the power distribution to the various systems requiring AC voltage.

SYSTEMS DESCRIPTION (CONT)

ELECTRICAL SYSTEM (CONT)

AC Electrical Power (CONT)

Some systems requiring 115 VAC include the main fuel quantity indicator, autopilot, weather radar, flight director instruments, and compasses. Some systems requiring 26 VAC are the engine fuel pressure indicators, engine oil pressure indicators, ADF's, V/ILS's, RNAV, and VNAV.

During normal operation, DC input is supplied to the inverter through the circuit breaker MAIN (STBY) INV POWER. During engine start, power is supplied directly from the start bus through the DC-DC converter. While starting an engine, AC output voltage from the inverter drops due to the decrease in DC power supplied to the inverter. To prevent this drop, the DC-DC converter is automatically operated only during the engine start cycle. The DC-DC converter also operates the engine fuel flow indicators and engine torque indicators during either series or parallel starts.

An inverter failure detecting relay is provided for the 115 VAC output. Should the inverter voltage fall below a specified value, the inverter failure detecting relay actuates, illuminating the **INVERTER FAIL** annunciator and MASTER CAUTION light in the cockpit. Should this occur, the pilot switches to the STBY (or MAIN, if previous MAIN inverter failure has not occurred) inverter by means of the inverter select switch. Reset the MASTER CAUTION light and for a main inverter failure disengage the following circuit breakers: MAIN INVT POWER, MAIN INVT CONT, (and 115 VAC LH POWER and 26 VAC LH POWER for airplane S/N 799SA, 1501SA and Up and 748SA, 758SA, 779SA thru 798SA when modified by SR034/24-002). With these circuit breakers disengaged, the entire main inverter system is isolated from any 28 VDC. Should a failure occur while the standby inverter system is selected, disengage the following circuit breakers: STBY INVT POWER, STBY INVT CONT, (and 115 VAC RH POWER and 26 VAC RH POWER for airplane S/N 799SA, 1501SA and Up and 748SA, 758SA, 779SA thru 798SA when modified by SR034/24-002). With these circuit breakers disengaged, the entire standby inverter system is isolated from any 28 DC voltage. Should both inverters fail, refer to EMERGENCY PROCEDURES, Section 3 of the FAA Approved Airplane Flight Manual.

DC POWER DISTRIBUTION

The DC power is distributed from the LH and RH main buses to the LH and RH load buses of the cockpit circuit breaker panel. The LH and RH load buses are powered respectively by the LH and RH main buses through the overload sensors, feeder relays, feeders and diodes. The LH and RH radio buses are connected to the LH and RH load buses through the radio master switch on the circuit breaker panel. The overhead panel buses are powered by the LH and RH load buses through circuit breakers No. 1 and No. 2 LH OVHD PANEL and No. 1 and No. 2 RH OVHD PANEL.

SYSTEMS DESCRIPTION (CONT)

ELECTRICAL POWER (CONT)

AC POWER DISTRIBUTION

Airplane S/N 700SA, 731SA thru 798SA except 748SA, 758SA, 779SA thru 798SA when Modified by SR034/24-002.

Normal AC power distribution is accomplished through two power buses: a 115 VAC bus and a 26 VAC bus. During engine start these buses are automatically disconnected from the system. The fuel pressure and oil pressure indicators are supplied 26 VAC through the indicator power exchange relays during the start cycle only.

Airplane S/N 799SA, 1501SA and Up and 748SA, 758SA, 779SA thru 798SA when Modified by SR034/24-002.

Normal AC power distribution is accomplished through four power buses: two 115 VAC buses and two 26 VAC buses. During the engine start cycle, these buses are automatically disconnected from the system. The fuel pressure and the oil pressure indicators are supplied 26 VAC through the indicator power exchange relays during the start cycle only.

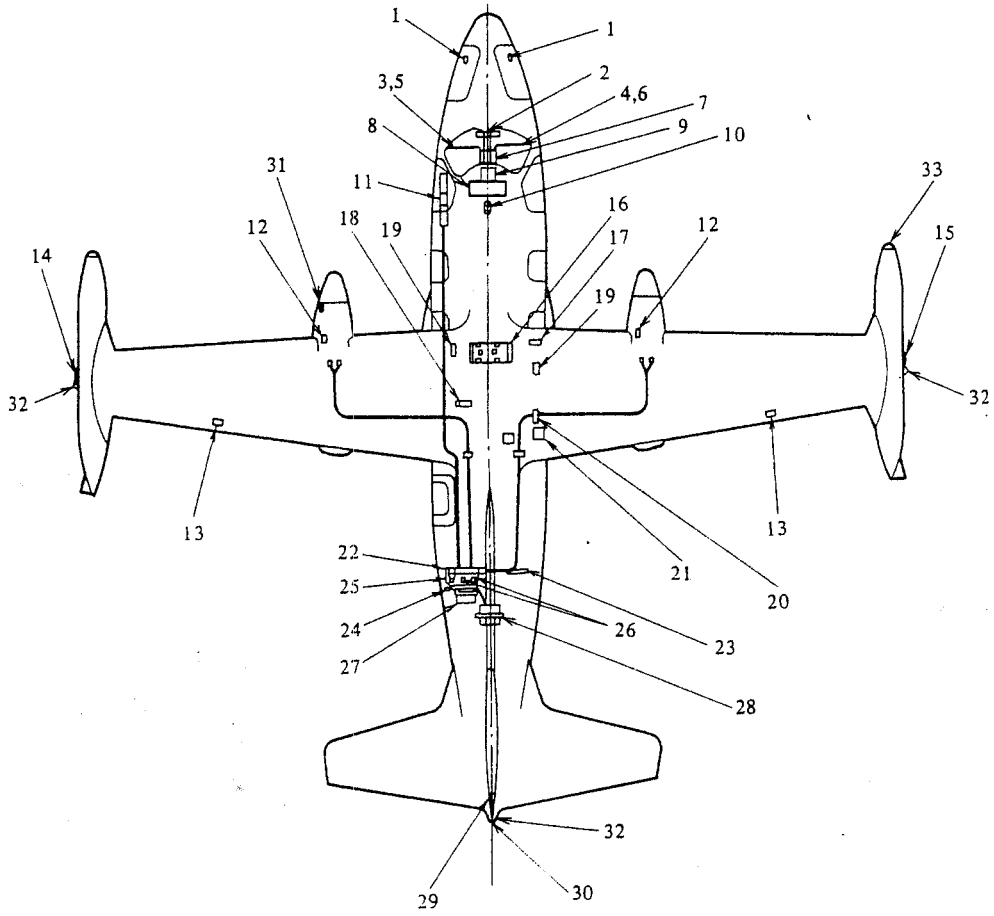
NOTE

Loss or isolation of the RH 115 VAC bus causes partial loss of input data to the autopilot and flight director.

Each bus may be isolated from the circuit by disengaging various combinations of circuit breakers. The following table lists the bus or buses to be isolated, which circuit breaker or breakers to disengage, and the inverter system in operation.

SYSTEMS DESCRIPTION (CONT)

ELECTRICAL POWER (CONT)

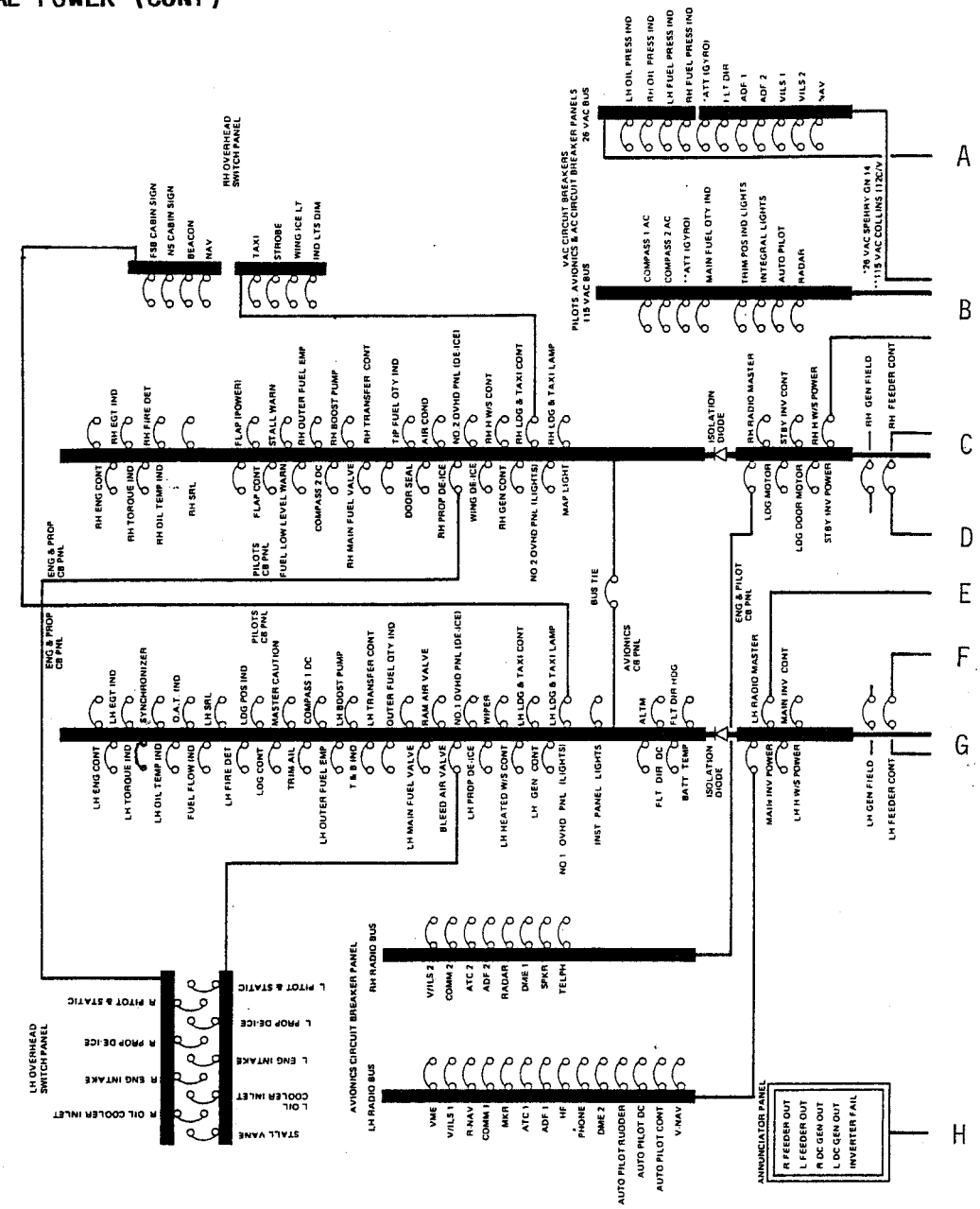


1. LANDING LIGHT
2. CONNECTION BOX
3. LH INSTRUMENT PANEL
4. RH INSTRUMENT PANEL
5. LH SWITCH PANEL
6. RH SWITCH PANEL
7. CENTER PEDESTAL SWITCH PANEL
8. OVERHEAD SWITCH PANEL
9. OVERHEAD AUXILIARY SWITCH PANEL
10. ANTI-COLLISION LIGHT (FUSELAGE LOWER SURFACE)
11. CIRCUIT BREAKER PANEL
12. STARTER GENERATOR
13. TRIM AILERON ACTUATOR
14. LH WING TIP LIGHT
15. RH WING TIP LIGHT
16. RELAY PANEL (CENTER WING FORWARD)
17. LANDING GEAR DOOR ACTUATOR (IN BULGE)
18. FLAP MOTOR (CENTER WING AFT)
19. PROPELLER DEICER TIMER
20. LANDING GEAR MOTOR (UNDER FLOOR)
21. LANDING GEAR CONTROL RELAY (IN BULGE)
22. MAIN JUNCTION BOX
23. INVERTER
24. EXTERNAL POWER RECEPTACLE
25. WING DEICER TIMER
26. AIR CONDITIONING CONTROLLER
27. NO. 1 BATTERY
28. NO. 2 BATTERY
29. ANTI-COLLISION LIGHT (VERTICAL STABILIZER)
30. TAIL LIGHT
31. ICE INSPECTION LIGHT
32. STROBE LIGHT
33. TAXI LIGHT

Main Electrical Installation (Typical)
Figure 3-10

SYSTEMS DESCRIPTION (CONT)

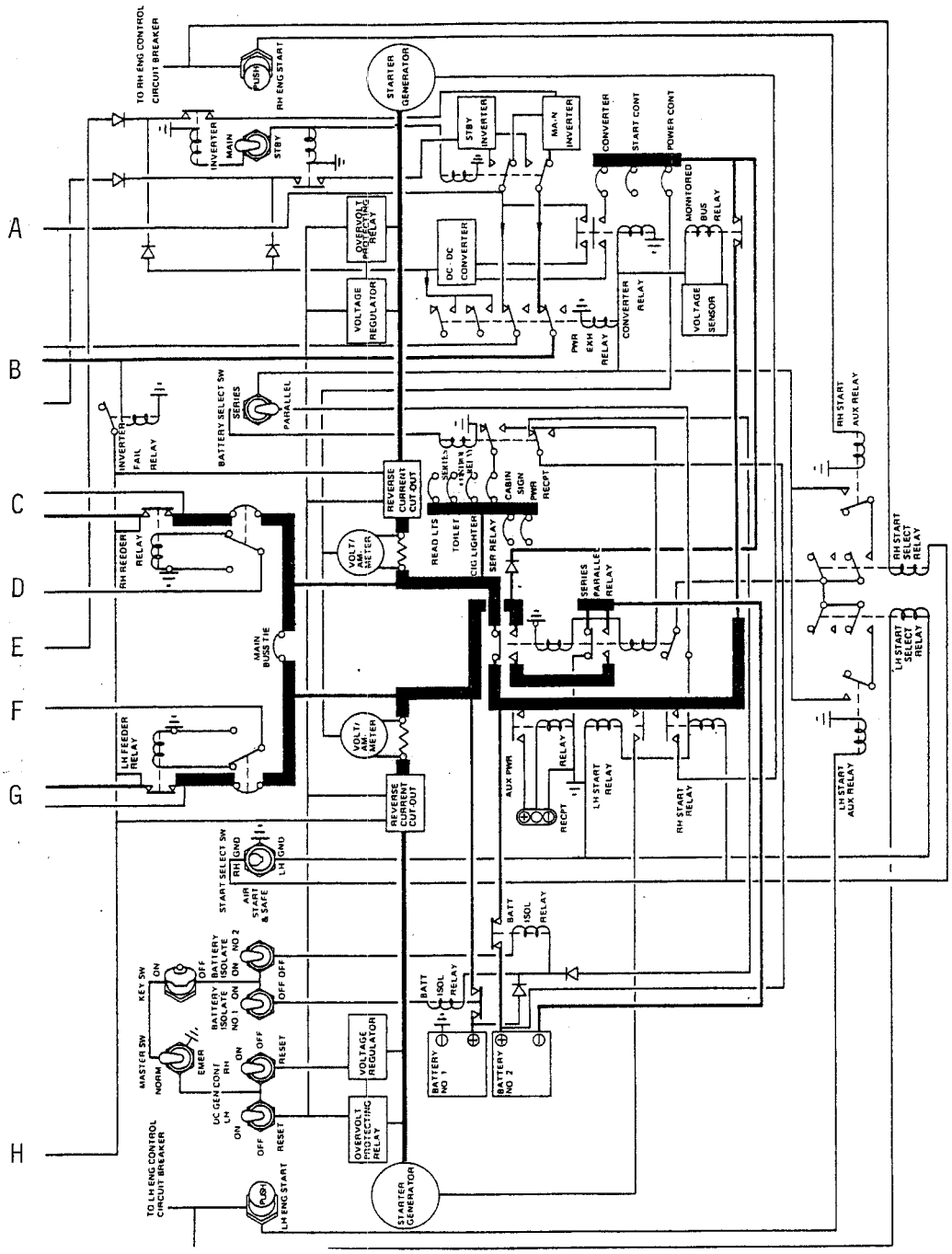
ELECTRICAL POWER (CONT)



Power Distribution
Figure 3-11 (Sheet 1 of 2)
(Typical S/N 700SA, 731SA thru 798SA Except 748SA, 758SA, 779SA thru 798SA When Modified by SR034/24-002)

SYSTEMS DESCRIPTION (CONT)

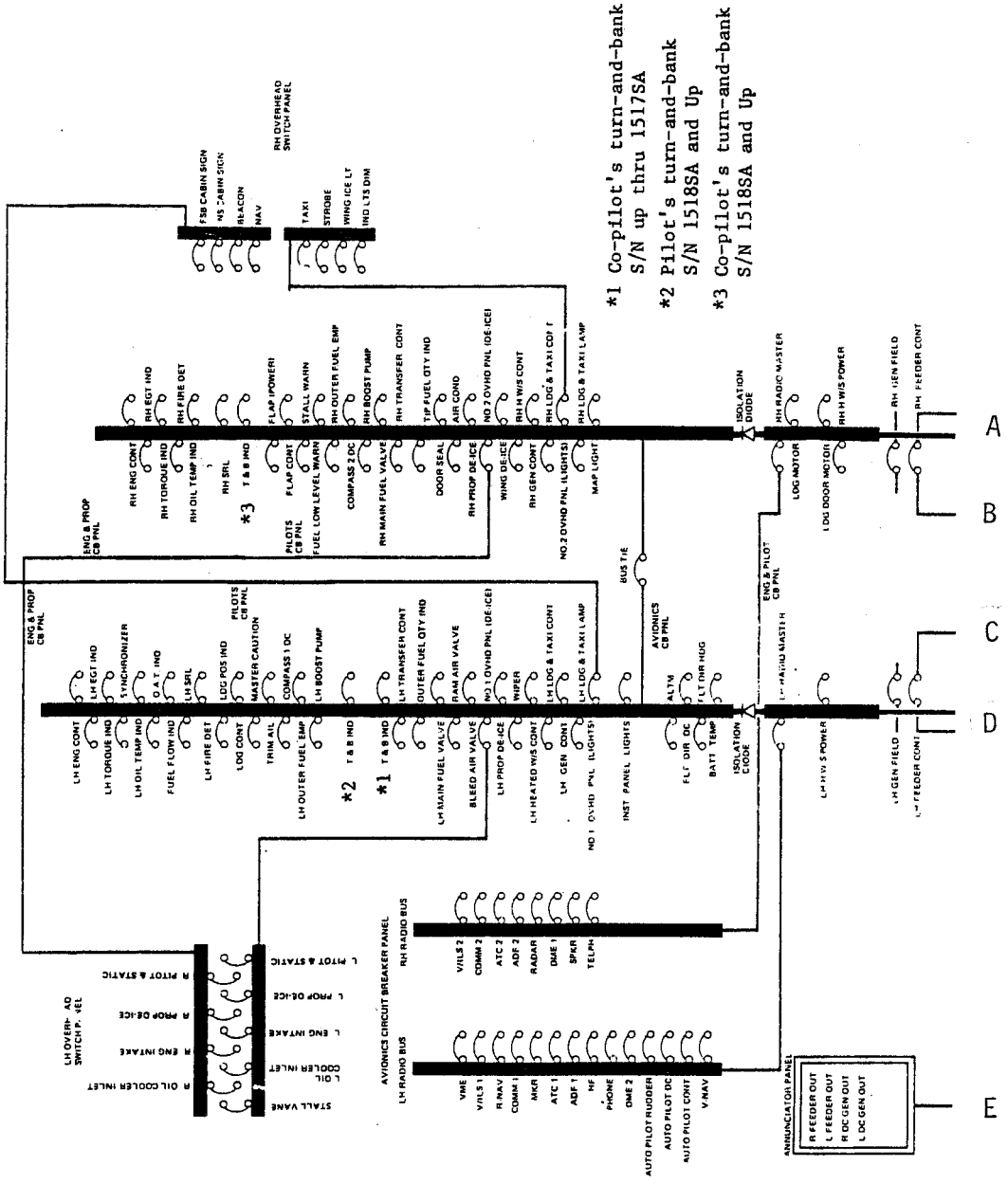
ELECTRICAL POWER (CONT)



Power Distribution
Figure 3-11 (Sheet 2 of 2)
(Typical S/N 700SA, 731SA thru 798SA Except 748SA, 758SA, 779SA thru 798SA When Modified by SR034/24-002)

SYSTEMS DESCRIPTION (CONT)

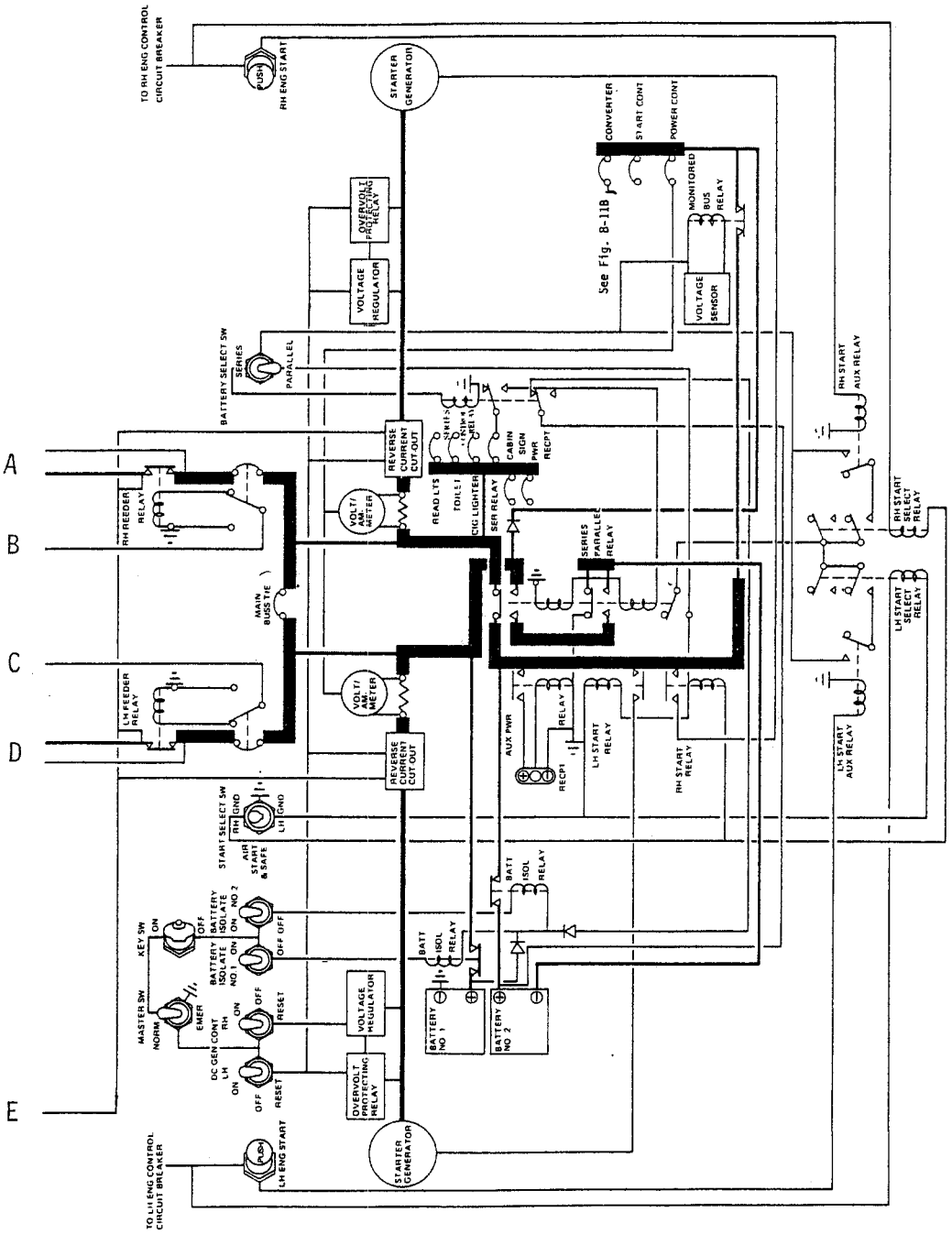
ELECTRICAL POWER (CONT)



Power Distribution
Figure 3-12 (Sheet 1 of 2)
(Typical S/N 799SA, 1501SA and up and 748SA, 758SA, 779SA thru 798SA When Modified by SR034/24-002)

SYSTEMS DESCRIPTION (CONT)

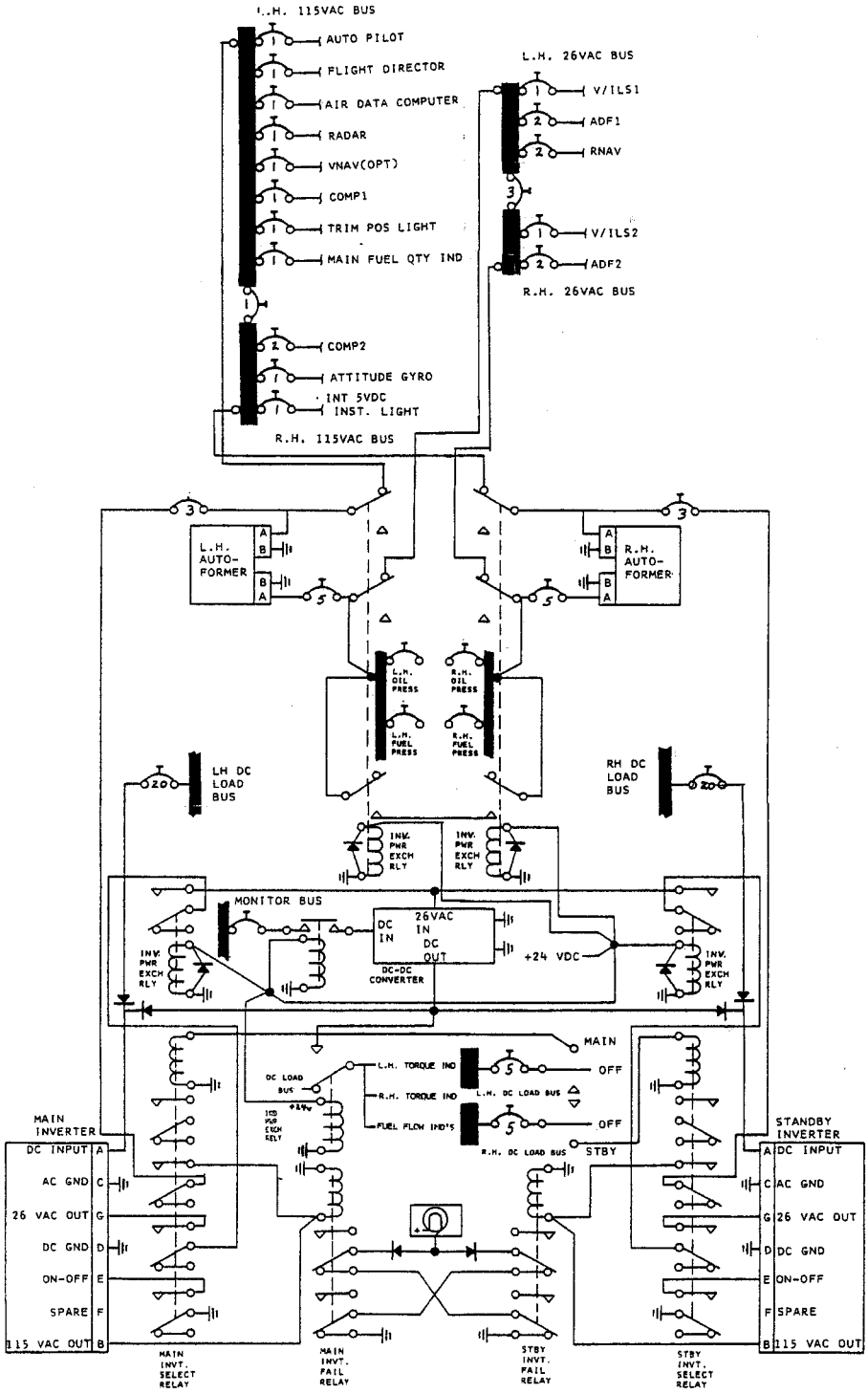
ELECTRICAL POWER (CONT)



Power Distribution
Figure 3-12 (Sheet 2 of 2)
(Typical S/N 799SA, 1501SA and up and 748SA, 758SA, 779SA thru 798SA When Modified by SR034/24-002)

SYSTEMS DESCRIPTION (CONT)

ELECTRICAL POWER (CONT)



AC Power Distribution
Figure 3-13
(Typical S/N 799SA, 1501SA and up and 748SA, 758SA, 779SA thru 798SA When Modified by SR045/24-002)

SYSTEMS DESCRIPTION (CONT)

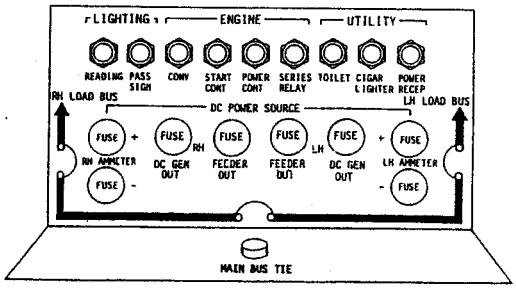
ELECTRICAL POWER (CONT)

INVERTER SYSTEM IN OPERATION	DISENGAGE BREAKERS	ISOLATED BUS
MAIN	MAIN INV POWER, MAIN INV CONT OR 115 VAC LH POWER	ALL
	115 VAC TIE AND RH 26 VAC POWER	RH 115 VAC
	LH 26 VAC POWER AND 26 VAC TIE	LH 26 VAC
	RH 26 VAC POWER AND 26 VAC TIE	RH 26 VAC
	LH 26 VAC POWER AND RH 26 VAC POWER	LH 26 VAC RH 26 VAC
	LH 26 VAC POWER AND 115 VAC TIE	LH 26 VAC RH 26 VAC RH 115 VAC
	26 VAC TIE AND 115 VAC TIE	RH 26 VAC RH 115 VAC
STBY	STBY INV POWER, MAIN INV CONT OR 115 VAC RH POWER	ALL
	LH 26 VAC POWER AND 115 VAC TIE	LH 115 VAC
	LH 26 VAC POWER AND 26 VAC TIE	LH 26 VAC
	RH 26 VAC POWER AND 26 VAC TIE	RH 26 VAC
	LH 26 VAC POWER AND RH 26 VAC POWER	LH 26 VAC RH 26 VAC
	RH 26 VAC POWER AND 115 VAC TIE	LH 26 VAC RH 26 VAC LH 115 VAC
	26 VAC TIE AND 115 VAC TIE	LH 26 VAC LH 115 VAC

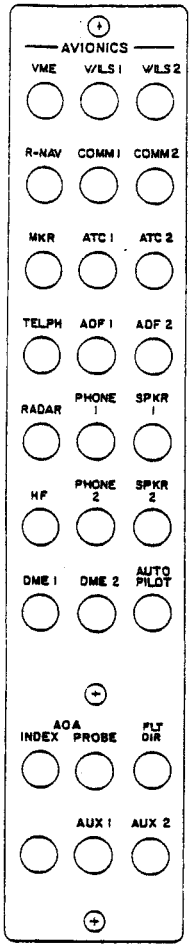
Refer to Figure 3-13 for the various systems which will lose power with various buses isolated.

SYSTEMS DESCRIPTION (CONT)

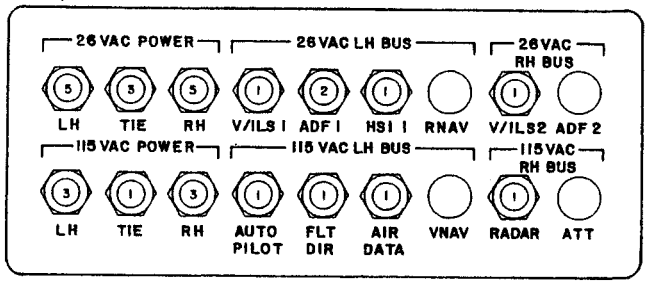
ELECTRICAL POWER (CONT)



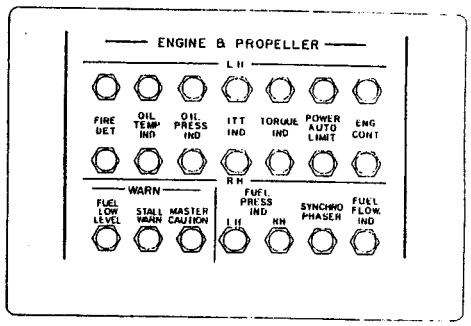
MJB CB PANEL



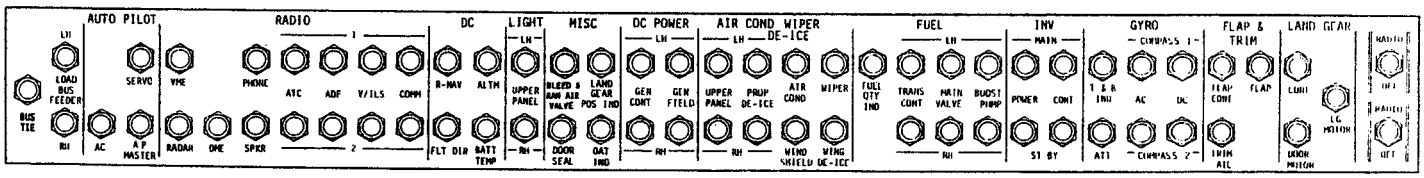
AFT CB PANEL



ARMREST LOWER CB PANEL



FORWARD CB PANEL



CENTER CB PANEL

Circuit Breaker Panel (Typical)
Figure 3-14

SYSTEMS DESCRIPTION (CONT)

LIGHTING SYSTEM (Figure 3-8)

LANDING LIGHTS

Retractable landing lights are installed on each side of the forward fuselage. These lights are controlled by the LANDING LT switches on the RH overhead switch panel. The switches have three positions: RETRACT, OFF and EXT. When a switch is placed to EXT, the landing light extends and automatically illuminates when fully extended. It requires about ten seconds for the lights to come on after the switches have been placed in EXT. When in the extended position, the lights may be turned off or on as desired by moving the switches to OFF or EXT. When a switch is placed to RETRACT from EXT, the light will automatically extinguish, retract, and stop at the fully retracted position.

TAXI LIGHTS

The taxi lights are installed in the leading end of each tip tank. They are controlled by the TAXI light switch on the RH overhead switch panel.

NAVIGATION LIGHTS

The airplane is equipped with conventional wing tip and tail navigation lights. They are controlled by the NAV light switch on the RH overhead switch panel.

ROTATING BEACON

A rotating beacon is mounted on the vertical stabilizer fin and rotates 360 degrees. It is controlled by the BEACON light switch on the RH overhead switch panel. A second rotating beacon, if installed, is located on the lower fuselage and is controlled by the same switch.

ICE INSPECTION LIGHT

An ice inspection light is installed in the LH engine cowling to illuminate the LH outer wing leading edge. This is controlled by the WING ICE LT switch in the RH overhead switch panel. The tip tank leading edge taxi light, if installed, may also be used as an indication of ice accumulation per Airplane Flight Manual procedures.

STROBE LIGHTS

The strobe lights are installed on the wing tips and tail and are controlled by the STROBE light switch on the RH overhead switch panel. They also serve as anti-collision lights.

SYSTEMS DESCRIPTION (CONT)

LIGHTING SYSTEM (CONT)

INSTRUMENT LIGHTS

Pilot flight instruments, copilot flight instruments and engine instruments are illuminated by post lights. These three light groups are respectively controlled by the rheostats PILOT FLT INST, COPILOT FLT INST and ENG INST on the LH and RH overhead switch panels. PILOT FLT INST also controls the integral light of the magnetic compass mounted on the windshield center post.

PANEL LIGHTS

LH switch panel, RH switch panel, radio panels, and overhead switch panel are indirectly illuminated by edge lights and are controlled by the rheostats SW PANEL, OVHD PANEL and RADIO on the LH and RH overhead switch panels. The circuit breaker panel lights are controlled by a circuit breaker panel light switch under the left armrest.

CABIN ROOM LIGHTS

The cabin room lights are installed in the cabin ceiling for cabin illumination. The lights are controlled by the push button cabin room light switch located aft of the entrance door and on the left side wall aft of the pilot side window. The cabin room lights and the baggage compartment light are protected by a circuit breaker located upward of the No. 1 battery in the electric compartment.

COCKPIT ROOM LIGHTS

Two cockpit room lights are controlled by the push button cockpit room light switch installed on the left side wall aft of the pilot's side window.

NOTE

The cabin and cockpit room lights are the only lights that will remain operational if the master switch is positioned to EMERGENCY. They are not activated automatically and must be manually turned ON if cabin or cockpit illumination is required.

MAP LIGHTS

A map light is installed in the bottom of each control wheel and controlled by a rheostat in the center of the control wheel.

READING LIGHTS

The airplane is equipped with reading lights beside the cold air outlets in the cabin ceiling. These lights are controlled by switches in the arm rests.

SYSTEMS DESCRIPTION (CONT)

LIGHTING SYSTEM (CONT)

BAGGAGE AND PRIVATE ROOM LIGHT

Private room lights are controlled by two switches: one just aft of the entrance door on the oxygen cylinder cabinets and the other in the cockpit.

CABIN SIGN LIGHTS

The cabin sign lights are installed in the cabin ceiling above the cockpit/passenger compartment divider and can be operated by two switches on the overhead switch panel. When the CABIN SIGN FSB light switch is ON, the FASTEN SEAT BELT sign illuminates and when the CABIN SIGN NS light switch is ON, the NO SMOKING sign illuminates.

OVERHEAD COCKPIT LIGHT

The center pedestal and lower cockpit are indirectly flood lighted by the map light installed in the overhead cockpit. In the NORMAL position its intensity is controlled by the engine instrument lighting rheostat. In the MAP position, it has its own rheostat intensity control.

COMMUNICATION SYSTEM

AUDIO CONTROL

The audio control system provides amplification and switching control for all communications and navigation audio signals. Independent systems are provided for the pilot and copilot. The system consists of two audio controls, speakers, jacks for pilot/copilot headsets and microphones, and a radio control panel. The audio control system provides the following major functions:

A. Transmitter selection.

B. Selective monitoring of transceiver and receiver audio with either speaker or headphones.

C. Passenger address.

D. Intercommuncation between pilot and copilot.

Controls and switches for system operation are located on the radio control panel. The radio control panel is shown in Figure 3-15. The microphone mode selector switch has five selector positions: TX-1, TX-2, PA, HF, and INT. With the selector switch set in the TX-1 position, the audio output from COMM 1 is coupled to the cockpit speakers and headphones. When the microphone button is depressed, COMM 1 is keyed. TX-2 position is used for COMM 2. In the PA (Passenger Address) position, the audio is connected to the cabin

SYSTEMS DESCRIPTION (CONT)

COMMUNICATION SYSTEM (CONT)

AUDIO CONTROL (CONT)

speakers for passenger announcements. HF position is used for the HF COMM system, if installed. INT position provides audio communications between the pilot and copilot by use of the headphone channel. The BOTH/TONE/VOICE filter control switch controls the tone filter for VOR and LOCALIZER, DME, and ADF reception. Set in the TONE position, the input tone from selected audio receiver signals below 800 HZ and above 1,300 HZ are attenuated. In the BOTH position, selected audios are connected directly to the speaker or headphone. The audio select switches permit the operator to monitor various signals received. To receive a signal, the switch should be positioned in either the speaker or phone position. The AUTO switch permits the operator to transfer his audio channel to either COMM transceiver without the necessity of activating the associated audio selector switch. The VOL control knobs control the volume of all selected audio sources. The inner knob controls the speaker audio output level and the outer knob controls the headphone audio output level.

VHF COMMUNICATIONS

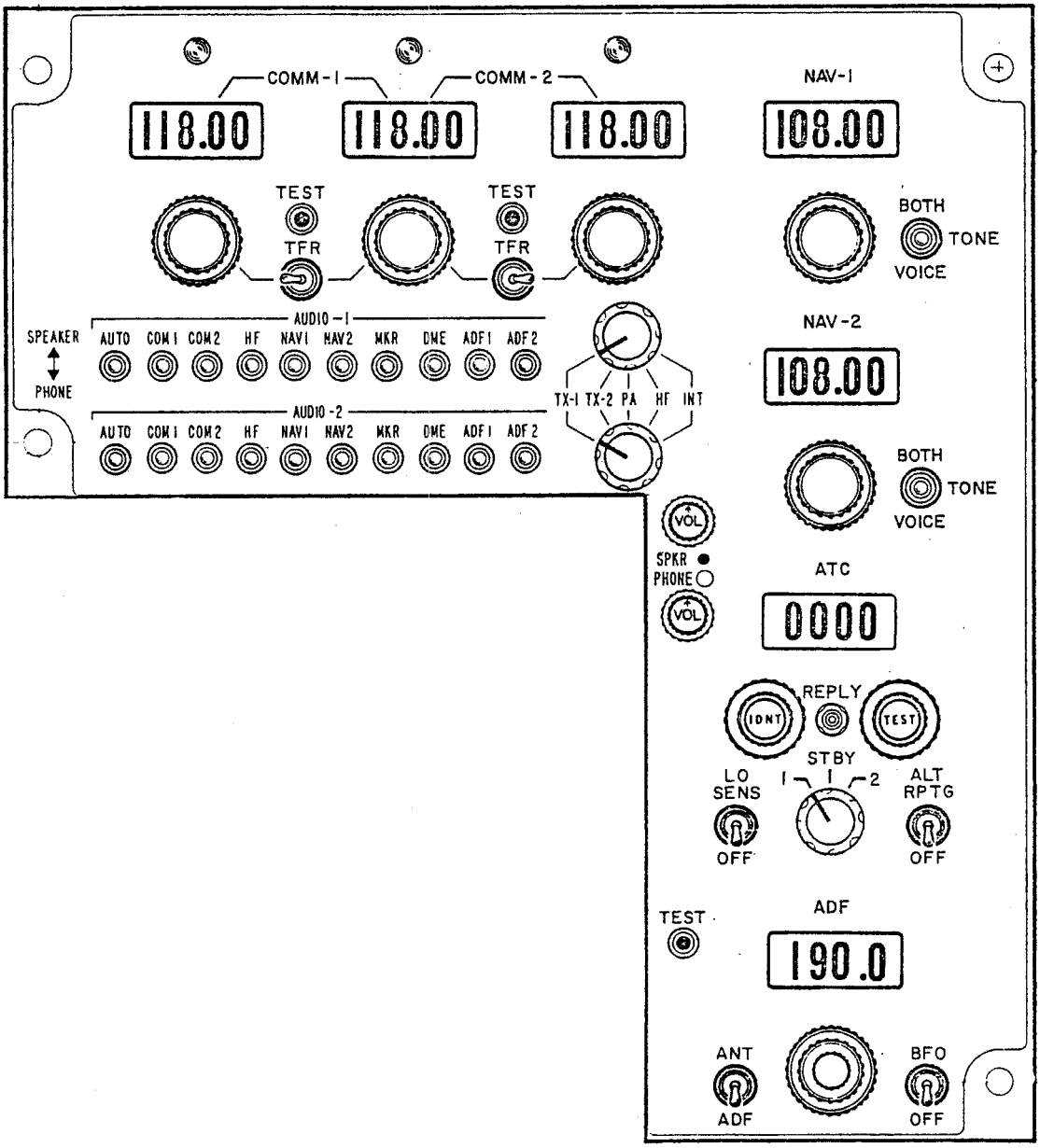
The VHF communications system provides air to air and air to ground communications. The airplane has a dual installation with two independent systems designated COMM 1 and COMM 2.

The VHF communications system uses two transceivers and two antennas. The antennas are located on top of the fuselage and on top of the vertical fin. The transceivers are remotely controlled from the radio control panel. They provide voice communications in the frequency range 118.000 through 135.975 MHZ using 720 channels, spaced 25 KHZ apart.

Three selector knobs on the radio control panel are used for frequency selection. The frequency selected is displayed in the window immediately above each knob. The left and right frequency selector knobs are for COMM 1 and COMM 2 respectively, while the center knob is common to both COMM 1 and COMM 2. The transmit frequency is determined by the position of the mode selector switch and the TFR switches located between the frequency selector knobs. As an example, with the mode selector on TX-1, either the left or center frequency may be used dependent upon the position of the TFR switch located between the two frequency selector knobs. There is a light above each frequency window which will illuminate the indicate which frequency is being transmitted upon. Two TEST buttons are located above the TFR switches. Pressing these buttons causes a momentary interruption in the audio systems incoming signals. This confirms proper operation of the squelch disabling circuitry.

SYSTEMS DESCRIPTION (CONT)

COMMUNICATION SYSTEM (CONT)



Radio Panel
Figure 3-15

SYSTEMS DESCRIPTION (CONT)

NAVIGATION SYSTEM

VHF NAVIGATION RECEIVER

The airplane has a dual navigation installation designated NAV 1 and NAV 2. Each subsystem has 200 VOR/LOC operating channels, 40 glideslope channels, and automatic DME channeling. Frequency and/or channel selection is remotely controlled from the radio control panel (Figure 3-15). The frequency control knob is used to select the desired operating frequency which is displayed in the frequency display window. A two position toggle switch for marker beacon sensitivity selection (HI or LO) is located on the pilot's and copilot's instrument panels.

The navigation receiver contains the VOR/LOC receiver, glideslope receiver, and marker beacon receiver. The VOR/LOC receiver provides a VOR bearing to the RMI and sends VOR and localizer data to the HSI and flight director. The glideslope receiver sends glideslope deviation information to the HSI and the flight director. The marker beacon receiver has audio and indicator lamp outputs for outer, middle, and inner (airway) markers. The middle marker signal is sent to the flight director computer, changing gain programming to provide a more precise approach.

NAV 1 operates the course pointer, course deviation bar, NAV warning flag and TO-FROM pointer on the pilot's HSI and sends a VOR bearing signal to both RMIs. VOR bearing is displayed by the single bar pointer on the RMI only when the VOR/ADF selector on the indicator is switched to the VOR position. Airplane deviation from the VOR course is manually selected by rotating the HSI course knob and is displayed by deflection of the HSI course deviation bar. Loss of signal is indicated by a red NAV flag on the HSI. A TO-FROM pointer is installed within the HSI to resolve course ambiguity.

NAV 2 information is displayed on the copilot's HSI and both RMIs when the RMI VOR/ADF selector is in the VOR position. The VOR bearing information is indicated by the double bar pointer on the RMI. Course selection on the copilot's HSI is accomplished by rotating the course knob for the desired setting. A red and yellow striped NAV flag on the HSI will appear when the NAV 2 information is unreliable.

ILS data is provided to the flight director and the marker beacon indicator light. In ILS mode, the RMI bearing pointer is in a horizontal position indicating no radial VOR signal. NAV 1 localizer information is displayed by the course deviation bar on the pilot's HSI and by the expanded localizer pointer on the pilot's ADI. NAV 2 localizer information is displayed on the copilot's HSI. The NAV flag on the HSI will appear upon loss of signal.

R SYSTEMS DESCRIPTION (CONT)

R

R NAVIGATION SYSTEM (CONT)

R

R VHF NAVIGATION RECEIVER (CONT)

R

R NAV 1 glideslope deviation information is displayed on the pilot's HSI and on
R the pilot's ADI glideslope pointer. If the NAV 1 information is invalid, the
R VERT flag will come into view on the pilot's HSI. NAV 2 glideslope deviation
R information is displayed by the glideslope deviation pointer on the copilot's
R HSI. The GS flag in the copilot's HSI will appear when the NAV 2 information
R is unreliable.

R

R DISTANCE MEASURING EQUIPMENT (DME)

R

R The distance measuring equipment system provides the slant range distance from
R the airplane to a preselected ground station. The airplane has a single DME
R and an optional No. 2 DME subsystem, either of which are capable of interro-
R gating all 252 channels. The single airborne DME subsystem consists of one
R receiver transmitter, one indicator, one antenna, and the radio control
R panel. The DME presents a continuously updated display of distance to
R station, time to station, or computed ground speed. Distance is also display-
R ed on the pilot's HSI. Range of the DME is 250 nautical miles. Transmitter
R frequency band is 1025 to 1150 MHz and receiver frequency band is 962 to
R 1213 MHz. The frequency control knobs of NAV 1 on the radio control panel
R are used for frequency selection.

R

R The TEST button on the DME indicator provides for system self-test. Pressing
R and holding the TEST button causes the window to display 0.0 or 0.1 in NM.
R After releasing the TEST button, displays will read all 8's for duration
R memory (8 to 12 seconds).

R

R Push buttons on the DME indicator front panel are used to select knots, min-
R utes, or nautical miles. Selecting the NM button gives distance in nautical
R miles in the window. The MIN button gives time to station in minutes and the
R KTS button gives computed airplane ground speed in knots. The ground speed
R and time to station indications are accurate only if the airplane is flying
R directly toward (or away from) the ground station and the distance is suffi-
R cient for the slant range and ground range to be nearly equal. The system
R must also have been on for at least 6 minutes to allow for stabilization. The
R DIM control on the indicator varies the display intensity. The NAV select
R switch is used to select the ground station (VORTAC or DME) to which either
R NAV 1 or NAV 2 is tuned. The NAV select switch also has an H selection that
R will hold the last operating frequency regardless of where the NAV system is

R SYSTEMS DESCRIPTION (CONT)

R NAVIGATION SYSTEM (CONT)

R DISTANCE MEASURING EQUIPMENT (CONT)

R tuned. The hold indicator light on the radio control panel illuminates when R the NAV select switch is in the H position.

R NOTE

R The indicator displays dashes in the window during warm up R (approximately 60 seconds) and search time (1 second). When R KTS is selected, the window displays dashes anytime the com- R puted airplane groundspeed is less than approximately 50 R knots. The MIN and KTS indications require approximately 6 R minutes after station acquisition for final accuracy.

R AUTOMATIC DIRECTION FINDING (ADF)

R The automatic direction finder system provides relative bearing to a selected R ground station. The airplane has a single ADF system with a frequency range R of 190 to 1749.5 KHz. The system consists of an ADF receiver, control unit, R and antenna.

R The RMI is required to complete system operation. Bearing information is dis- R played on both the pilot's and copilot's RMIs when the ADF mode is selected on R the RMI and also displayed on the bearing pointer in the pilot's HSI if the R ADF mode is selected. The ADF receiver can also be used to receive weather or R other programs from standard AM broadcast stations without the ADF function R operating.

R All system operations are controlled from the radio control panel. Two toggle R switches are used to select the desired mode of operation. When the ANT/ADF R function switch is placed in the ANT position, the system operates as an aural R receiver. The tone or broadcast program may be heard by setting the ADF audio R monitoring switch to speaker or phone position at the radio control panel.

R In the ANT mode, the RMI pointer will park horizontally. In the ADF position, R the RMI pointer will indicate relative bearing to the tuned station, and an R audio signal may be heard. The system also provides ADF bearing information R on the pointer in the pilot's HSI when the ADF repeated needle option is R installed.

R NOTE

R When the system is not receiving a reliable signal, the RMI R pointer may momentarily park in the ADF mode during station R passage.

SYSTEMS DESCRIPTION (CONT)

NAVIGATION SYSTEM (CONT)

AUTOMATIC DIRECTION FINDING (CONT)

The Beat Frequency Oscillator (BFO) mode may be engaged in either the ADF or ANT function and allows reception of CW (Morse code) signals. The ADF receiver provides a 1,000 HZ aural signal for identification of CW stations. Three concentric frequency selector knobs are used for selecting a desired operating frequency. The selected frequency is displayed in the frequency display window located above the frequency selector. The VOL control adjusts the audio output level from the ADF receiver. The TEST button provides for a self-test of the system. With ADF control unit in ADF function, activating the TEST button causes the pointer of the RMI to rotate 90 degrees from its previous position and a 1,000 HZ aural tone to be heard in the audio output. Releasing the TEST button allows the pointer to return to its original position.

ATC TRANSPONDER

The air traffic control (ATC) transponder system is an airborne component and is an integral part of the Air Traffic Control Radar Beacon System (ATCRBS). The ATC transponder system provides identification of the transponder equipped airplane on the ATC ground controller's radar and provides verification of radar contact. The airplane has a dual installation with two independent systems designated XPDR 1 and XPDR 2. The system consists of two receiver transmitters, one control unit with system select switch, and two antennas. A remote identification push button switch, (ATC IDENT), mounted on the pilot's wheel, is also included in this system. The transponder receives interrogating pulses on a frequency of 1,030 MHZ and transmits on a frequency of 1,090 MHZ. It has a 4,096 identification code capability in each mode of operation. All of the controls for operating the transponder are located on the radio control panel. The radio control panel provides a means for selecting the identification reply code, low sensitivity, standby or self-test modes of operation, transmission of the special identification pulse, and removal of the altitude information from mode C replies.

A reply lamp is provided to indicate transponder activity and evaluate results of a self-test push button. The function switch marked 1, STBY, 2 selects the system to be used or places the transmitters in standby. A LO SENS switch is available should this mode be required.

NOTE

There is a 60 second delay from the time the primary power is first applied until the system is fully operational.

SYSTEMS DESCRIPTION (CONT)

NAVIGATION SYSTEM (CONT)

ATC TRANSPONDER (CONT)

If the system selector switch is placed in 1, transponder 2 remains in standby while 1 is operating. When switching from 1 (SYS 1) to 2 (SYS 2), there is no additional 60 second delay until 2 is in operation. The code selector knobs are used for selecting the reply code which is displayed in the code window. The LH knob selects the first and second digits of the reply code, and the RH knob selects the third and fourth digits. The ALT RPTG/OFF switch in the ALT RPTG position will transmit coded altitude information on mode C. In the OFF position the transponder will respond with a normal mode A reply. When the IDNT button is depressed, an additional pulse is added to the normal reply pulses.

The identification pulse is transmitted for approximately 20 seconds longer than the time during which the IDNT button is depressed. The IDNT button is normally used only when requested by the ATC ground controller. The REPLY lamp operates each time the transponder replies to an interrogation. The lamp is illuminated for 1 second. When the button is pushed in the TEST position, a simulated interrogation is generated in the transponder on mode A. Mode C is tested when the ALT RPTG/OFF switch is in the ALT RPTG position. If the system is operating normally, the REPLY lamp illuminates.

DIRECTIONAL GYRO COMPASS SYSTEM

The directional gyro compass system provides primary heading data to the RMI, automatic flight control, and flight director system. The airplane has a dual installation with two independent systems designated as COMP 1 and COMP 2. The systems consist of two DG-14 directional gyro compasses, two flux valves, and a dual remote compensator. COMP 1 provides compass heading to the pilot's HSI and the copilot's RMI. COMP 2 provides compass heading to the copilot's HSI and pilot's RMI. These instruments are not only convenient for monitoring the difference between COMP 1 and COMP 2 headings but they also provide one heading display to each pilot after any failure of either COMP 1 or COMP 2. The two compasses and a dual remote compensator are installed in the nose electronic compartment and two flux valves are installed in both the left and right wing tip. The switches located on both the pilot's and copilot's instrument panels are utilized for system operation. Two gyro slave control switches, one marked SLAVE/DG, the other INC/DEC, allow selection of automatic (slaved mode) or manual (free gyro mode) operation of the COMP 1/2. When the gyro slave control switch is moved to SLAVE (slaved mode) position, the automatic fast synchronization cycle is initiated which moves the gyro at a rate of 50 degrees per minute.

SYSTEMS DESCRIPTION (CONT)

NAVIGATION SYSTEM (CONT)

DIRECTIONAL GYRO COMPASS SYSTEM (CONT)

When the gyro is aligned with the earth's magnetic field (actual magnetic heading), the system returns to the normal slaving rate of 2.5 to 5.0 degrees per minute. In the slaved mode, the system is fully operational within 3 minutes. The compass flag on the HSI automatically retracts when the slaving cycle is completed and the heading card is aligned with the magnetic heading. The RMI function is the same as the HSI. The slaving conditions can be monitored by the compass annunciator on the HSI. The compass annunciator slowly oscillates between (+) and dot (.) when the system is correctly slaved. The system may be operated in the free gyro mode by placing the gryo slave control switch in the DG position. In this position, the HSI heading card can be rotated clockwise or counterclockwise by toggling the manual slave switch to the INC or DEC marked position. Manual operation gives accurate short term heading reference when heading information is unreliable.

WARNING SYSTEMS

STALL WARNING SYSTEM

A control wheel shaker is provided as a stall warning indicator. As the airplane approaches a stall, a lift transducer mounted in the leading edge of the right wing responds to changes in airflow over the wing. The electrical signal from the lift transducer is compensated for flap deflection angle and actuates the shaker 4 to 9 kts before the stall. Control wheel vibration from the stall warning shaker may be checked by placing the stall warning test switch, installed on the center instrument panel, to GND position on the ground or to AIR position in flight. The lift transducer incorporates a heater element for ice protection. During flight conditions when ice accumulates on the wing leading edge, the stall warning system may not always actuate the stick shaker prior to stall. Flight tests have demonstrated however, that natural aerodynamic buffet precedes the stall.

LANDING GEAR WARNING SYSTEM

The landing gear warning system consists of a warning horn and unsafe light installed on the left switch panel. The warning horn provides an aural warning for the following gear unsafe conditions:

1. When the power lever is moved close to the FLIGHT IDLE position with the gear not extended.

2. When the control switch is placed to the UP position on the ground.

NOTE

The warning horn may be silenced by pushing the horn cutout switch when the flaps are in the UP or 5° positions.
See MHI Service Bulletin 085/32-014 (A10SW airplanes) for maintenance procedures to improve this warning system.

SYSTEMS DESCRIPTION (CONT)

WARNING SYSTEMS (CONT)

LANDING GEAR WARNING SYSTEM (CONT)

The RED unsafe light may be activated when any of the gear is not fully retracted or extended, or if the main gear forward doors are not fully closed. The lamp is a press to test type and may be dimmed by the indicator light dimmer switch on the overhead switch panel.

The light will normally illuminate during extension and retraction cycles for approximately 17 seconds, extinguishing when gear and doors are fully closed during retraction or when the gear is down-locked and main gear forward doors are closed during extension.

NOTE

Red light illumination may not indicate gear failure; see following conditions.

GEAR EXTENSION CYCLE

ALL downlock lights (green) illuminated
Unsafe Light (red) illuminated

Gear should be down and locked, but main gear forward doors are not closed.

NOT all downlock lights (green) illuminated
Unsafe light (red) illuminated

Gear that does not have a green indication is not down and locked.

GEAR RETRACTION CYCLE OR IN FLIGHT

Unsafe Light (red) illuminates
Indicates that any one of the gear is not fully retracted and/or the main gear aft or forward doors are not fully closed.

NOTE

Conditions causing the unsafe light to illuminate may be corrected by recycling the gear.

CAUTION

AIRSPEED LIMITATIONS MUST BE OBSERVED IF RECYCLING IS ATTEMPTED AS CORRECTIVE ACTION. SEE EMERGENCY PROCEDURES, SECTION 3 OF THE FAA APPROVED AIRPLANE FLIGHT MANUAL.

SYSTEMS DESCRIPTION (CONT)

WARNING SYSTEMS (CONT)

ENGINE FIRE WARNING SYSTEM

The fire warning **LH** or **RH ENGINE** annunciator will illuminate when a fire condition is detected within either engine cowling (these lights are contained in the left and right fire extinguisher handles located in the shroud). Both systems may be tested by depressing the fire detector test switch beside the fire extinguisher handle. When this annunciator illuminates, take proper action according to EMERGENCY PROCEDURES, Section 3 of the FAA Approved Airplane Flight Manual. If the fire extinguisher handle is pulled, the affected engine fuel shutoff valve is closed electrically and fire extinguisher (if installed) is discharged.

BATTERY TEMPERATURE WARNING SYSTEM

This system is composed of a temperature probe (or sensor) installed in each battery, a dual readout temperature indicator, test switch and battery isolation switches, all located on the left lower instrument panel. This system monitors the temperature of each battery. When battery temperature rises to 120°F, the **BAT TEMP 120°** annunciator illuminates. The battery's temperature must be monitored. If the temperature continues to rise, the battery should be isolated by the battery isolation switch when the temperature reaches 140°F. When the battery temperature rises to 150°F, the **BATTERY OVER TEMP** annunciator illuminates. (See EMERGENCY PROCEDURES, Section 3 of the FAA Approved Airplane Flight Manual).

CAUTION

IF THE BATTERY TEMPERATURE RISES TO 150°F, THE BATTERY MUST BE REMOVED FOR BENCH TEST AND INSPECTION PRIOR TO THE NEXT FLIGHT.

MASTER CAUTION SYSTEM

The master caution system consists of a master caution light and a light test switch, both located in the center of the shroud. The master caution light works in conjunction with the lights in the annunciator panel beside the pilot seat. The master caution light illuminates when any one of the annunciators illuminate due to a fault in its corresponding system. The master caution light may be reset by depressing it, but the annunciator will remain illuminated until the defective system is restored or corrected to its normal condition.

CAUTION

AFTER CONFIRMING A FAILED SYSTEM, THE MASTER CAUTION LIGHT SHOULD BE RESET, ARMING IT FOR ANOTHER SYSTEM FAILURE DETECTION.

SYSTEMS DESCRIPTION (CONT)

WARNING SYSTEMS (CONT)

MASTER CAUTION SYSTEM (CONT)

A defective lamp in either the master caution or the annunciator panel lights may be detected by depressing the master caution system test switch. The caution light may be dimmed by the indicator light dimmer switch on the overhead switch panel.

The master caution system should be checked before starting engines as follows:

1. Check and set all circuit breakers except radio master.

2. Check master caution light is illuminated.

3. Check annunciator panel.

System	Light	System	Light
Fuel Low Level	OFF	Door Open	OFF
L H/W Over Temp	OFF	R H/W Over Temp	OFF
L Boost Pump Fail	OFF	R Boost Pump Fail	OFF
L Fuel Filter Bypass	OFF	R Fuel Filter Bypass	OFF
Cabin Press Low	OFF	Air Cond Sys Fail	OFF
L DC Gen Out	ON	R DC Gen Out	ON
L Feeder Out	OFF	R Feeder Out	OFF
Bat Temp 120°	OFF	Battery Over Temp	OFF
L SRL Fail	OFF	R SRL Fail	OFF
Inverter Fail	ON	Spare	OFF
P T/B Power Fail	OFF	CP T/B Power Fail	OFF
Inst Vac Fail	ON	Defog Over Temp	OFF

4. Push the system test switch (located to the right of the master caution light) and check all annunciator lights for illumination.

5. Push the master caution light and ensure it extinguishes.

MASTER CAUTION ANNUNCIATORS

FUEL LOW LEVEL

The **FUEL LOW LEVEL** annunciator illuminates when the fuel quantity indicator reading is below 215 +15, -10 pounds or fuel quantity of the main tank is below 30 ±5 gallons. Test according to NORMAL PROCEDURES, Section 5 of the FAA Approved Airplane Flight Manual.

SYSTEMS DESCRIPTION (CONT)

MASTER CAUTION ANNUNCIATORS (CONT)

DOOR OPEN

The **DOOR OPEN** annunciator illuminates when the entrance door is not locked.

WINDSHIELD OVERTEMP

The L **H/W** or **R H/W OVER TEMP** annunciator illuminates when the left or right heated windshield temperature reaches or exceeds 129°F. When an annunciator illuminates, the heated windshield system should be turned OFF on the defective side.

BOOST PUMP FAILURE

The L or **R BOOST PUMP FAIL** annunciator illuminates to warn that the fuel discharge pressure of the respective boost pump has decreased below 3.2 psi.

If either annunciator illuminates during flight, the fuel boost pump circuit breaker for the faulty pump should be pulled. No further action is required if the engine is running satisfactorily. Correct malfunction prior to the next flight.

FUEL FILTER BYPASS

The L or **R FUEL FILTER BYPASS** annunciator illuminates to indicate the pressure differential between the inlet and outlet ports of the respective fuel filter has increased above 1.9 psi. If an annunciator illuminates in flight, no action is required, but the filter should be serviced prior to the next flight.

CABIN PRESSURE LOW

The **CABIN PRESS LOW** annunciator illuminates when the cabin pressure altitude reaches 11,000 ±500 feet. If this annunciator illuminates, descend according to EMERGENCY PROCEDURES, Section 3 of the FAA Approved Airplane Flight Manual.

AIR CONDITIONING SYSTEM FAILURE

The **AIR COND SYS FAIL** annunciator illuminates when the precooler inlet air pressure and/or compressor outlet temperature in the air cycle machine exceeds the preset limits (37 psi and 430°F). If this annunciator illuminates, use the air conditioning system in accordance with EMERGENCY PROCEDURES, Section 3 of the FAA Approved Airplane Flight Manual.

DC GENERATOR OUT

The L or **R DC GEN OUT** annunciator illuminates when the corresponding generator is disconnected from the D.C. power system because of generator reverse

SYSTEMS DESCRIPTION (CONT)

MASTER CAUTION ANNUNCIATORS

DC GENERATOR OUT (CONT)

current or over voltage. If this annunciator illuminates, the generator may be restored to normal operation by momentarily placing its control switch to the RESET position, then to ON. If the annunciator does not extinguish, the generator's load should not exceed 200 amperes up to 28,000 feet or 175 amperes between 28,000 and 31,000 feet (see Section 2, OPERATING LIMITATIONS of the FAA Approved Airplane Flight Manual).

FEEDER OUT

The **L** or **R FEEDER OUT** annunciator illuminates when the respective feeder protective circuit breakers trip due to feeder fault.

If the L **FEEDER OUT** annunciator illuminates, the main inverter, LH heated windshield and equipment connected to the LH RADIO bus become inoperative. If the **R FEEDER OUT** annunciator illuminates, the standby inverter, landing gear door and motor, RH heated windshield and equipment connected to the RH RADIO bus become inoperative. If one of the feeder circuits is inoperative, the bus tie breaker may open and it will be necessary to reduce the electrical load in order to maintain power for essential equipment. (Refer to ABNORMAL PROCEDURES, Section 4 of the FAA Approved Airplane Flight Manual.)

BATTERY TEMP 120°

The **BAT TEMP 120°** annunciator illuminates when the battery temperature rises to 120°F. If the annunciator illuminates, the battery temperature must be monitored.

BATTERY OVERTEMP

The **BATTERY OVER TEMP** annunciator illuminates when the battery temperature rises to 150°F. If the annunciator illuminates, the battery should be isolated by the battery isolate switch. (See EMERGENCY PROCEDURES, Section 3 of the FAA Approved Airplane Flight Manual.)

SRL FAILURE

The **L** or **R SRL FAIL** annunciator illuminates when the respective single red line EGT does not indicate because of failure of the single red line system. Operate the affected engine in accordance with ABNORMAL PROCEDURES, Section 4 of the FAA Approved Airplane Flight Manual.

SYSTEMS DESCRIPTION (CONT)

MASTER CAUTION ANNUNCIATORS (CONT)

INVERTER FAIL

The **INVERTER FAIL** annunciator illuminates when the AC voltage decreases below 70 volts. If this annunciator illuminates, the inverter switch must be placed to OFF, or STANDBY when standby inverter is installed. The fuel quantity, oil pressure indicator, and trim position indicator lighting system will be inoperative. Avionics equipment will also be affected. Refer to Power System Schematics for affected equipment. (See EMERGENCY PROCEDURES, Section 3 of the FAA Approved Airplane Flight Manual)

TURN AND BANK POWER FAIL

The **P T/B PWR FAIL** annunciator illuminates when electric power is not supplied to the pilot's turn and bank indicator (S/N 1518SA and Subsequent). The **CP T/B PWR FAIL** annunciator illuminates when electric power to the copilot turn and bank indicator is not supplied. If annunciator illuminates, disengage the autopilot.

The **P T/B PWR FAIL** is not used on S/N 700SA, S/N 731SA through S/N 799SA, and S/N 1501SA through S/N 1517SA because the pilot's T/B is a vacuum instrument.

INSTRUMENT VACUUM FAIL

The **INST VAC FAIL** annunciator will illuminate when the suction pressure in the vacuum source decreases below 4 in-Hg.

DEFOG OVERTEMP

The **DEFOG OVER TEMP** annunciator illuminates when the defog air temperature increases above 200° F. If this annunciator illuminates, use the air conditioning system in accordance with EMERGENCY PROCEDURES, Section 3 of the FAA Approved Airplane Flight Manual.

SYSTEM ANNUNCIATORS

These annunciators are located on the lower center instrument panel and are checked with the panel indicator test switch. They may be dimmed using the IND LT DIM switch on the RH overhead switch panel.

BETA RANGE

The **LH** or **RH BETA RANGE** annunciator illuminates when an engine is being operated in the beta control mode or when the NTS system is checked during engine starts. (See Section 3, EMERGENCY PROCEDURES, and Section 5, NORMAL PROCEDURES of the FAA Approved Airplane Flight Manual)

CONTINUOUS IGNITION

The **LH** or **RH CONT IGNITION** annunciator illuminates when the selected continuous ignition switch on the center console is placed ON.

SYSTEMS DESCRIPTION (CONT)

SYSTEM ANNUNCIATORS (CONT)

OUTER FUEL EMPTY

The **LH** or **RH OUTER FUEL EMP** annunciator illuminates when an outer tank is empty or the transfer pump for that outer tank has failed.

INDICATOR LIGHTS

The MU-2 is equipped with the following indicator lights. These lights, except for engine start and windshield Hi Heat, may be dimmed by the IND LT DIM switch on the RH overhead switch panel.

LANDING GEAR POSITION INDICATOR LIGHTS (NOSE, RIGHT, LEFT, Green)

Lights illuminate to indicate landing gear is extended and locked.

FLAP POSITION INDICATOR LIGHT (UP, Green)

Light illuminates to indicate flaps are completely retracted.

FLAP POSITION INDICATOR LIGHT (5° , Amber)

Light illuminates to indicate flaps are at 5° position.

FLAP POSITION INDICATOR LIGHT (20° , Amber)

Light illuminates to indicate flaps are at 20° position.

FLAP POSITION INDICATOR LIGHT (40° , Amber)

Light illuminates to indicate flaps are at 40° position.

ENGINE AIR INTAKE ANTI-ICING INDICATOR LIGHTS (ENG INTAKE, Green)

These lights are located on the LH overhead switch panel and are checked by the IND LTS TEST button. They illuminate when the ENG INTAKE switches are placed to ON. System operation must be verified by noting a decrease in engine torque and increase in EGT on the respective engine when the system is selected ON.

OIL COOLER INLET ANTI-ICE INDICATOR LIGHTS (OIL COOLER INLET, Green)

These lights are located on the LH overhead switch panel and are checked by the IND LTS TEST button. They illuminate when the OIL COOLER INLET switches

SYSTEMS DESCRIPTION (CONT)

INDICATOR LIGHTS (CONT)

OIL COOLER INLET ANTI-ICE INDICATOR LIGHTS (OIL COOLER INLET, Green) (CONT)

are placed to ON. System operation must be verified by increasing load on the respective voltammeter.

SURFACE DEICING INDICATOR LIGHT (WING DE-ICE, Green)

The light is located on the LH overhead switch panel and is checked by the IND LTS TEST button. It illuminates when the deice boots inflate after the WING DE-ICE switch is placed to ON. System operation must be verified by observing inflation of the boots while the light is illuminated for about six seconds in each three minute cycle.

ELECTRICAL HEATED WINDSHIELD ANTI-ICING INDICATOR LIGHT (WINDSHIELD HEAT LOW, Green)

These lights are located on the LH overhead switch panel and are checked by the IND LTS TEST button. They illuminate when the WINDSHIELD HEAT LOW switches are placed to ON. System operation must be verified by increasing load on the respective voltammeter. The lights will cycle as the windshield heat reaches 38.5°C (101.3°F) and will not illuminate if the windshields are hot from setting in direct sunlight prior to flight.

ELECTRICAL HEATED WINDSHIELD ANTI-ICING INDICATOR LIGHT (H/W HI HEAT MODE, Green)

The light illuminates when the electrical heated windshield system is in high heat operation. On early model airplanes, the light is a press-to-test type which may be dimmed by rotating the light shroud as indicated by directional arrow. On late model airplanes, the annunciator H/W HI HEAT MODE is on both the left and right instrument panels and is dimmed with the ANN BRT/DIM switch on the left instrument panel.

ENGINE START INDICATOR LIGHT (ENG START, Amber)

Illuminates when ENG START switch is pressed and extinguishes when engine speed reaches 60% rpm, indicating that the starter and ignition have been electrically disconnected.

WINDSHIELD WIPER SYSTEM

The electrically operated wipers are equipped to keep the forward windshield surface clean. It is recommended to clean the glass surface by applying dust repellent with a soft cloth prior to flight. The WIPER switch is in the overhead switch panel. When placed ON, the wipers begin to run and when

SYSTEMS DESCRIPTION (CONT)

WINDSHIELD WIPER SYSTEM (CONT)

placed to PARK, the wipers run to extreme position then return to the parked position.

CAUTION

DO NOT OPERATE THE WIPERS ON DRY WINDSHIELDS OR AT AN AIRSPEED ABOVE 175 KCAS.

AIR CONDITIONING AND PRESSURIZATION SYSTEM

The airplane is equipped with a complete air conditioning and pressurization system. The system consists essentially of a refrigeration unit with heat exchanger and cooling turbine, a water separator, a temperature control system, and a pressure control system. The first three are located in the air conditioning equipment compartment and the latter is installed on the forward and aft ends of the cabin.

SYSTEM OPERATION (Figure 3-16)

High temperature and high pressure air from the engine compressor is regulated by the pressure regulator and precooled by the precooler and primary heat exchanger; then, compressed into high temperature and high pressure air by the compressor. The air is again cooled by the secondary heat exchanger and further cooled by the cooling turbine. Air from the cooling turbine is passed through the water separator, then flows into the mixing chamber. In the mixing chamber, hot air bypassed from the engine bleed air line is mixed with cold air from the refrigeration unit.

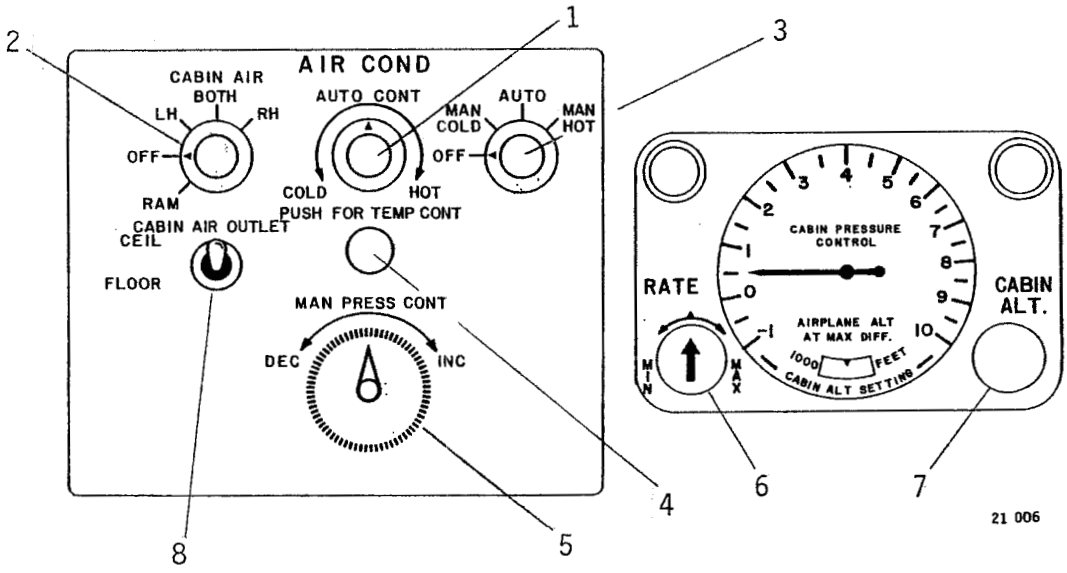
The air temperature is controlled by adjusting the ratio of hot and cold air in the mixing chamber. Conditioned air from the mixing chamber is supplied to the cabin through the main conditioned air outlet which is located at the rear of the cabin and the forward conditioned air outlets which are located in the right and left side panels beside the seats. Some of the cold air is bypassed from the water separator discharge and may be supplied through the cabin cold air outlets for the purpose of cooling. Air flow supplied through the conditioned air outlets and the cold air outlets can be adjusted manually. The cabin pressure is controlled by the adjustment of air outflow to the atmosphere at the outflow safety valves of the cabin pressure control unit.

SYSTEMS DESCRIPTION (CONT)

AIR CONDITIONING AND PRESSURIZATION SYSTEM (CONT)

SYSTEM OPERATION (CONT)

The cabin pressure and temperature can be controlled either automatically or manually. The system is also used for windshield and window defogging.



1. CABIN AIR TEMPERATURE SELECTOR
2. CABIN AIR SELECTOR SWITCH
3. AUTO-MANUAL SELECTOR SWITCH
4. TRANSFER SWITCH
5. MANUAL PRESSURE CONTROL VALVE
6. CABIN RATE OF CHANGE CONTROL KNOB
7. CABIN ALTITUDE SELECTOR KNOB
8. CABIN AIR OUTLET SELECT SWITCH

Air Conditioning & Pressure Control
Figure 3-16

SYSTEMS DESCRIPTION (CONT)

AIR CONDITIONING AND PRESSURIZATION SYSTEM (CONT)

CABIN AIR SELECTOR SWITCH

This switch is used to select the system's air source.

Switch Position	Air Source
RAM	: Ram air flow into the cabin.
OFF	: There is no air supply to the cabin.
LH	: System air is supplied from left engine only.
BOTH	: System air is supplied from both engines.
RH	: System air is supplied from right engine only.

AUTO-MANUAL SELECTOR SWITCH

This is a four position rotary switch. It should be noted that the switch is effective only when the cabin air selector switch is in the LH, BOTH or RH position.

Switch Position	Function
OFF	: There is no cabin air temperature control.
AUTO	: The system provides automatic air temperature control.
MAN COLD	: Coldest cabin air supply position.
MAN HOT	: Hottest cabin air supply position. A high temperature limit switch is installed to limit the supplied air temperature to below 200°F (93.5°C).

CABIN AIR TEMPERATURE SELECTOR

This is a variable rheostat used to select the desired cabin air temperature when the auto-manual selector switch is in the AUTO position. The temperature range of the supplied cabin air is from 60°F to 90°F.

CABIN AIR OUTLET SELECT SWITCH

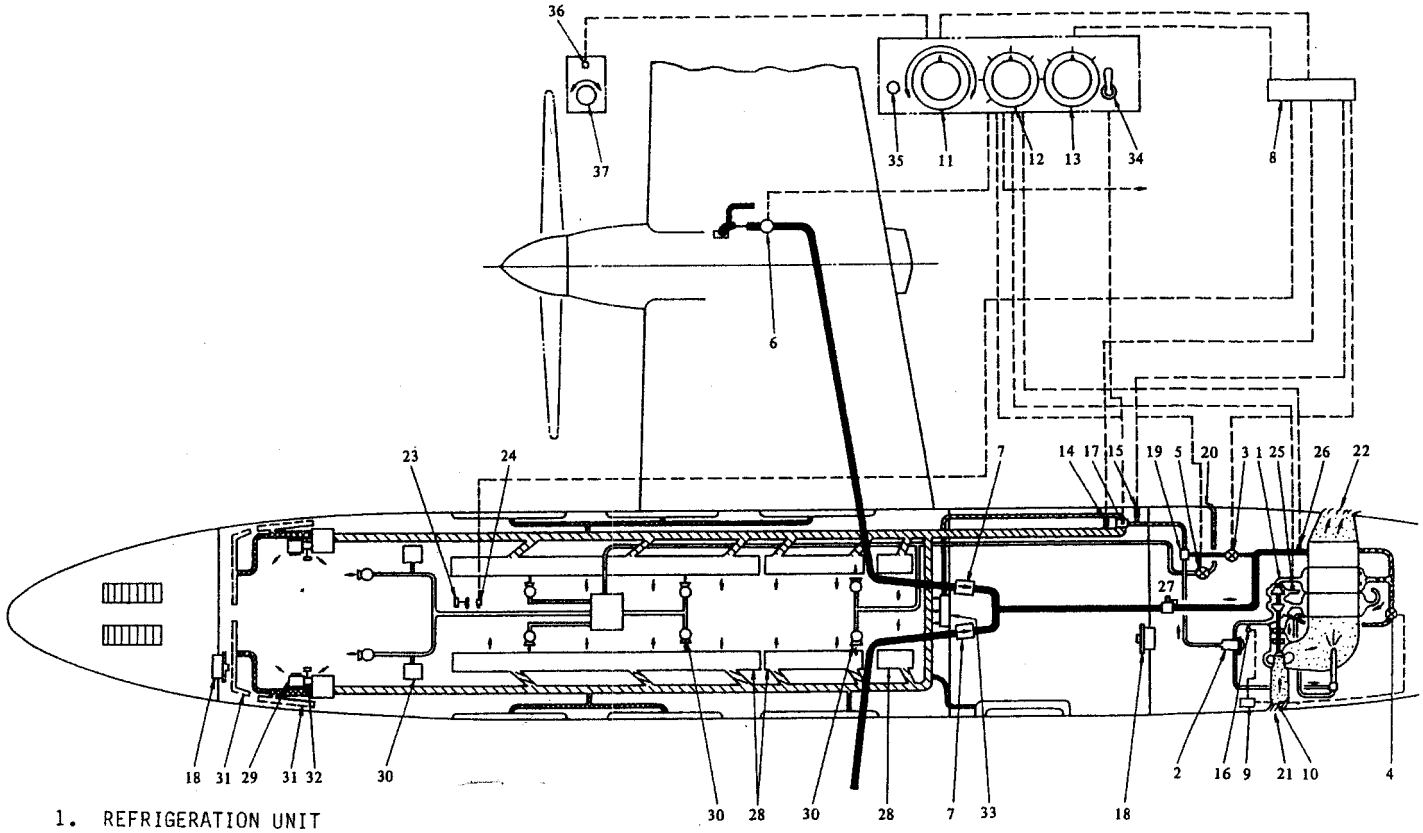
This switch actuates the distributor valve to distribute air among cabin conditioned air outlets and ceiling outlets.

FLOOR - Valve is not actuated and most air comes out of cabin outlet.

CEIL - Valve is actuated. Air flow from cabin outlet decreases and flows from the ceiling outlet.

SYSTEMS DESCRIPTION (CONT)

AIR CONDITIONING AND PRESSURIZATION SYSTEM (CONT)



1. REFRIGERATION UNIT
2. WATER SEPARATOR
3. REF. UNIT BY PASS VALVE
4. COOLING TURBINE BY PASS VALVE
5. RAM AIR SHUTOFF VALVE
6. ENGINE BLEED AIR SHUTOFF VALVE
7. ENGINE BLEED AIR CHECK VALVE
8. CABIN TEMPERATURE CONTROL
9. WATER SEPARATOR INLET AIR TEMPERATURE CONTROL
10. SCREEN
11. CABIN AIR TEMPERATURE SELECTOR
12. CABIN AIR SELECTOR SWITCH
13. AUTO-MANUAL SELECTOR SWITCH
14. CABIN SUPPLY AIR TEMPERATURE SENSOR
15. SUPPLY AIR TEMPERATURE LIMIT SWITCH
16. WATER SEPARATOR INLET AIR TEMPERATURE SENSOR
17. DISTRIBUTOR VALVE
18. OUTFLOW SAFETY VALVE
19. MIXING CHAMBER
20. RAM AIR INTAKE
21. COOLING AIR INTAKE
22. COOLING AIR OUTLET
23. FAN CABIN SENSOR
24. CABIN TEMPERATURE SENSOR
25. COMPRESSOR OUTLET TEMPERATURE LIMIT SWITCH
26. PRECOOLER INLET PRESSURE LIMIT SWITCH
27. PRESSURE REGULATOR
28. MAIN CONDITIONED AIR OUTLET
29. FORWARD CONDITIONED AIR OUTLET
30. COLD AIR OUTLET
31. DEFOG AIR OUTLET
32. DEFOG CONTROL VALVE
33. CEILING OUTLET
34. CABIN AIR OUTLET SELECT SWITCH
35. TRANSFER SWITCH (COCKPIT)
36. TRANSFER SWITCH (CABIN)
37. CABIN TEMPERATURE SELECTOR (CABIN)

: ENGINE COMPRESSOR BLEED AIR
: CONDITIONED AIR
: DEFOGGING AIR
: PRECOOLED AIR
: RAM AIR
: COLD AIR

Air Conditioning and Pressurization System
Figure 3-17

SYSTEMS DESCRIPTION (CONT)

AIR CONDITIONING AND PRESSURIZATION SYSTEM (CONT)

TRANSFER SWITCH

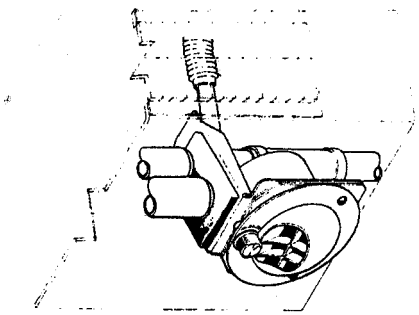
This switch selects whether operation of cabin supply air temperature selector is controlled at the cockpit or cabin. Its control is transferred with each push.

FORWARD CONDITIONED AIR OUTLET KNOB

Two outlets are installed at the right and left side panels in the cockpit. The DEFOG position is used for defogging the windshield.

DEFOGGING CONTROL

Conditioned air is also utilized for windshield defogging. The airplane is provided with small outlets at the bottom of the windshields and cockpit side windows. When defogging is required, turn the forward conditioned air outlet knob to the DEFOG position. Conditioned air flows up from the outlets to eliminate fog on the windshield. If the airflow is insufficient to eliminate fog in extremely cold weather, increase the defogging air temperature by setting the auto manual selector switch to the MAN HOT position.



Defog Control
Figure 3-18

PRESSURIZATION CONTROL

Manual Pressure Control Valve (Figure 3-16)

The manual pressure control valve is normally operated at the FULL INC position. In the event of automatic pressure control system failure or when rapid cabin depressurization is required, cabin pressure can be decreased by turning this valve. Cabin pressure decrease will occur after turning this valve about one half turn from the FULL INC position. Approximately six additional turns are required to reach the FULL DEC position.

SYSTEMS DESCRIPTION (CONT)

AIR CONDITIONING AND PRESSURIZATION SYSTEM (CONT)

PRESSURIZATION CONTROL (CONT)

Cabin Altitude Selector Knob (Figure 3-16)

The desired cabin pressure altitude is selected by this control. The number in a small window at the bottom of the instrument shows the altitude at which the airplane should be flown to give a maximum pressure differential. If this altitude is exceeded, a constant differential pressure will be maintained. The altitude range of the selector is from minus 1,000 feet (304.8 meters) to 10,000 feet (3,048 meters). A cabin altitude and differential pressure indicator is provided on the RH switch panel adjacent to the cabin pressure control. The altitude range tolerance is plus or minus 700 feet from the selected altitude setting.

Cabin Rate Control Knob (Figure 3-16)

The desired rate of climb or descent within the cabin is selected by the RATE knob. The selector range is marked MIN and MAX with the MIN position representing a maximum change rate of 50 ft/min and the MAX position representing a maximum change rate of 2,000 ft/min. The actual rate that can be achieved will vary with climb and descent but the controller should operate within above limits.

Cabin Altitude Differential Pressure Indicator

The instrument indicates cabin pressure altitude and differential pressure between cabin and the airplane's pressure altitude. The differential pressure gauge has a green arc up to 6.00 psi and a red line at 6.10 psi. Cabin altitude is shown in feet and differential pressure in psi. The differential pressure indicator is located on the RH Switch Panel to the right of the cabin pressure control.

Cabin Pressure Control Schedule

Cabin pressure should be controlled for the comfort of the passengers. The cabin pressure control schedule chart shows a sample flight with corresponding cabin pressures. Described below are two cases with different cabin altitude pressure settings and cabin rate of climb.

SYSTEMS DESCRIPTION (CONT)

AIR CONDITIONING AND PRESSURIZATION SYSTEM (CONT)

PRESSURIZATION CONTROL (CONT)

Example

Line Segments	Description
A-B	airplane takeoff and climb to an altitude of 31,000 feet.
B-C	airplane flight altitude of 31,000 feet.
C-D	airplane rate of descent at 2,000 feet/minute to 15,000 feet altitude into a controlled area.
D-E	airplane segmented controlled area altitude of 15,000 feet.
E-F	airplane descent and approach at 2,000 feet/minute to airport elevation of 3,000 feet.

Example Case 1

Cabin altitude set at 1,000 feet
Cabin rate of climb set at 500 feet/minute

Climb-Cruise Line Segments A -B'-C'-D'-E'

As the airplane ascends, cabin altitude is maintained at 1,000 feet (B'-C') until the airplane reaches 15,500 feet, at which time maximum differential pressure (500 ft/min) comes into effect, adjusting cabin pressure (C'-D') until the airplane reaches flight altitude. Cabin altitude (D'-E') is then maintained at 9,850 feet.

Descent Line Segments E'-F'-G'-H'-J'-F

Cabin pressure (E'-F') will adjust to an altitude of 1,000 feet, which is 2,000 feet less than the arrival airport elevation. This means that the cabin altitude control must be increased to approximately 4,000 feet for final approach and landing (G'-H'-J'-F).

Example Case 2

Cabin altitude set at 4,000 feet
Cabin rate of climb set at 500 feet/minute

Climb-Cruise Line Segments A -B"-C"-D'-E'

As the airplane ascends, cabin altitude is maintained at 4,000 feet (B"-C") until the airplane reaches 20,500 feet, at which time maximum differential pressure comes into effect, adjusting cabin pressure (C"-D') until the airplane reaches flight altitude. Cabin altitude (D'-E') is maintained at 9,850 feet.

SYSTEMS DESCRIPTION (CONT)

AIR CONDITIONING AND PRESSURIZATION SYSTEM (CONT)

PRESSURIZATION CONTROL (CONT)

R Descent Line Segments E'-D"-J'-F

Cabin pressure (E'-D") will adjust to an altitude of 4,000 feet (D"-J').

Alternate Cabin Descent

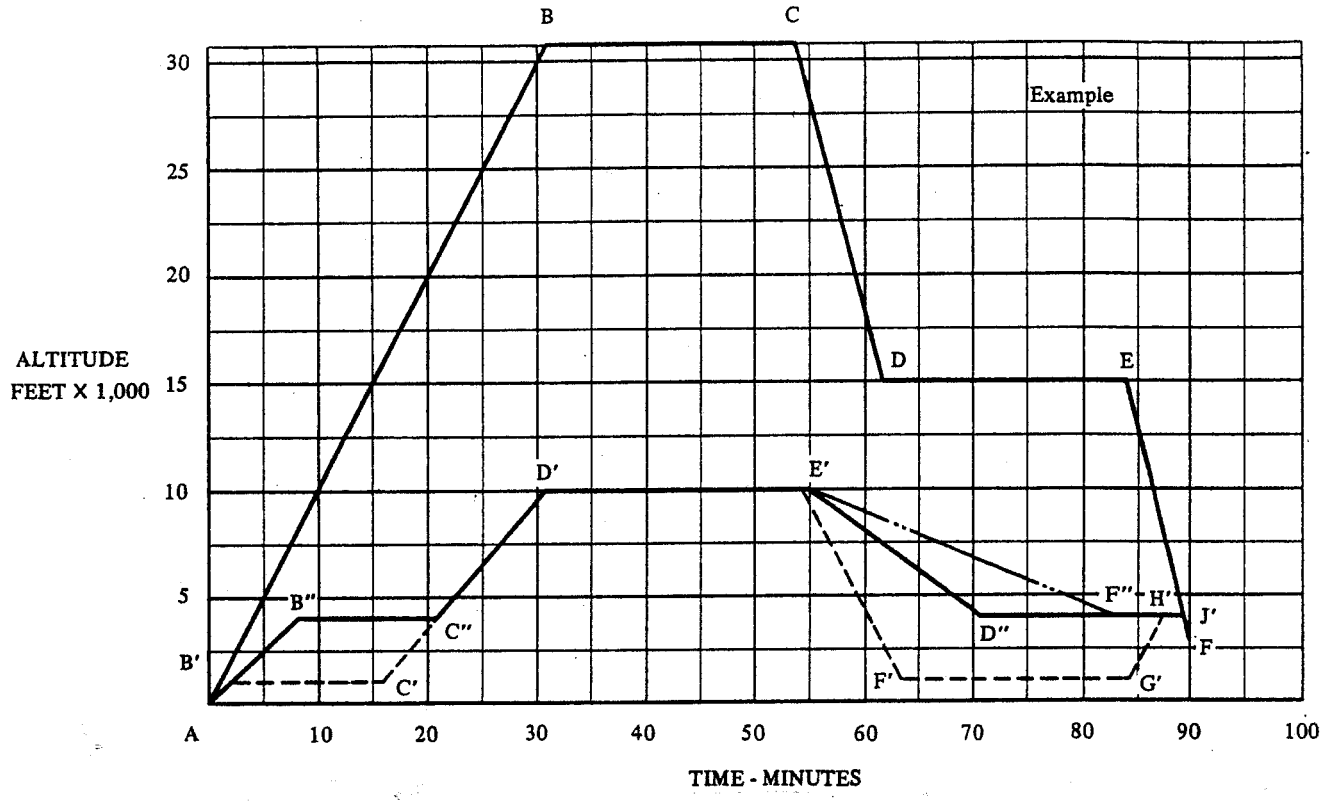
R An alternate cabin rate of descent setting may be selected for optimum passenger comfort. Cabin descent rate of 200 feet/minute (Line Segment E'-F") may be used with cabin altitude set at 4,000 feet or 1,000 feet above destination airport elevation. The slower rate of descent may be used for either Example Case 1 or Case 2.

NOTE

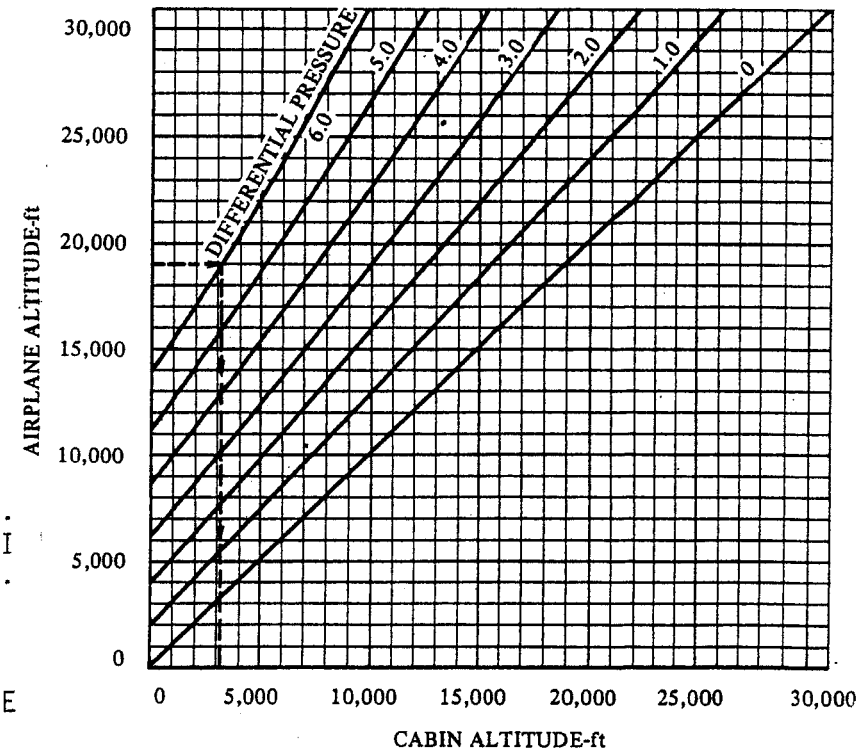
Avoid rapid cabin altitude selection during climb or descent until the cabin rate of climb or descent has stabilized.

SYSTEMS DESCRIPTION (CONT)

AIR CONDITIONING AND PRESSURIZATION SYSTEM (CONT)



CABIN PRESSURE CONTROL SCHEDULE
GRAPH 1



EXAMPLE:

Airplane Altitude - 19,000 FT.
Differential Pressure - 6 PSI
Cabin Altitude - 3,200 FT.

DIFFERENTIAL PRESSURE SCHEDULE
GRAPH 2

SYSTEMS DESCRIPTION (CONT)

SURFACE DEICING SYSTEM (Figure 3-19)

Deicing of the wing and empennage is accomplished by a pneumatic system that periodically inflates and deflates rubber boots cemented to the leading edges. The system utilizes bleed air.

WING DEICER SWITCH

The wing deicer switch is an ON-OFF circuit breaker switch marked WING DE-ICE in the anti-icing switch group in the LH overhead switch panel. The system operates either automatically or manually. If the switch is placed in the ON position, inflation and deflation of boots is automatically controlled by a timer with a cycle time of three minutes. The FAA has determined that pilots should turn the wing deice system on at the first sign of ice accumulation on the airframe. Refer to FAA approved procedures in the Airplane Flight Manual for additional information.

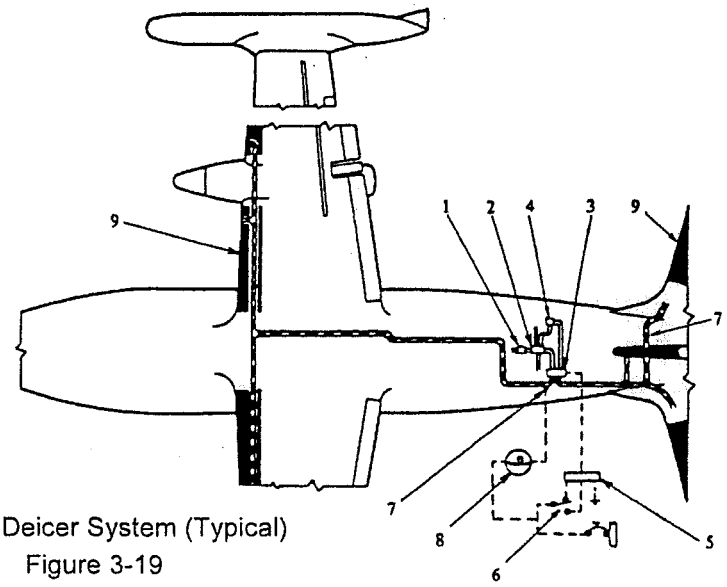
NOTE

If pilot judgement determines that a shorter cycle operation is required due to actual icing conditions, place the switch in the ON position for 6 seconds then return it to the OFF position for 10 seconds. Repeat this cycle as often as needed per Airplane Flight Manual procedures.

INDICATOR LIGHT

The indicator light, located adjacent to the WING DE-ICE Switch, will illuminate during inflation of the boots and extinguishes when the boots have deflated. Verify system operation during the preflight checks and correct any problem prior to next flight. Failure of the light to illuminate when the switch is selected ON indicates that the wing or tail deice boots are not being supplied with proper inflation pressure. Service Bulletin 096/30-004 added a second pressure switch so that inflation pressure to the wing boots and tail boots could be independently monitored. Illumination of the indicator light indicates proper supply pressure to both sets of boots.

1. REGULATOR & RELIEF VALVE
2. MANIFOLD
3. DISTRIBUTOR VALVE
4. EJECTOR
5. TIMER
6. DEICER SWITCH
7. PRESSURE SWITCH
8. INDICATOR LIGHT
9. DEICER BOOTS



Surface Deicer System (Typical)
Figure 3-19

SYSTEMS DESCRIPTION (CONT)

WINDSHIELD ANTI-ICING SYSTEM

HEATED WINDSHIELD ANTI-ICING SYSTEM

General Description

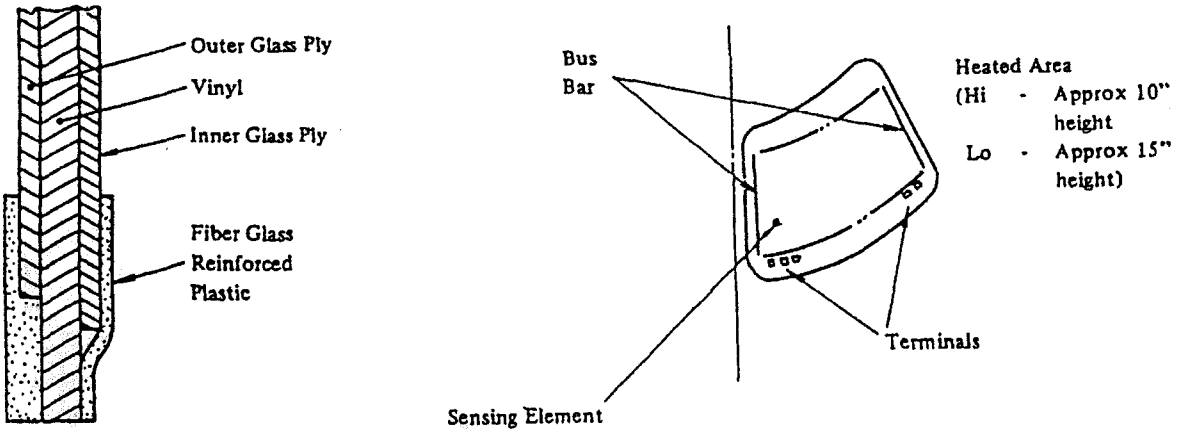
This system is designed to perform anti-icing and deicing functions on the forward windshields.

Major components of the system consist of a three ply windshield with an electrical heating mat and a temperature controller which controls the operating temperature of the windshield. The system is operated by the Windshield Heat Low switches located in the LH overhead switch panel with indicator lights which illuminate when the system is ON. For extreme icing conditions, W/S HI HEAT switches are provided in the pilot's and copilot's control wheels. H/W HI HEAT MODE annunciators on the outboard edge of the pilot's and copilot's instrument panels will illuminate when these switch buttons are depressed. W/S HI HEAT can be operated only when the Windshield Heat Low switches are ON.

Heated Windshield (Figure 3-20)

The heated windshield consists of an inner and outer tempered glass ply with a vinyl ply sandwiched between them. The glass plies are designed to bear the cabin internal pressure and flight loads.

The electric heating mat is located between the vinyl and outer glass plies. Five electrical terminals are located on the lower edge surface for the sensing element, static drain and power. Power is supplied to the low and high heat area bus bars located on the extreme outboard windshield edge. The sensing element is located in the inboard edge of the high heat area to maintain the heated area temperature at approximately 104° F (40°C).



Heated Windshield (Typical)
Figure 3-20

SYSTEMS DESCRIPTION (CONT)

ENGINE AIR INTAKE ANTI-ICING SYSTEM

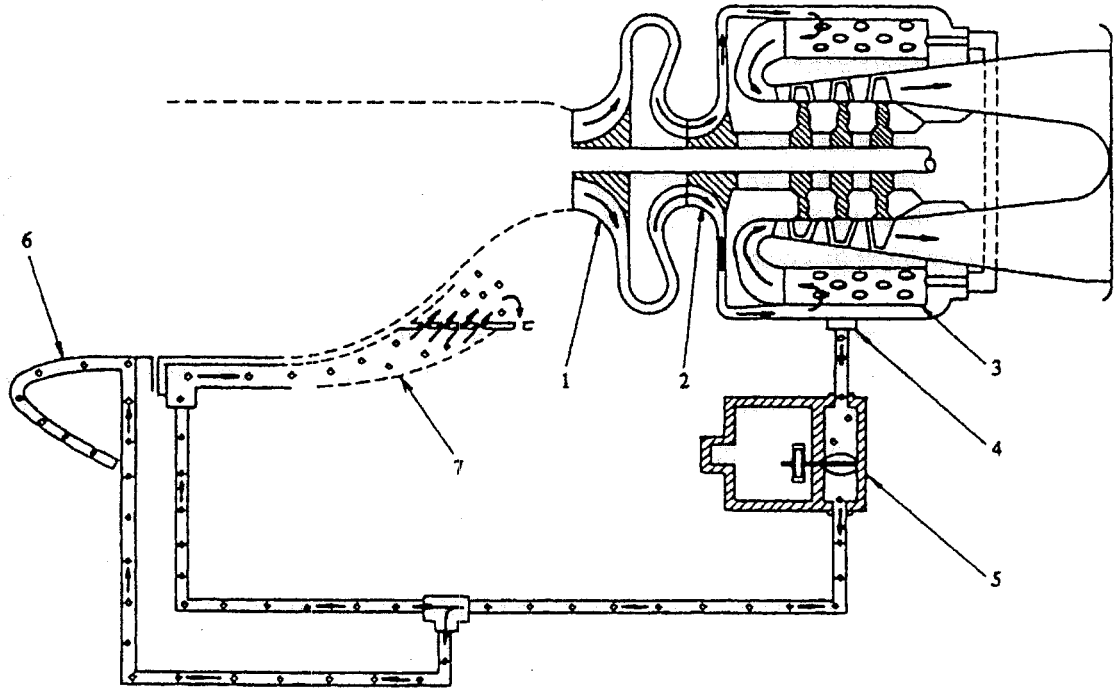
The engine air intake anti-icing system utilizes engine bleed air. Placing the ENG INTAKE switches located on the LH overhead panel to ON, opens a shutoff valve and directs bleed air to the engine inlet for anti-icing. Decreasing torque and increasing EGT verify operation of the system. Two indicator lights, adjacent to the switches, illuminate when the switches are ON.

CAUTION

MAXIMUM 10 SECONDS OPERATION FOR TEST PURPOSES WHEN THE OAT IS 10°C (50° F) OR HIGHER.

NOTE

This is true whether visible moisture is present or not.



1. FIRST STAGE COMPRESSOR/IMPELLER
2. SECOND STAGE COMPRESSOR/IMPELLER
3. COMBUSTION CHAMBER
4. BLEED AIR PORT
5. ANTI-ICING BLEED AIR VALVE
6. COWLING LIP
7. AIR INTAKE DUCT

Engine Air Intake Anti-Icing System (Typical)
Figure 3-21

SYSTEMS DESCRIPTION (CONT)

OIL COOLER AIR INTAKE ANTI-ICING SYSTEM

The oil cooler air inlet electrical heater protects the oil cooler air inlet from ice build-up during icing conditions. Rubber boots with embedded electrical heating elements are installed on the air inlet of both engine oil coolers. The maximum temperature of the heating elements is limited by the thermostat installed under the rubber boots. Placing the OIL COOLER INLET switches, located on the LH overhead switch panel, to ON supplies electrical power to the heating elements of the boots. A load increase on the voltammeters verifies operation of the system. Two indicator lights, adjacent to the switches, illuminate when the switches are ON.

CAUTION

OIL COOLER INLET ANTI-ICING SYSTEM MUST NOT BE OPERATED ON GROUND FOR MORE THAN 10 SECONDS.

PROPELLER DEICING SYSTEM

The propeller blades are protected from ice accumulation by the electrical heating elements embedded in the rubber boots bonded to each blade. Deicing is accomplished by melting the under surface of the ice and allowing it to be thrown off by centrifugal force. The system utilizes a timer for each propeller which delivers current to the inner and outer halves of the boots in about a 34 second cycle.

This system is controlled by the PROP DE-ICER circuit breaker switches on the LH overhead switch panel. Verify system operation by placing the HEATER Current Select switch, on the center of the overhead switch panel, to the desired position and check loadmeter readings. (See NORMAL PROCEDURES, Section 5 of the FAA Approved Airplane Flight Manual.)

CAUTION

1. IF THE LOADMETER INDICATIONS ARE ABNORMAL, AVOID OPERATING THIS SYSTEM EXCEPT DURING EMERGENCY CONDITIONS.

2. IF ONE OF THE RUBBER BOOTS SHOULD BECOME PARTIALLY DETACHED, IT MAY CAUSE EXCESSIVE VIBRATION. IF THIS CONDITION EXISTS, IT IS RECOMMENDED TO SHUT DOWN THE AFFECTED ENGINE AND FEATHER THE PROPELLER, THEN LAND AS SOON AS PRACTICAL.

SYSTEMS DESCRIPTION (CONT)

STATIC, PITOT AND STALL WARNING ANTI-ICING SYSTEM

Anti-icing of the pitot tubes, static ports, and the lift transducer vane for the stall warning system is performed by the embedded electric heaters. The pitot tubes and static ports heat is controlled by the PITOT & STATIC switches on the LH overhead panel. The stall vane heat is controlled by the STALL VANE switch on the LH overhead switch panel. Verify system operation by placing the HEATER current select switch on the center of the overhead switch panel to the desired position and check loadmeter readings. (See NORMAL PROCEDURES, Section 5 of the FAA Approved Airplane Flight Manual.)

CONTINUOUS IGNITION SYSTEM

Two switches labeled CONTINUOUS IGNITION, located on the lower center instrument panel, allow the left and right start auxiliary relay to be bypassed so either or both engine's igniters can be run continuously when ice, slush, or water might present a flameout hazard. Observe duty cycle limits of NORMAL PROCEDURES, Section 5 of the FAA Approved Airplane Flight Manual.

The system can be checked prior to engine start by placing the Start Selector switch to AIR START & SAFE and the left RUN CRANK STOP switch to RUN. Activate the left Continuous Ignition switch and listen for the igniter box to start firing and observe the left **CONT IGNITION** annunciator illuminates. Turn off the left continuous ignition switch and place left RUN CRANK STOP switch to STOP. Repeat procedure for the right side. On aircraft modified by SB 086/74-002 with auto-ignition system, verify proper operation during the preflight checks per AFM procedures. This Service Bulletin added a third position, labeled auto-ignition, to the ignition switches. This third position activates the igniter boxes whenever the engine torque decreases below a preset level (below flight idle).

CAUTION

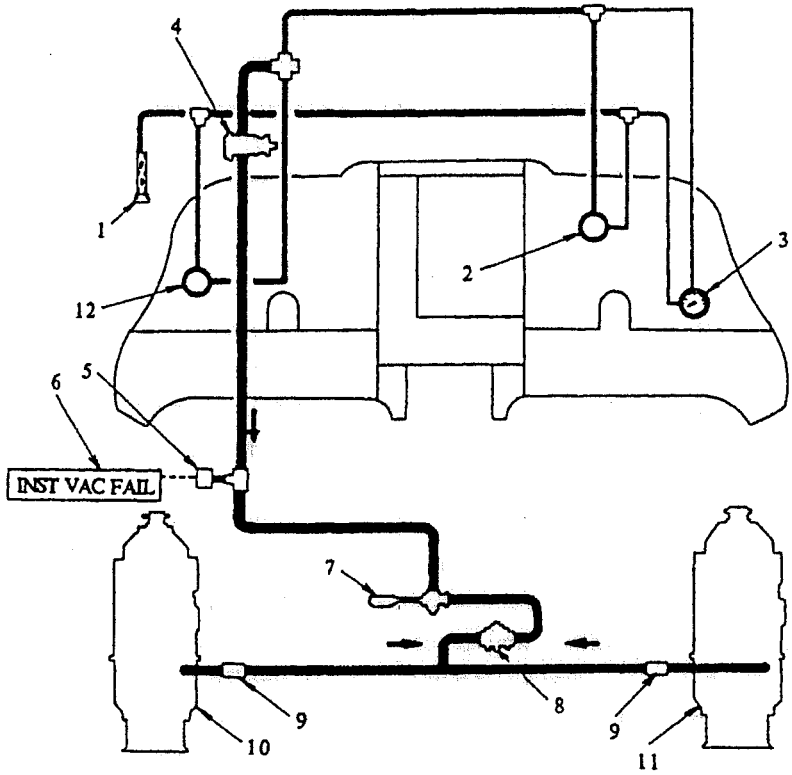
DO NOT PERFORM THIS CHECK IF THE ENGINE IS SUSPECTED OF CONTAINING UNBURNED FUEL. INSURE ALL GROUND PERSONNEL ARE CLEAR OF ENGINES PRIOR TO CHECK.

VACUUM SYSTEM (Figure 3-22)

The airplane is equipped with an ejector type vacuum pump operated by engine bleed air. The vacuum system operates an attitude indicator and pilot's turn and bank indicator (on airplane S/N 1518SA and Up, both the pilot's and copilot's turn and bank indicators are electrically operated.) A vacuum gauge is installed in the right instrument panel to indicate vacuum pressure. A vacuum of 4.2 to 5.0 in-Hg is required for normal operation and is indicated by the vacuum gauge. The annunciator **INST VAC FAIL** illuminates when vacuum drops below 4.0 in-Hg.

SYSTEMS DESCRIPTION (CONT)

VACUUM SYSTEM (CONT)



1. AIR FILTER
2. ATTITUDE INDICATOR
3. VACUUM GAUGE
4. RELIEF VALVE
5. VACUUM PRESSURE WARNING SWITCH
6. ANNUNCIATOR PANEL
7. EJECTOR
8. REGULATOR VALVE
9. CHECK VALVE
10. LH ENGINE
11. RH ENGINE
12. TURN & BANK INDICATOR (S/N 700SA, 731SA through 799SA, and 1501SA through 1517SA)

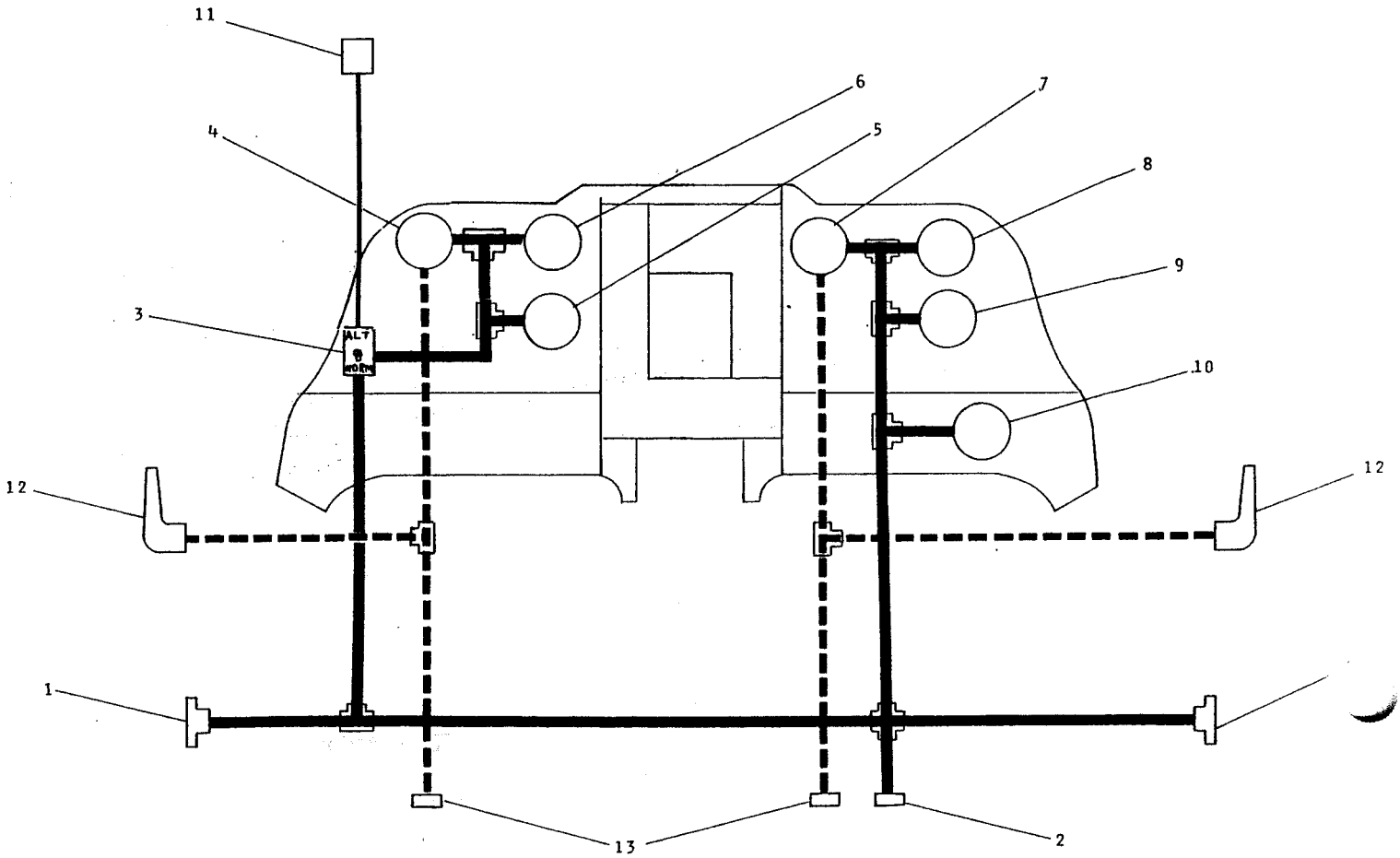
Vacuum System (Typical)
Figure 3-22

SYSTEMS DESCRIPTION (CONT)

PITOT-STATIC SYSTEM (Figure 3-23)

The pitot-static system consists of two pitot tubes with anti-icing heaters mounted on the left and right side of the forward fuselage, external static pressure ports with anti-icing heaters on each side of the fuselage beneath the forward side windows, and lines to connect the instruments to the sources. The system provides pitot and static pressure to operate the airspeed indicator and static pressure to operate the rate of climb indicator, altimeter, and the cabin altitude and differential pressure indicator. An alternate static port is installed on the forward pressure bulkhead in the front part of the cockpit. (Refer to ABNORMAL PROCEDURES, Section 4 of the FAA Approved Airplane Flight Manual.)

SYSTEMS DESCRIPTION (CONT)

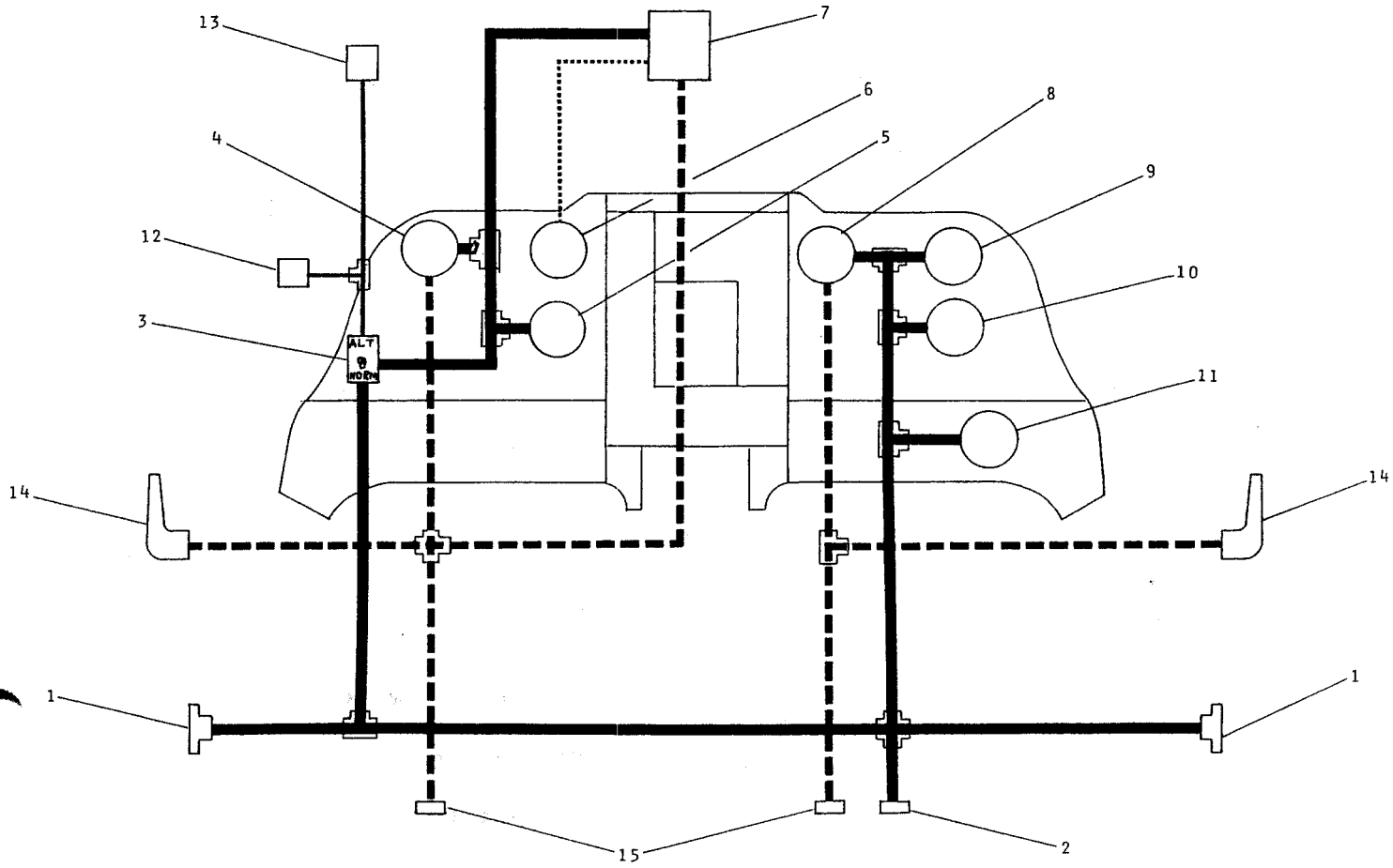


PRIMARY STATIC LINE
ALTERNATE STATIC LINE
PITOT LINE

1. HEATED STATIC PORT
2. STATIC LINE DRAIN
3. ALTERNATE STATIC SELECT VALVE
4. PILOT AIRSPEED INDICATOR
5. PILOT RATE OF CLIMB INDICATOR
6. PILOT ALTIMETER INDICATOR
7. CO-PILOT AIRSPEED INDICATOR
8. CO-PILOT ALTIMETER INDICATOR
9. CO-PILOT RATE OF CLIMB INDICATOR
10. CABIN DIFFERENTIAL PRESSURE INDICATOR
11. ALTERNATE STATIC SOURCE
12. HEATED PITOT TUBE
13. PITOT LINE DRAIN

Pitot - Static System
(Typical S/N 700SA, 731SA through 747SA, 749SA through 757SA, and 759SA through 778SA)
Figure 3-23 (Sheet 1 of 2)

SYSTEMS DESCRIPTION (CONT)



PRIMARY STATIC LINE
ALTERNATE STATIC LINE
PITOT LINE
ELECTRIC CONNECTION

1. HEATED STATIC PORT
2. STATIC LINE DRAIN
3. ALTERNATE STATIC SELECT VALVE
4. PILOT AIRSPEED INDICATOR
5. PILOT RATE OF CLIMB INDICATOR
6. PILOT ALTIMETER INDICATOR
7. AIR DATA COMPUTER
8. CO-PILOT AIRSPEED INDICATOR
9. CO-PILOT ALTIMETER INDICATOR
10. CO-PILOT RATE OF CLIMB INDICATOR
11. CABIN DIFFERENTIAL PRESSURE INDICATOR
12. ALTERNATE STATIC SOURCE
13. ANEROID SWITCH
14. HEATED PITOT TUBE
15. PITOT LINE DRAIN

Pitot - Static System
(Typical S/N 748SA, 779SA through 799SA,
and 1501SA and Up)
Figure 3-23 (Sheet 2 of 2)

SYSTEMS DESCRIPTION (CONT)

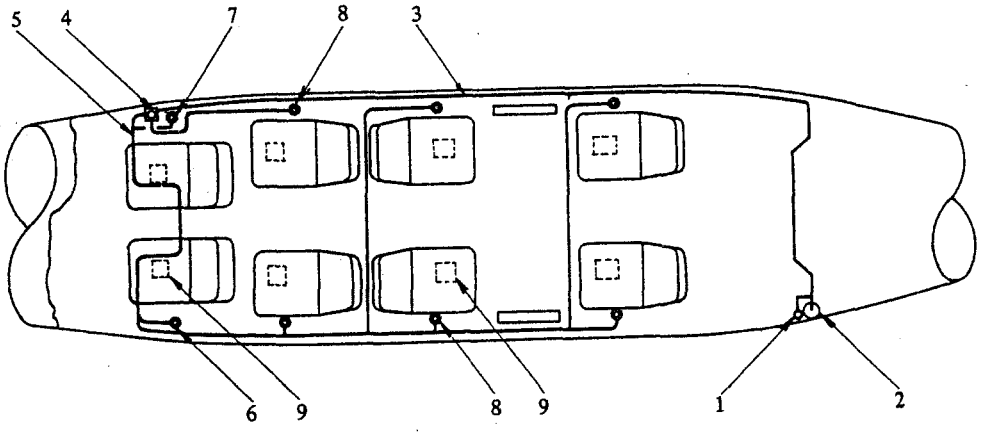
OXYGEN SYSTEM (Figure 3-24)

The Oxygen system will handle a maximum of eleven outlets from a 22 cu. ft. cylinder (located aft of the entrance door) through a regulator and pressure gauge in the cockpit right side panel. The number of passenger overhead outlets will correspond to the individual seating arrangement of each airplane. The system is completely automatic, adjusting oxygen flow as required for the pressure altitude. (See NORMAL PROCEDURES, Section 5 of the FAA Approved Airplane Flight Manual.)

NOTE

Before each flight, confirm the shutoff valve on the oxygen cylinder, located aft of the entrance door, is open. The oxygen pressure gauge on the copilot's side panel will show false oxygen pressure based on the locked pressure in the high pressure line between the gauge and the pressure shutoff valve. In this condition, oxygen is not available for the pilot. MAKE SURE THAT BOTH THE CYLINDER VALVE AND THE OXYGEN OUTLET VALVE ARE OPEN WHEN OXYGEN IS REQUIRED. (See NORMAL PROCEDURES, Section 5 of the FAA Approved Airplane Flight Manual.)

Oxygen masks are installed under each seat, except S/N 1554SA, 1562SA and up which have quick don masks with mics on the pilot and copilot seat backs.



1. OXYGEN FILLER VALVE
2. OXYGEN CYLINDER/PRESSURE GAUGE/VALVE
3. HIGH PRESSURE TUBING
4. OXYGEN REGULATOR/OXYGEN OUTLET VALVE
5. LOW PRESSURE TUBING
6. PILOT OXYGEN OUTLET
7. COPILOT OXYGEN OUTLET
8. PASSENGER OXYGEN OUTLET
9. OXYGEN MASK UNDER SEAT (EXCEPT S/N 1554SA, 1562SA AND UP PILOT/COPILOT BEHIND SEAT BACK)

Oxygen System
Figure 3-24

SYSTEMS DESCRIPTION (CONT)

COCKPIT AND CABIN INTERIOR

PILOT AND COPILOT SEAT

The pilot and copilot seats are adjustable fore/aft and up/down. A handle for fore/aft adjustment is located at the lower front of each seat. A handle for up/down adjustment is located at the inboard side of each seat. To move the seat forward or backward, pull the handle up and slide the seat to the desired position, then release the handle and slide the seat to the nearest locking position. To move the seat up or down, pull the lever up and adjust by applying more or less body weight to obtain the desired height, release handle to nearest lock position. The inboard arm rests are folding and attached to the seat back. The outboard arm rests are fixed to the side walls.

INDIVIDUAL RECLINING SEATS

The reclining seats can be adjusted to suit the comfort of the occupant. A button on the inboard side of each seat adjusts the reclining position. To adjust the reclining angle, push the button and lean backward to the desired position, then release the button. To adjust the seat to the upright position, push the button and lean forward, then release the button. The side panel of the cabin may be used as outboard arm rests for the reclining seats. Lift the inboard arm rests to position them for use. Lift the arm rest and then lower for stowing.

DIVAN COUCH (If Installed)

A divan couch may be located as desired by the owner/operator in the cabin arrangement. It may have a cigar lighter and ash tray below the center seat bottom. The divan couch has no position adjusting device.

REFRESHMENT CENTERS

Hot and cold refreshment centers are available to be installed in locations as desired by the owner/operator. The refreshment centers contain space for liquor dispensers and bottles, ice, hot liquid container, stereo tape player and storage.

PASSENGER COMPARTMENT CLOSEOUT

A closeout divider may be installed between the cockpit and the passenger compartment; passenger compartment and the baggage/convenience compartment. The cockpit/passenger compartment divider is a sliding door, while the baggage area closeout may be a sliding or swing door.

SYSTEMS DESCRIPTION (CONT)

COCKPIT AND CABIN INTERIOR (CONT)

CIGAR LIGHTER/ASH TRAY/DRINK HOLDER

Cigar lighter, ash trays and drink holders are installed in the outboard arm rests beside each seat.

Cigar lighters are protected by a circuit breaker located on the aft pressure bulkhead.

EXECUTIVE TABLE

The fold away table and stowage compartment may be removed from the side armrest by lifting upward on stowage unit. The mounting brackets will break away allowing the Emergency Window Exit to be opened without removing the table and stowage compartment. However when the emergency exit is to be functionally checked, remove the table and stowage compartment to avoid damage to the mounting hardware.

DOORS

ENTRANCE DOOR (Figure 3-25)

The entrance door, located on the left side of the airplane, has conventional inside and outside handles. It is provided with three door lock devices: a conventional door lock, an automatic pressure lock device, which locks the door handles when the main landing gear is retracted, and an automatic open lock device which locks the handle in the open position when the door is open. The door is completely sealed to prevent cabin air pressure leakage. The door lock is operated with a key and is unlocked by turning the key counterclockwise approximately one half turn. To open the door, rotate the handle clockwise one half turn.

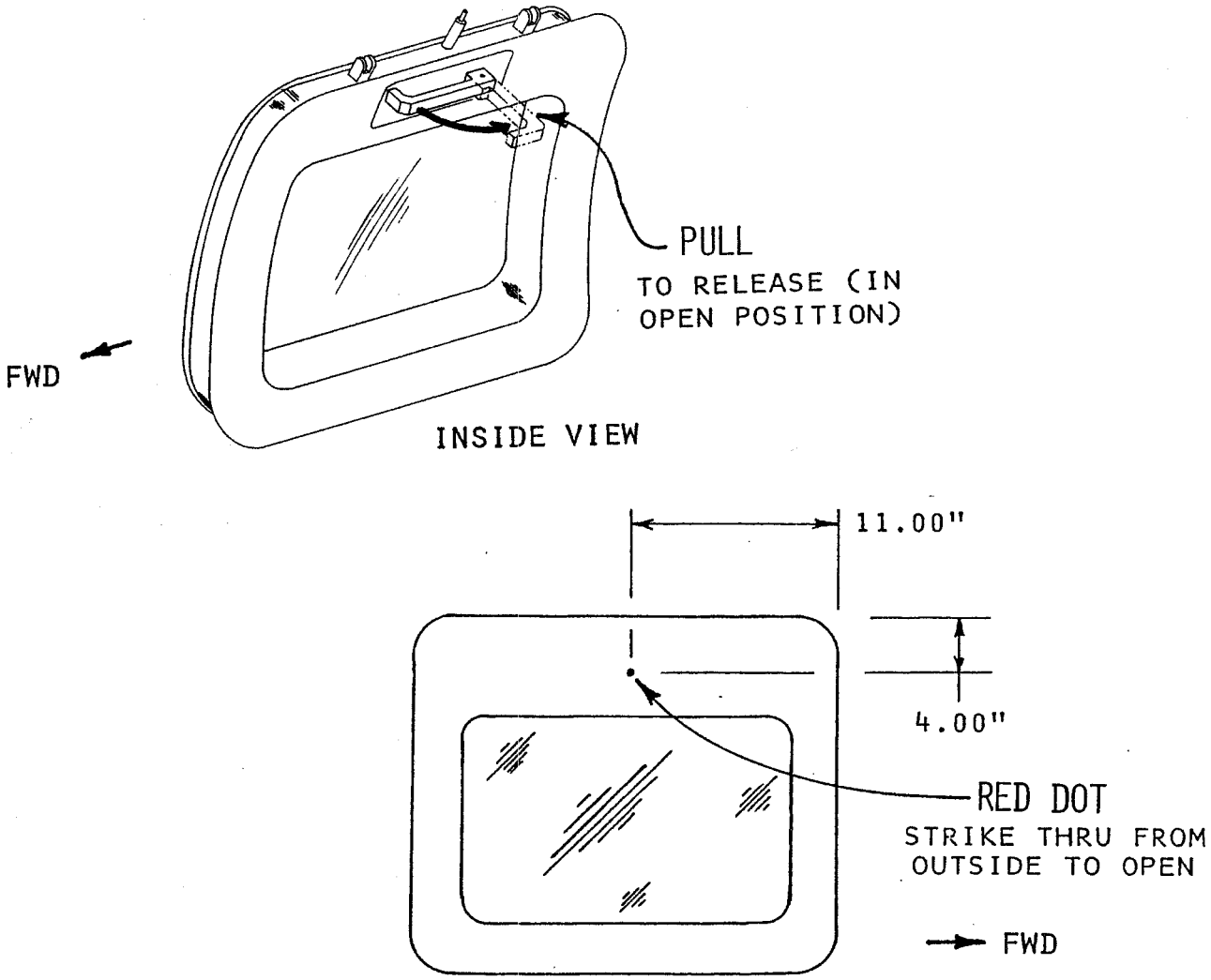
Passenger Entrance Door (Typical)
Figure 3-25

SYSTEMS DESCRIPTION (CONT)

DOORS (CONT)

EMERGENCY EXIT DOOR (Figure 3-26)

To open the emergency exit door, remove the card table (if installed), push the access plate beside the handle, and pull the handle out until it reaches the stop. The door can be detached from the cabin wall by pulling in at the top and lifting up and into the cabin.



NOTE: Applicable to S/N 1546SA and up and those others modified by SR 036/11-001.

Emergency Exit Door (Typical)
Figure 3-26

OPERATING DETAILS

GENERAL

Although the illustrations that follow do not represent an MU-2, the following article, produced in cooperation by the Federal Aviation Administration and the General Aviation Manufacturers Association, is herein presented for its technical merit...

NOTE

Remember that the MU-2B-60 airplane propeller rotates such that the right engine is the critical engine. Therefore, the information in the following article as pertains to critical engine must be interpreted in this manner. All other information is technically correct. Manufacturer's recommended V_{sse} is 125 KIAS.

The major difference between flying a twin-engine and a single-engine airplane is knowing how to manage the flight if one engine loses power for any reason. Safe flight with one engine-out requires an understanding of the basic aerodynamics involved -- as well as proficiency in engine-out procedures.

LOSS OF POWER ON ONE SIDE

Loss of power from one engine affects both climb performance and controllability of any light twin.

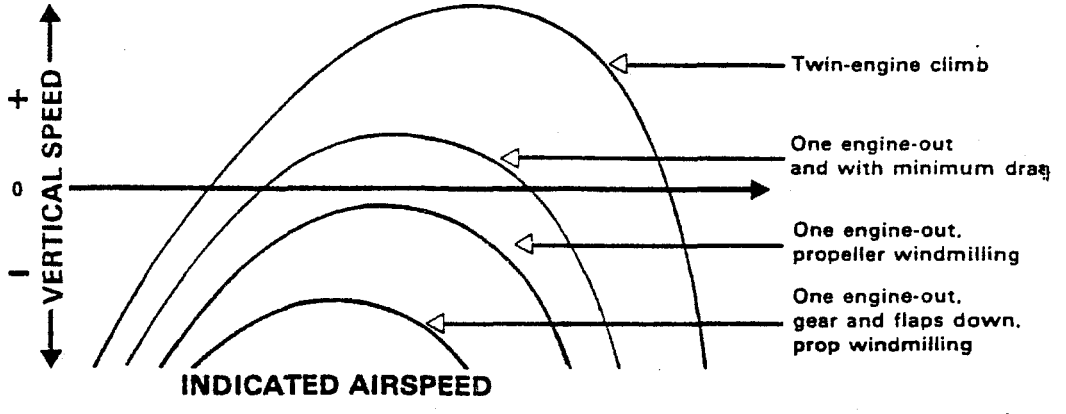


Figure 1. Effect of one engine-out and airplane configuration on vertical speed

OPERATING DETAILS (CONT)

CLIMB PERFORMANCE

Climb performance depends on an excess of power over that required for level flight. Loss of power from one engine obviously represents a 50% loss of power but, in virtually all light twins, climb performance is reduced by at least 80%. (See Figure 1)

The amount of power required for level flight depends on how much drag must be "overcome" to sustain level flight. It's obvious, that if drag is increased because the gear and flaps are down and the prop windmilling, more power will be required. Not so obvious, however, is the fact that drag also increases as the square of the airspeed while power required to maintain that speed increases as the cube of the airspeed. (See Figure 2)

Thus, climb performance depends on four factors:

- Airspeed - too little or too much will decrese climb performance.
- Drag - gear, flaps, cowl flaps, prop and speed.
- Power - amount available in excess of that needed for level flight.
- Weight - passengers, baggage and fuel load greatly affect climb performance.

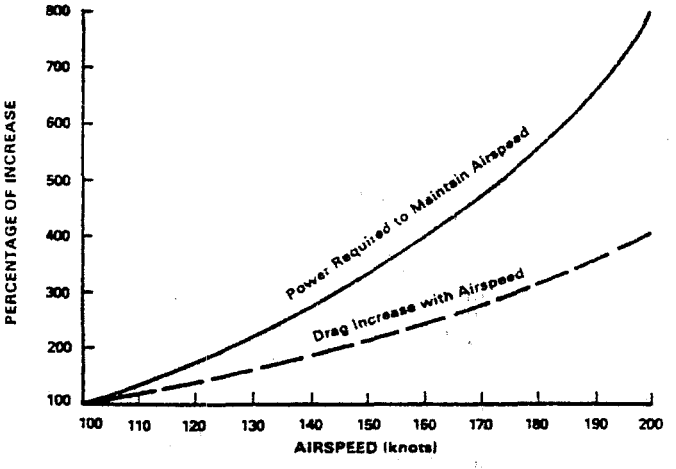


Figure 2. Effect of airspeed on drag—and power required to maintain that airspeed while in level flight.

OPERATING DETAILS (CONT)

YAW

Loss of power on one engine also creates yaw due to asymmetrical thrust. Yaw forces must be balanced with the rudder. (See Figure 3)

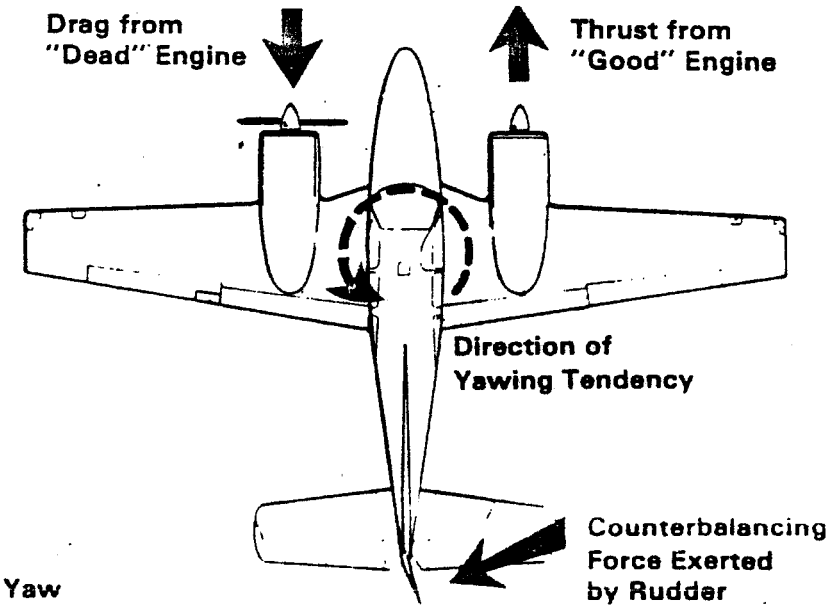


Figure 3. Yaw

ROLL

Loss of power on one engine reduces prop wash over the wing. Yaw also affects the lift distribution over the wing causing a roll toward the "dead" engine. (See Figure 4) These roll forces may be balanced by banking into the operating engine.

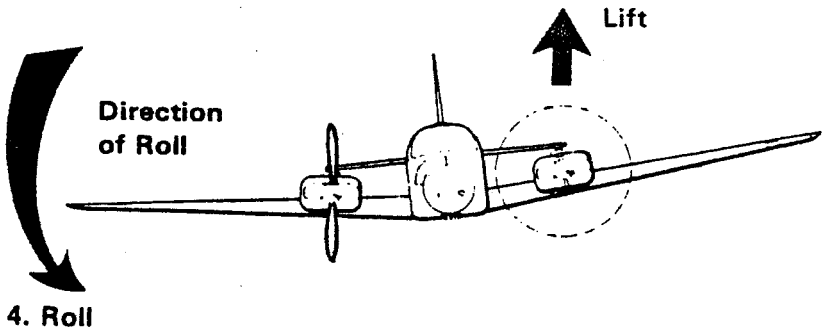


Figure 4. Roll

OPERATING DETAILS (CONT)

CRITICAL ENGINE

The critical engine is that engine whose failure would most adversely affect the performance or handling qualities of the airplane. The critical engine on most U.S. light twins is the left engine as its failure requires the most rudder force to overcome yaw. At cruise, the thrust line of each engine is through the propeller hub.

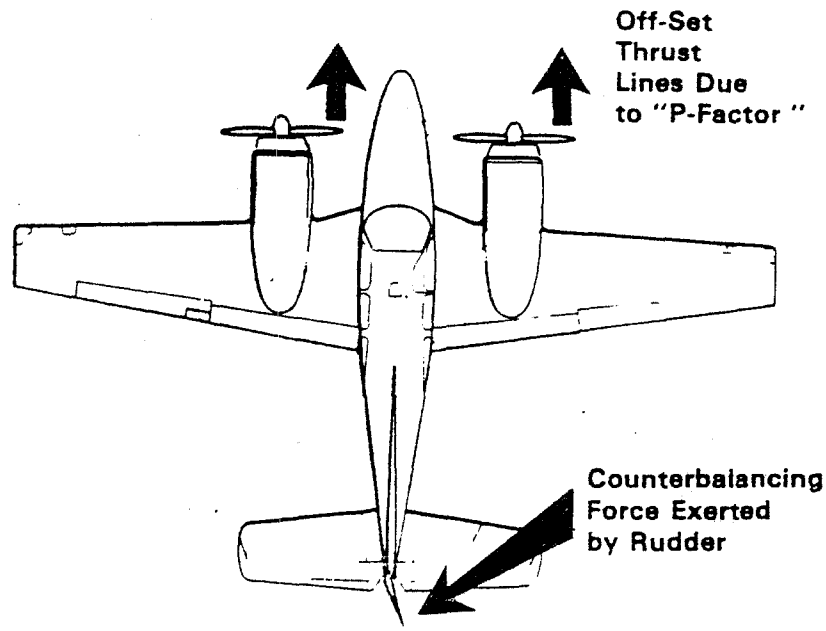


Figure 5. Engine Thrust Line Shifts to Right at Low Airspeeds and at High Angles of Attack.

But, at low airspeeds and at high angles of attack, the effective thrust centerline shifts to the right on each engine because the descending propeller blades produce more thrust than the ascending blades (P-factor). Thus, the right engine produces the greatest mechanical yawing moment and requires the most rudder to counterbalance the yaw.

OPERATING DETAILS (CONT)

KEY AIRSPEEDS FOR SINGLE ENGINE OPERATIONS

Airspeed is the key to safe single engine operations. For most light twins there is an:

	Symbol
- airspeed below which directional control cannot be maintained.	V_{mca}
- airspeed below which an intentional engine cut should never be made.	V_{sse}
- airspeed that will give the best single engine rate-of-climb (or the slowest loss of altitude).	V_{yse}
- airspeed that will give the steepest angle-of-climb with one engine-out.	V_{xse}

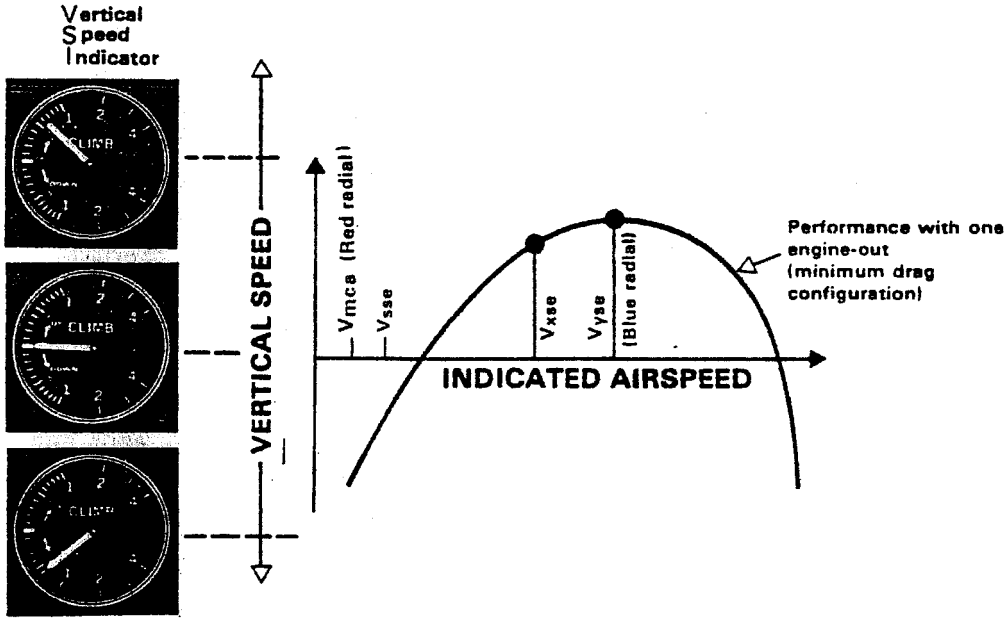


Figure 6. Key Single Engine Airspeeds.

OPERATING DETAILS (CONT)

Minimum Control Speed Airborne (V_{mca})

V_{mca} is designated by the red radial on the airspeed indicator and indicates the minimum control speed, airborne at sea level. V_{mca} is determined by the manufacturer as the minimum airspeed at which it's possible to recover directional control of the airplane within 20 degrees heading change and, thereafter, maintain straight flight, with not more than 5 degrees of bank, if one engine fails suddenly with:

- Take-off power on both engines,
- Rearmost allowable center of gravity,
- Flaps in takeoff position,
- Landing gear retracted,
- Propeller windmilling in takeoff pitch configuration (or feathered if automatically featherable).

However, sudden engine failures rarely occur with all of the factors listed above and, therefore, the actual V_{mca} under any particular situation may be a little slower than the red radial on the airspeed indicator. However, most airplanes will not maintain level flight at speeds at or near V_{mca}. Consequently, it is not advisable to fly at speeds approaching V_{mca} except in training situations or during flight tests.

Intentional One-Engine Inoperative Speed (V_{sse})

V_{sse} is specified by the airplane manufacturer in new Handbooks and is the minimum speed at which to perform intentional engine cuts. Use of V_{sse} is intended to reduce the accident potential from loss of control after engine cuts at or near minimum control speed. V_{mca} demonstrations are necessary in training but should only be made at a safe altitude above the terrain and with the power reduction on one engine made at or above V_{sse}. Power on the operating (good) engine should then be set at the position for maximum continuous operation. Airspeed is reduced slowly (one knot per second) until directional control can no longer be maintained or the first indication of a stall obtained. (See Figure 7)

OPERATING DETAILS (CONT)

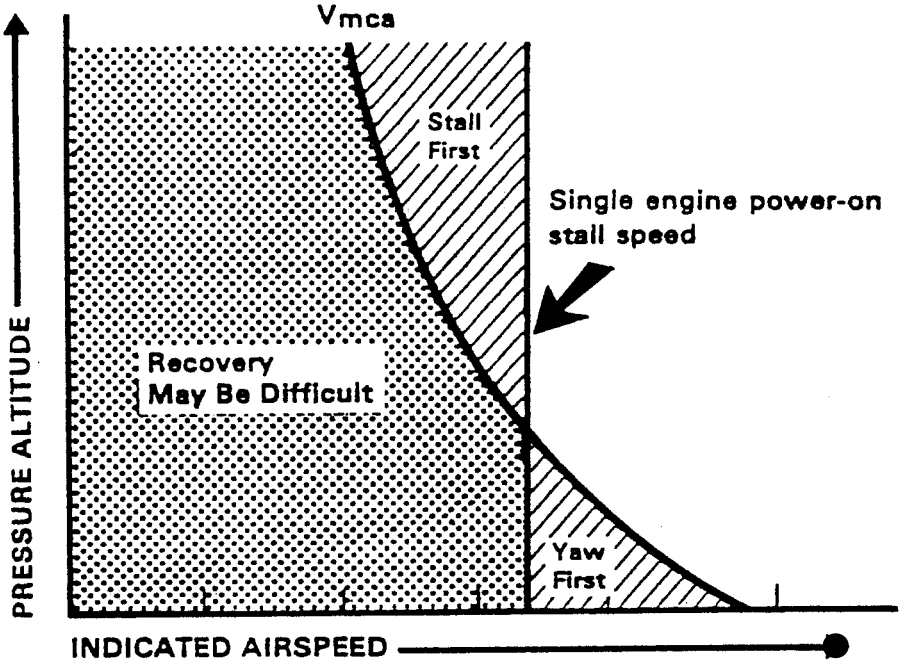


Figure 7. Relationship Between Stall Speed and V_{mca} for Aircraft with Normally Aspirated Engines

Recovery from flight below V_{mca} is made by reducing power to idle on the operating (good) engine, decreasing the angle of attack by dropping the nose, accelerating through V_{mca}, and then returning power to the operating engine and accelerating to V_{yse}, the blue radial speed.

Best Single Engine Rate-of-Climb Speed (V_{yse})

V_{yse} is designated by the blue radial on the airspeed indicator. V_{yse} delivers the greatest gain in altitude in the shortest possible time, and is based on the following criteria:

- critical engine inoperative, and its propeller in the minimum drag position.
- operating engine set at not more than maximum continuous power.
- landing gear retracted.
- wing flaps in the most favorable (i.e., best lift/drag ratio) position.
- cowl flaps as required for engine cooling.
- airplane flown at recommended bank angle.

Drag caused by a windmilling propeller, extended landing gear, or flaps in the landing position will severely degrade or destroy single engine climb performance. Single engine climb performance varies widely with type of airplane, weight, temperature, altitude and air-

OPERATING DETAILS (CONT)

plane configuration. The combined gradient (altitude gain or loss per mile) may be marginal - or even negative - under some conditions. Study the "Pilot's Operating Handbook" for your specific airplane and know what performance to expect with one engine out. Remember, the Federal Aviation Regulations do not require any single engine climb performance for light twins that weight 6,000 pounds or less or that have a stall speed of 61 knots or less.

Best Single Engine Angle-of-Climb Airspeed (V_{xse})

V_{xse} is used only to clear obstructions during initial climb-out as it gives the greatest altitude gain per unit of horizontal distance. It provides less engine cooling and requires more rudder control than V_{yse}.

SINGLE ENGINE SERVICE CEILING

The single engine service ceiling is the maximum altitude at which an airplane will climb, at a rate of at least 50 feet per minute in smooth air, with one engine feathered. New "Handbooks" show service ceiling as a function of weight, pressure altitude and temperature while the old "Flight Manuals" frequently use density altitude.

The single engine service ceiling chart should be used during flight planning to determine whether the airplane, as loaded, can maintain the Minimum Enroute Altitude (MEA) if IFR, or terrain clearance if VFR, following engine failure.

BASIC SINGLE ENGINE PROCEDURES

Know and follow, to the letter, the single-engine emergency procedures specified in your "Pilot's Operating Handbook" for your specific make and model airplane. However, the basic fundamentals of all the procedures are as follows:

- Maintain aircraft control and airspeed at all times. **This is cardinal rule No. 1.**
- Usually, apply maximum power to the operating engine. However, if the engine failure occurs during cruise or in a steep turn, you may elect to use only enough power to maintain a safe speed and altitude. If the failure occurs on final approach, use power only as necessary to complete the landing.
- Reduce drag to an absolute minimum.
- Secure the failed engine and related sub-systems.

OPERATING DETAILS (CONT)

The first three steps should be done promptly and from memory. The check list should then be consulted to be sure that the inoperative engine is secured properly and that the appropriate switches are placed in the correct position. The airplane must be banked into the live engine with the "slip/skid" ball out of center toward the live engine to achieve "Handbook" performance.

Another note of caution: Be sure to identify the dead engine, positively, before feathering it. Many red faced pilots - - both students and veterans alike - - have feathered the wrong engine. Don't let it happen to you. Remember: First, **identify** the suspected engine (i.e., "Dead foot means dead engine"); second, **verify** with cautious throttle movement; then feather. But be sure it is dead and not just sick.

ENGINE FAILURE ON TAKE-OFF

If an engine fails before attaining lift-off speed, the only proper action is to discontinue the take-off. If the engine fails after lift-off with the landing gear still down, the take-off should still be discontinued if touch-down and roll-out on the remaining runway is still possible.

If you do find yourself in a position of not being able to climb, it's much better to pull the power on the good engine and land straight ahead than try to force a climb and lose control.

"Pilot's Operating Handbooks" have charts that are used in calculating the runway length required if the engine fails before reaching lift-off speed and may have charts showing performance after lift-off such as:

- Accelerate-Stop Distance. That's the distance required to accelerate to liftoff speed and, assuming failure of an engine at the instant that liftoff speed is attained, to bring the airplane to a full stop.

- Accelerate-Go Distance. That's the distance required to accelerate to liftoff speed and, assuming failure of an engine at the instant liftoff speed is attained, to continue the take-off on the remaining engine to a height of 50 feet.

Study your accelerate-go charts carefully. No airplane is capable of climbing out on one engine under all weight, pressure altitude and temperature conditions. Know, before you take the actual runway, whether you can maintain control and climb-out if you lose an engine while the gear is still down. It may be necessary to off-load some weight, or wait for more favorable temperature or wind conditions.

OPERATING DETAILS (CONT)

WHEN TO FLY Vx, Vy, Vxse AND Vyse

During normal two-engine operations, always fly Vy (or Vx if necessary for obstacle clearance) on initial climb-out. Then, accelerate to your cruise climb airspeed, which may be Vy plus 10 to 15 knots after you have obtained a safe altitude. Use of cruise climb airspeed will give you better engine cooling, increased inflight visibility and better fuel economy. However, at the first indication of an engine failure during climb-out, or while on approach, establish Vyse or Vxse, whichever is appropriate. (Consult your "Handbook" or "Flight Manual" for specifics.)

SUMMARY

Know the key airspeeds for your airplane and when to use them:
- Vmc (Red Radial) - never fly at or near this airspeed except in training or during flight test situations.
- Vsse - never intentionally cut an engine below this airspeed.
- Vyse (Blue Radial) - always fly this airspeed during a single engine emergency during climb-out (except when necessary to clear an obstacle after take-off) and on final approach until committed for landing.
- Vxse - Fly Vxse to clear obstacles, then accelerate to Vyse.

Know the performance limitations of your airplane, including its:
- accelerate-stop distances,
- accelerate-go distances,
- single engine service ceiling, and
- maximum weight for which single engine climb is possible.

Know the basic single engine emergency procedures:
- Maintain control of the airplane by flying at the proper airspeed.
- Apply maximum power, if appropriate.
- Reduce drag (includes feathering).
- Complete engine-out checklist.

And finally, put your knowledge into practice with a qualified instructor pilot observing and assisting you. Engine failures can be handled competently and safely by proficient pilots. Keep your proficiency up and every flight in a multi-engine airplane should be a safe one.

NOTE

Remember that the MU-2B-60 airplane propeller rotates such that the right engine is the critical engine. Therefore, the information in the preceding article as pertains to critical engine must be interpreted in this manner. In the event of an engine failure, use rudder to get the balance ball to a near centered position. Next, use sufficient lateral control wheel to maintain control of the airplane. Once under control, trim out any remaining control wheel deflection with the trim aileron system to achieve the best climb performance. This results in a condition where the wings are either approximately level or in a shallow bank into the operating engine. All other information is technically correct.

OPERATING DETAILS (CONT)

PREFLIGHT CHECK

The exterior check items presented in NORMAL PROCEDURES, Section 5 of the FAA Approved Airplane Flight Manual should be covered prior to the first flight of the day; subsequent flight check items may be normally limited to important ones, for example, tail surface hinges, fuel and oil quantity, security of fuel and oil filler cap, etc.

CAUTION

WHEN CHECKING THE ENGINE FOR FREE ROTATION, CHECK BY PULLING THE PROPELLER THROUGH IN THE NORMAL DIRECTION OF ROTATION ONLY.

If the airplane has had recent major maintenance, been in storage or has been operated from unusual fields, more extensive inspection should be performed as indicated in succeeding steps.

1. After major maintenance:

   Pay particular attention to smooth and correct movement of flight and trim tab controls. Check external static ports for obstructions if the airplane has been waxed or polished.

2. After storage:

   Check particularly for dents and scratches on wing, tip tank, fuselage, and tail surfaces, damage to navigation and landing lights, deicing boots, and radio antennas, and for water or obstructions in pitot-static system lines, fuel system, and vents.

3. After operation from abnormal fields:

Rough ground or cinder fields:	Check all components of the landing gear retracting mechanism, shock struts, torque linkage, tires and brakes for damage. Inspect inlets for turbine damage. Check leading edge and underside of stabilizer and elevator for damage. Pay extra attention to propeller tips.
Snow covered fields:	Remove ice and/or snow completely. In case of outdoor parking in low ambient temperature, make certain that the tires are not frozen to the ramp. If necessary, rotate tires 1/2 turn from parked position. Taxi or tow to remove deformation from tires. If deformation remains, change tires prior to flight.

OPERATING DETAILS (CONT)

PREFLIGHT CHECK (CONT)

The interior inspection depends upon the flight mission and optional equipment installed. The general inspection of the oxygen system, prior to high altitude flight, is very important. Check the quantity of oxygen, condition of face masks and hoses and the oxygen supply. Checking static, pitot and stall warning anti-icing systems for proper operation is indispensable. The stall vane heat circuit is independent from other circuits and operation may be verified by loadmeter indication. The pitot head and static port circuits are connected near the loadmeter and meter indications are for LH pitot/static and RH pitot/static. The pitot head heater draws approximately 2 to 3 times as much current as the static port and it is possible to have meter indications within the specified range (see NORMAL PROCEDURES, Section 5 of the FAA Approved Airplane Flight Manual) and have a heated static port failure. However, failure can be detected if the following is observed.

System operation may be confirmed by switching the loadmeter from LH to RH and comparing the readings to each other and with the values as listed in Section 5 of the FAA Approved Airplane Flight Manual. Current draw from each system will vary with the ambient temperature and will be considerably higher if extremely cold. If unfamiliar with the normal current draw for the prevailing temperature or if any discrepancy is noted between LH and RH, or as stated in Section 5 of the FAA Approved Airplane Flight Manual, system operation should be confirmed by cautiously feeling to verify the heating function.

CAUTION

DO NOT EXCEED GROUND OPERATION TIME LIMITS AS LISTED IN NORMAL PROCEDURES, SECTION 5 OF THE FAA APPROVED AIRPLANE FLIGHT MANUAL.

STARTING ENGINES

CAUTION

TO PREVENT POSSIBLE ENGINE DAMAGE DUE TO THERMAL DISTORTION, INSURE ENGINE WILL TURN FREELY BY HAND BEFORE STARTING IS ATTEMPTED.

It is very important to clear the airplane properly before starting engines. Since it is difficult to make certain from the cockpit whether ground crew personnel are in a danger area or not, utilize some signal from a responsible ground crew member, for example "raising hand", "thumbs up", etc. An external power source for starting engines is recommended in cold weather. When a battery start is to be made, it is recommended to place the Battery Select switch to SERIES when outside air temperature is less than 10°C (50°F).

OPERATING DETAILS (CONT)

STARTING ENGINES (CONT)

NEGATIVE TORQUE SENSOR CHECK

This check shall be accomplished prior to the first flight of the day or as required in accordance with NORMAL PROCEDURES, Section 5 of the FAA Approved Airplane Flight Manual. Flight must not be attempted if the NTS check is not satisfactory.

OVERSPEED GOVERNOR CHECK

This check should be accomplished prior to the first flight of the day, for any flight when air starts are to be intentionally made, if there is an indication of malfunction, or when any maintenance or adjustments involving the engine control system have been performed. The propeller must be locked. If engine speed will not increase above 100% rpm or **BETA RANGE** annunciator extinguishes, propeller pitch locks are probably disengaged. To reengage locks, stop engine, then restart with the power lever advanced slightly further forward than in the previous start. Repeat governor check. Limit operation at speeds over 100% rpm to the minimum necessary to make the overspeed governor check. Refer to NORMAL PROCEDURES, Section 5 of the FAA Approved Airplane Flight Manual for OSG check and limitations.

ENGINE GROUND RUN

When necessary for the airplane engines to be operated on the ground for various maintenance checks, they should be performed with the airplane headed into the prevailing wind if possible. Ground operations performed with a tailwind may result in exhaust gas recirculation and above normal engine temperatures resulting in possible engine damage.

TAXIING

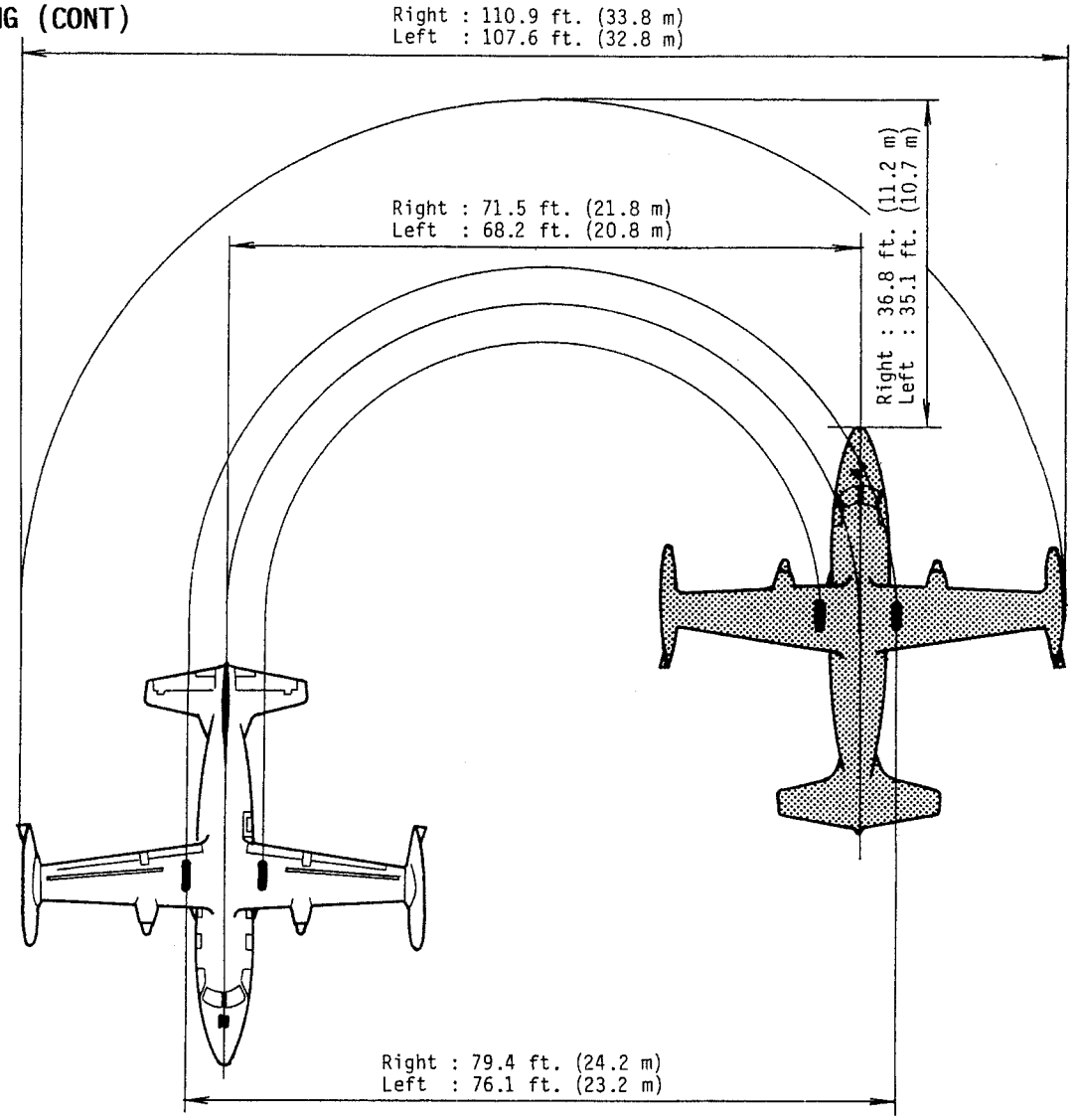
During taxiing, control is provided by the steerable nose wheel mechanism to 23° left and 22° right of center. Use of the rudder and application of differential braking on the main wheels are also available. Control by means of nose wheel steering is recommended whenever practical.

In the early stage of taxi run, brakes should be checked for any unusual reaction such as uneven braking and spongy feel. If the brakes do not show satisfactory response, stop taxiing immediately and repair the malfunction.

If excess speed is attained, reverse thrust may be used by pulling back the power levers slightly over ground idle detent to slow down taxiing speed.

OPERATING DETAILS (CONT)

TAXIING (CONT)



Minimum Turning Distance (Typical)
Figure 3-27

BEFORE TAKEOFF

Make sure that the preflight check items have been covered as outlined in NORMAL PROCEDURES, Section 5 of the FAA Approved Airplane Flight Manual. A simple last minute recheck of important items should include circuit breakers, master caution light, heading indicator, trim indicator, switch panels, and proper position of the start selector switch and condition levers. Air conditioning and pressurization system shall be turned to the ram air ventilation mode to obtain maximum takeoff performance.

OPERATING DETAILS (CONT)

BEFORE TAKEOFF (CONT)

Normally set the cabin air selector switch in RAM for ram air ventilation. Placing the cabin air selector switch in OFF position for a short duration as an alternate for ram air ventilation is permissible.

WARNING

STANDING WATER OR SLUSH ON RUNWAY MAY CAUSE ENGINE FLAME-OUT. ACTIVATE CONTINUOUS IGNITION SWITCHES BEFORE TAKEOFF AND OBSERVE DUTY CYCLE.

TAKEOFF

When ready for takeoff, slowly move the condition levers to the TAKEOFF LAND position and lock. Smoothly advance the power levers toward the TAKEOFF position until takeoff power is achieved. Takeoff data is provided in PERFORMANCE, Section 6 of the FAA Approved Airplane Flight Manual using torquemeter (including exhaust gas temperature) as the basic reference. On takeoff under normal circumstances, allow the airplane to accelerate in the level attitude. When the indicated airspeed reaches computed V_R speed apply sufficient back pressure on the elevator control to establish a maximum 13° pitch attitude. Airplane will lift off and accelerate to normal climb speed. After the airplane is safely airborne, gear retraction can be completed. A slight coordinate turn into the wind should be made to correct for drift. After takeoff, air conditioning and pressurization can be operated.

CLIMB

It is impossible to specify all climb procedures because of variations in practical consideration. Choose a type of climb in accordance with individual circumstances. Refer to the climb performance data presented in Section 4, Flight Planning Data. In general, a best rate of climb speed with recommended cruise power will attain desired cruising altitude quickly and with the best fuel economy.

It is recommended to climb within turbine temperature limit in recommended cruise power under normal conditions. Although power can be safely set by charts, monitor engine instruments and maintain engine operation within the limits. After takeoff from wet runway, if sub-freezing outside temperature is anticipated, it is recommended to cycle the landing gear two or three times to prevent freezing of landing gear and/or doors. Observe AIRSPEED LIMITATIONS (CAS), Section 2 of the FAA Approved Airplane Flight Manual for landing gear operational speeds.

OPERATING DETAILS (CONT)

CRUISE

When cruising altitude is reached and the condition levers are repositioned, first retard the power levers slightly so that no EGT limits will be exceeded. Move the condition levers to any point between TAKEOFF LAND (100% rpm) and MIN CRUISE (96% rpm) as desired during cruise. Normally MIN CRUISE position is recommended. There is no single cruise speed recommended for all situations, but choice of airspeed, or choice of power setting is primarily determined by the purpose of the flight.

For cruise power settings, high speed level flight and maximum mileage per gallon of fuel, refer to charts provided in Section 4, Flight Planning Data.

Maximum range profile is also presented in Section 4 to give a rough estimate of range corresponding to various cruising altitudes.

If fuel has been consumed at an uneven rate between the tip tanks, balance the fuel loads by switching off the tip tank with lesser fuel.

STALLS

The stall characteristics of the MU-2 are conventional in all configurations. Control wheel shaking is generated by the stall warning system between 4 kts and 9 kts above the stalling speed in all configurations. Landing gear and flap position have little influence on the stall characteristics except that stall speed is lowered in proportion to the degree of flap extension. The stall warning system must be kept operational at all times and must not be deactiviated by interruption of circuits, circuit breakers or fuses. Compliance with this requirement is especially important in multi-engine airplanes during engine-out practice or demonstrations because the stall speed is critical in all low speed operations. The proper function of the stick shaker stall warning system is particularly important in the case of airplanes which display a minimum of aerodynamic buffeting prior to stall. Power off stall speeds at maximum gross weight are presented in PERFORMANCE, Section 6 of the FAA Approved Airplane Flight Manual. Average altitude loss to recover from stall is as follows:

Power ON	Level Flight:	220 feet
Power OFF	Level Flight:	475 feet

If the airplane is allowed to become fully stalled while one engine is providing lift producing thrust, a rapid rolling and yawing motion may develop even against full spoiler and rudder deflection, resulting in the airplane becoming inverted during the onset of a spinning motion.

OPERATING DETAILS (CONT)

SPINS

Intentional spins are prohibited in this airplane and should be avoided. Should an inadvertent spin be encountered, the following recovery procedure should be employed.

1. Retard both power levers to FLIGHT IDLE.

2. Apply full rudder opposite the direction of rotation and hold.

3. Push control wheel briskly forward.

4. When rotation stops, neutralize controls and pull out of the dive by applying steady back pressure on the control wheel.

WARNING

MOST UNSUCCESSFUL SPIN RECOVERIES ARE THE RESULT OF NOT WAITING LONG ENOUGH FOR THE CONTROLS TO BECOME EFFECTIVE.

MANEUVERS

The MU-2 operates under the NORMAL category of aircraft and no acrobatic maneuvers are approved for this airplane. Always remember that extra alertness and pilot techniques are required for slow flight maneuvers including the practice or demonstration of stalls or V_{mca}.

Be certain that the center of gravity of the airplane is as far forward as possible. Forward C.G. aids stall recovery.

Whenever a student pilot is required to practice slow flight or single engine maneuvers, be certain that the qualified instructor pilot has a full set of operable controls in front of him. FAA regulations prohibit flight instruction without full dual controls.

Remember that an airplane at or near traffic pattern and approach altitudes cannot recover from a spin before impact with the ground. When descending to traffic altitude and during pattern entry and all other flight operations, maintain a speed no lower than V_{sse}. On final approach maintain at least the airspeed computed from the Airplane Flight Manual. Should a go around be required, do not apply more power than necessary until the airplane has accelerated to V_{sse}.

Remember that if an airplane flown under instrument conditions is permitted to stall or enter a spin, the pilot, without reference to the horizon, is certain to become disoriented. He may be unable to recognize a stall, spin entry or the spin condition and he may be unable to determine even the direction of the rotation.

OPERATING DETAILS (CONT)

DESCENT

Passenger comfort requires a low rate of descent; however, descent conditions will often be determined by weather conditions and air traffic control instructions. Typical descent data is presented in Section 4, Flight Planning Data. Select a cabin altitude of 1,000 feet above the airport elevation to avoid landing with the cabin pressurized. Rapid descent from high altitude to high temperature may sometimes result in wing surface ice accumulation due to cold fuel. This must be removed prior to subsequent takeoff.

LANDING

WARNING

STANDING WATER OR SLUSH ON RUNWAY MAY CAUSE ENGINE FLAMEOUT. ACTIVATE CONTINUOUS IGNITION SWITCHES BEFORE LANDING AND OBSERVE DUTY CYCLE.

BEFORE LANDING

Before landing, plan to enter the landing pattern with an indicated airspeed which will allow immediate landing gear extension. Landing gear extension is easily checked by the motor noise during operation. Illumination of the gear down indicator lights (green) indicate the gear is down and locked. In the event of failure to extend the landing gear during approach, aural warning is provided by the landing gear warning horn when either power lever is near FLIGHT IDLE. Just before landing, cabin differential pressure should be zero. If differential pressure remains, turn the manual pressure control valve to DEC to depressurize.

CAUTION

UNDER LOW VISABILITY CONDITIONS, LANDING LIGHTS MAY CAUSE DISORIENTATION REFLECTIONS.

NORMAL LANDING

Normal landings are made with 20° or 40° flaps, at a computed approach speed. As the airplane approaches touch down, progressively reduce power for adequate rate of sink control, and start flare out, rotating the airplane to a nose up attitude with back pressure on the elevator control.

WARNING

USE OF 40° WING FLAPS FOR LANDING CONSIDERABLY RESTRICTS THE GO AROUND CAPABILITY SHOULD AN ENGINE FAILURE OCCUR IN THE APPROACH OR LANDING PHASE.

OPERATING DETAILS (CONT)

LANDING (CONT)

NORMAL LANDING (CONT)

Under a slight power on condition, land the airplane on the main gear maintaining a slightly nose up attitude. As the airplane decelerates, lower the nose landing wheel to the runway. Just after nose landing gear touch down, move the power levers to GROUND IDLE. During landing roll heavy braking should be avoided as this may cause the main wheels to skid, resulting in serious damage to the tires.

Engine reverse operation may be employed to shorten the landing roll. When using reverse after landing on grass or rough fields, dust and solid particles may be thrown up in front of the propeller and enter the engine. To avoid foreign object damage, it is advisable to use reverse for a short time only or, under extreme rough conditions, not at all.

NOTE

When landing with an asymmetric fuel condition, increase computed V_{REF} by 10 KIAS.

When landing with ice accumulation on the wings increase V_{REF} by 15 KIAS.

CROSSWIND LANDING

Increase V_{REF} for crosswind landings by one-half the steady wind speed plus one-half the gust speed not to exceed V_{REF} plus 10 KIAS.

A wing low method, crab method, differential power method or a combination of methods may be employed during the approach to compensate for the effects of a crosswind. The landing should be made in as nearly a level attitude as possible and the nose wheel should be lowered to the runway as soon as possible. During the ground roll, maintain a straight course using the steerable nose wheel and use brakes as required if extreme crosswinds exist.

NOTE

Center rudder pedals prior to lowering the nose gear to the runway.

NIGHT LANDING

Night landing procedure is essentially identical to the normal landing procedure. However, it is recommended that the landing light be switched ON early in order to become accustomed to the effect of the light.

A power on landing is recommended because depth perception is decreased during the semi-darkness of the night. A power on landing allows a slower rate of descent, a lighter touch down, and rapid acceleration if the need for a go around should arise.

OPERATING DETAILS (CONT)

LANDING (CONT)

STOPPING ENGINES

Engine shutdown should be accomplished in accordance with STOPPING ENGINES, Section 5 of the FAA Approved Airplane Flight Manual. Engaging propeller pitch locks is important in the shut down procedure. To engage the locks, hold the Run-Crank-Stop switches in STOP until the rpm drops just below 50%, then move the power levers to REVERSE and hold until the engines decelerate to 18% rpm, then the power levers may be moved as desired. If this step is neglected, the propeller will feather. To unfeather, place power lever to reverse, press the unfeather switch and hold until the propeller is on the locks.

ENGINE SHUTDOWN/MAXIMUM COOLING FOR ANTICIPATED RESTART

Whenever a short stopover is required, the following procedures should be used in conjunction with the FAA Approved Airplane Flight Manual procedures:

1. Allow engines to run a minimum of 3 minutes before shutdown, including taxi time or use a combination of taxi and ground run time. For ground run, head airplane into the wind and position power levers to maintain a slight forward thrust for maximum cooling.

2. Head airplane into the wind (if possible) before shutdown so that maximum cooling can be achieved while parked.

3. During shutdown, as soon as propellers are on locks (at 20% to 18% rpm), position the power levers to slightly above flight idle to increase coast down time.

4. Approximately 10 minutes before restarting, observe engine compressor section and slowly rotate propeller (approximately one blade width) to position engine compressor 180° from shutdown position. If engine rotates normally, a restart may be initiated in the normal sequence.

If rotation produces abnormal noise and/or drag is encountered, do not attempt a restart. Allow engine to remain stationary while performing normal pre-flight or for approximately 10 minutes, then slowly rotate propeller (approximately 2 blade widths) until compressor section rotates one revolution. If a slight drag is present or abnormal noises occur, rotate propeller until the engine feels free with no abnormal noise.

OPERATING DETAILS (CONT)

STOPPING ENGINES (CONT)

ENGINE SHUTDOWN/MAXIMUM COOLING FOR ANTICIPATED RESTART (CONT)

NOTE

Rotate propeller in normal direction of rotation only.

For extreme conditions, the propellers may be slowly rotated by hand after shutdown to increase airflow through the engine which produces a more uniform cooling.

CAUTION

DO NOT ATTEMPT RESTART UNTIL PROPELLER ROTATES FREELY WITH NO ABNORMAL NOISE.

IF A RESTART IS ATTEMPTED PREMATURELY, IT MAY RESULT IN STAGNATED ACCELERATION ACCOMPANIED BY A RAPID INCREASE IN ITT/EGT. IN EXTREME CASES, THE ENGINE ROTATING GROUP MAY BE DAMAGED.

COLD WEATHER OPERATION

Prior to your normal preflight operation, remove all ice, snow, and frost from the wing, empennage, propellers, engine air intakes, control surfaces, windshield, pitot heads, static ports and fuel tank vents.

Icing in the engine air intake reduces engine horsepower and icing on propellers reduces their thrust. Icing increases takeoff speed, stall speed, V_{MC}, reduces rate-of-climb, increases power setting requirements and fuel consumption, while decreasing range and maneuverability. Icing in the oil cooler air intake reduces the capability of the oil cooler. When ice and snow are removed, pay particular attention to the freedom of movement of the control surfaces to ensure no hidden obstructions exist. If it's impossible to remove these ice formations, DO NOT FLY THE AIRPLANE.

In proceeding to the run up area, avoid taxiing through water puddles or accumulations of slush, etc. Water splashed on the wings and fuselage will freeze, increasing drag and decreasing lift. If standing water or slush is on the active runway, use continuous ignition for takeoff within the limits of the duty cycle. If water has been splashed on the landing gear down locks during taxi and takeoff, there is the possibility that water will freeze on the down locks after retraction of the gear, preventing them from engaging when the gear is lowered. If the down locks do not engage, you will get an

OPERATING DETAILS (CONT)

COLD WEATHER OPERATION (CONT)

unsafe indication on the switch panel. If this happens, initiate a go around and cycle the landing gear until the safe indication is received.

NOTE

It is recommended to utilize external power source, because of higher cranking power required, when starting engines at lower ambient temperatures.

When landing on a slush or ice covered runway, retract the flaps immediately after positive touch down in order to prevent flap damage resulting from particles thrown against them by the wheels or prop wash. Also utilize continuous ignition within the limits of the duty cycle.

During landing roll, use the brakes sparingly and apply them cautiously to avoid skidding, while utilizing the reverse pitch effect of the propellers. Apply only enough brake pressure to slow the wheels. Do not lock them. When you have slowed the airplane and are ready to turn off the active runway, use rudder and nose wheel steering and, if necessary, differential power of engines for directional control. When parking the airplane, place chocks under all wheels and DO NOT set the parking brake.

FLIGHT IN ICING CONDITIONS

Operation in icing conditions has several effects on all airplanes. Ice accumulation on an airplane increases buffet/stalling speeds and airframe drag. Ice on propellers reduces thrust at the same indicated torque. These effects, in turn, result in reduced climb capability, reduced airspeed capability, increased power setting requirements, and increased fuel consumption. In accordance with MU-2B Airplane Flight Manual procedures, a minimum airspeed of 180 KIAS must be maintained in sustained cruise and additional speed should be carried on landing approach whenever any residual ice is on the airframe. Procedural changes are also presented in the Airplane Flight Manual for operation in icing. Due to these effects it is recommended the pilot avoid icing conditions whenever possible. This includes ground icing conditions where it is the pilot's responsibility to assure that the airframe, engines and propellers are free of snow and ice prior to engine start and prior to take off.

The MU-2B is equipped with several systems designed to protect the airplane from hazards that may be encountered in icing conditions as defined in the Federal Aviation Regulations (FAR Part 25 Appendix C). Design and analysis of these systems, as well as flight experience, led to FAA approval for flight into known icing conditions. It is understood, however, that severe icing conditions exist that are beyond the FAA requirements and capability of any ice protection system. Recent data on Supercooled Large Droplets (SLD) as well as freezing rain and drizzle have shown that these conditions can overcome any ice protection system. As demonstrated in the MHI icing awareness training video, pilots must take immediate action to exit these conditions when encountered. Visual cues to the pilot are presented in the Airplane Flight Manual to aid in identifying these conditions. Flight tests of the MU-2B have shown that the certified ice protection systems provide a sufficient level of protection for the pilot to recognize and exit severe conditions. It is the pilot's responsibility to recognize and immediately act to exit severe icing conditions. It is recommended that pilots never plan a mission into icing conditions that are forecast or reported to be worse than 'light to moderate' .

OPERATING DETAILS (CONT)

FLIGHT IN ICING CONDITIONS (CONT)

Flight into known icing conditions must be conducted with care and requires the pilot to verify all required equipment identified in the Limitations section of the Airplane Flight Manual are installed and functional. When flight into icing conditions is not avoidable, all anti-icing and deicing equipment must be properly utilized. Procedures for preflight checking and operation of these systems are detailed in the Airplane Flight Manual. Preflight planning should include selecting a suitable cruise altitude that will allow diversion into warmer air and out of icing conditions should they become severe. In addition, the pilot must have sufficient fuel reserves to deal with increased fuel burn associated with potential ice accumulation on the airframe, flight path deviations around weather, altitude changes, and a suitable alternate destination. A thorough preflight briefing of reported and forecast weather, pilot reports, and ATC observations will aid in the cruise altitude selection, alternate plans and eventual 'go/no-go' decision. If there is any doubt about the severity of icing conditions, the flight should be delayed or cancelled.

When approaching areas of icing, turn on all anti-icing and continuous ignition systems before entering these conditions. In accordance with flight manual procedures, activate the wing de-ice system at the first sign of ice accumulation on the airframe, or annunciation of the ice detector, whichever occurs first. Frequently monitor airspeed and ice accumulation being alert for speed deterioration and/or signs of SLD. Pilot cues for SLD conditions are detailed in the Airplane Flight Manual.

WARNING

IF THE INDICATED AIRSPEED DETERIORATES BY 10% OF NORMAL SUSTAINED CRUISE SPEED, OR A MINIMUM OF 180 KIAS CANNOT BE MAINTAINED, THE PILOT SHOULD TAKE IMMEDIATE PRECAUTIONARY ACTION TO FLY TO WARMER AIR AND OUT OF THE ICING CONDITIONS.

No Manufacturer's Pilot Manual is intended to teach pilots how to fly. It is assumed that pilots meet the standards of regulatory agencies, such as the FAA in the United States, to be licensed to fly multi-engined aircraft in instrument meteorological conditions. In addition, MHI strongly encourages all pilots of MU-2B airplanes to attend initial and recurrent training specific to this model. Likewise the FAA has issued an AD requiring all pilots to view the MHI icing awareness training video once every two years prior to acting as pilot-in-command of a flight into known icing conditions. This requirement is meant to be an aid to the pilot in recognizing the cues of ice buildup on the aircraft that, if not attended to, could result in loss of performance and, in extreme cases, loss of control.

Pilots, as part of basic training, should know that flight in icing conditions is one of the most critical phases of flight that can be encountered. They should also know that they have a number of available systems that directly and indirectly tell them that ice is accumulating on the aircraft and/or that icing can be expected to be encountered. Some of the systems that must be frequently monitored are:

OPERATING DETAILS (CONT)

FLIGHT IN ICING CONDITIONS (CONT)

1. The airspeed indicator, which will show a decrease as ice accumulates.
2. The OAT, which will give Total air temperature. Whenever this is 10 degrees C or below and there is visible moisture, you should expect icing.
3. The radar will show areas of precipitation ahead.
4. The engine instruments may show a reduction in EGT when flying in moisture or icing conditions.
5. The DME may show a reduced ground speed.
6. The Rosemount Ice detector will announce icing with approximately 0.020 inches of ice accumulation.
7. Ice can be observed on the edges of the windshield, windshield wipers, tip tank leading edge, wing tie-down ring, wing leading edges and propeller spinner.
8. At night, ice can be observed by turning on the wing ice light, the tip tank taxi light (if installed), the windshield and looking at protuberances with a flashlight; and,
9. The autopilot trim may begin to trim frequently in the airplane nose-up direction if the autopilot is engaged and an altitude hold or rate hold mode is selected.

Prudent pilots take precautions when operating in icing conditions and monitor all systems to assure safety of operation and well being for the passengers.

The prudent pilot must remain alert to the possibility that icing conditions may exceed the capabilities of their equipment. At the first indication that such conditions may be ahead or may have been encountered, the pilot must select the most expeditious and safe course of action. The decision should be based on weather briefing, recent pilot reports and ATC observations, and his basic weather flight training.

We recommend the book WEATHER FLYING by Robert N. Buck as an excellent source for the information and knowledge essential for safe all weather flight. This book includes valuable information for identifying the most favorable altitudes for flight in known icing conditions. Before getting into ice - when icing conditions are possible - an aware pilot knows what the IAS is and the right power settings, piston or jet. Then, once in ice, these settings are observed carefully for any changes. Change in IAS is a sure way to know the ice is affecting the aircraft, and power changes say heat had better be applied quickly. The early stage is the time to do something about getting out of the ice. It is folly to plug along without flexibility of thought, and willingness to realize that one may have to fly differently, change route, go IFR, divert, or even turn back. (Pp, 61, 228) It is the inexperienced or uneducated pilot who presses on "regardless", hoping that steadily worsening conditions will improve, only to find himself flying an airplane which has become so loaded with ice that he can no longer maintain altitude. At this point he has lost most if not all of his safety options, including perhaps, a 180 degree turn to retreat along the course already traveled. The responsible and well informed pilot recognizes the limitations of his airplane and its systems and reacts accordingly.

OPERATING DETAILS (CONT)

FLIGHT IN ICING CONDITIONS (CONT)

When flight in icing conditions is unavoidable, all anti-icing and deicing equipment should be properly utilized. The pilot should select the optimum altitude to meet the specific icing circumstances with the objective to fly to warmer air and out of the icing conditions as soon as possible. Remember that a sure way to gain the attention and assistance of Air Traffic Controllers is to report icing conditions. They can be of value to you in finding more favorable flight conditions.

The pilot should incorporate these important elements into the plan for flight into icing conditions:

1. All anti-icing and de-icing systems for power plant, propeller, stall warning, and pitot-static heat systems must be turned ON before entering an icing area. In addition, engine ignition should be selected ON or CONT in accordance with flight manual procedures. Auto-ignition, if installed, should be verified in the AUTO position for aircraft not equipped with the 'continuous duty cycle' ignition boxes per SB 086/74-002.
2. WINDSHIELD HI HEAT switch shall be turned ON for ice removal only. The windshield wiper may be used at the same time to remove melted ice.

NOTE

Do not operate wiper on a dry windshield or above 175 KIAS.

3. Select WING DE-ICE switch ON at the first sign of ice accumulation on the airframe, or annunciation of the ice detector (SB 80/30-003), in accordance with FAA AD 2000-09-15 (see the Limitations section of the Airplane Flight Manual). System shall remain in the automatic mode until the airplane has exited that icing condition and the airframe is clear of ice. During icing conditions, monitor ice accumulation/shedding on the wings. If deicing effect in the automatic mode is not satisfactory due to extreme icing conditions, repetition of intermittent manual operation may be required. However, very rapid manual cycling of the wing and tail deice boots (less than 16 seconds) reduces deicing efficiency.
4. Minimum sustained cruise speed in icing conditions is 180 KIAS. Use engine power as required to maintain normal cruise airspeeds. If unable to maintain 180 KIAS, sacrifice altitude to maintain airspeed. Change altitude and/or course as required to exit icing conditions. The pilot must monitor airspeed closely when using the autopilot in any of the hold modes to assure the airspeed does not slow below 180 KIAS during cruise flight. Autopilot use in some icing conditions is prohibited by the AFM.
5. Holding in icing conditions should be avoided. If assigned to hold in moderate or severe icing conditions the pilot should advise ATC and request an altitude and/or course change. If icing is unavoidable, hold with flaps and gear UP. Do not allow the airspeed to slow below 180 KIAS and expect increased engine power requirements. Ice may collect behind the leading edge boots on the lower surface of the wing. This increases the power requirement and should be closely monitored. The pilot should disconnect the autopilot occasionally to verify flight characteristics with any residual ice accumulation. Hold control wheel firmly prior to disconnecting the autopilot to assure no unusual characteristics.

OPERATING DETAILS (CONT)

FLIGHT IN ICING CONDITIONS (CONT)

6. Flap and gear extension should be performed as late as practical when in icing conditions to minimize ice formation. On approach, cycle the wing deice boots to clear the accumulated ice then select the system OFF to preclude boot inflation on landing. If there is any residual ice on the wings, increase landing approach speed by at least 15 kts.
7. Monitor wing leading edges, windshield, engine air inlet, wing tip tank leading edge, and propeller spinner for icing buildup inflight. If any of the indications of SLD identified in the Airplane Flight Manual are noted, immediate action must be taken to exit the conditions. Likewise, if the pilot sees any indication that the ice protection systems are not able to cope with the icing conditions, or an uncommanded speed decrease, immediate action must be taken to exit the icing conditions.

If icing conditions are inadvertently encountered (for example high altitude flight in the summer), or if ice has been permitted to collect on the engine air intake, activate Continuous Ignition switches immediately. Then turn one Engine Intake Anti-Ice switch ON. Assure proper operation of that engine prior to selecting the Engine Intake Anti-ice switch ON for the other engine. When proper operation of both engines is assured, and all of the ice is removed from the inlet and propeller spinner, the ignition switches can be returned to 'AUTO' (SB 86/74-002).

If ice has been permitted to build on the engine air intake do not activate even one engine air intake anti-ice system unless you are certain that control can be maintained on one engine. Assure that continuous ignition is ON or CONT and change flight condition to assure control can be maintained in event of one engine failure. Refer to Abnormal Procedures, "Inadvertent Icing Encounter" in the Airplane Flight Manual for the complete procedure.

If ice accumulates in the engine air intake(s), engine flameout may occur when the airplane flies from colder temperatures to warmer temperatures, such as in a descent. Ignitions should be ON or CONT(aircraft with continuous duty ignition boxes) or AUTO(aircraft without continuous duty boxes) to initiate a relight.

In unusually severe icing conditions, propeller icing can be a problem that is only indicated by a rapid speed decrease (.2 to .5 kts per sec.). This speed change has been observed with relatively benign appearing ice accumulations on the airframe but video coverage of the propeller showed ice accumulation on the leading edge of each propeller blade. Ice on the propeller reduces propeller efficiency and has the same effect as a significant drag increase on the airframe. Therefore, the pilot must have constant 'airspeed awareness' when in heavy icing conditions and have a plan to exit these conditions if encountered.

The Airplane Flight Manual presents expanded Limitations and Procedures for operation in icing. Any pilot planning a flight into known or forecast icing must be familiar with this information. In addition, in accordance with an FAA AD any pilot-in-command of an MU-2B planning a flight into known or forecast icing conditions must have viewed the current version of MHI icing awareness training videos and have a logbook signoff. This is for your own protection as well as your passengers well being.

OPERATING DETAILS (CONT)

FLIGHT IN ICING CONDITIONS (CONT)

MHI has provided ice protection systems for your MU-2B to minimize the risks associated with flight in icing conditions. For your own protection, these systems must be in good working order and functionally checked in the preflight. Complete flight planning for these conditions include checking for alternate altitudes, routes, alternate airports and additional fuel requirements. The most effective ice protection system is a pilot who respects the weather conditions and is prepared to take decisive action in event the weather conditions are more severe than anticipated.

GROUND HANDLING

Ground handling consists of mooring, towing and parking. When handling the airplane on the ground, observe the following:

1. If necessary, remove control surface locks during towing and taxiing.

2. Before starting engine:
   a. Remove all towing equipment.
   b. Remove control surface locks.
   c. Remove engine intake and tail pipe covers.
   d. Connect nose gear torque arm.
   e. Head the airplane into the wind and chock wheels.
   f. Keep all personnel, workstands and equipment out of the dangerous area.
   g. Set the parking brake.

MOORING AND TIE DOWN

When mooring the airplane in the open, head the airplane into the wind and proceed as follows:

1. Retract the flaps.

2. Set trim tabs in neutral position.

3. Install the external control surface locks.

4. Set the parking brake, if low ambient or freezing temperatures are not expected.

5. Chock the wheels.

6. Install the pitot tube, engine air intake, tail pipe and windshield covers (if equipped).

OPERATING DETAILS (CONT)

MOORING AND TIE DOWN (CONT)

7. If high wind conditions exist, proceed as follows:
   a. In wind conditions below 20 Kts, tie the nose wheel and tail skid to the ground.
   b. In wind conditions above 20 Kts, in addition to 'a' above, tie the wings to the ground using mooring fittings on the under surface of the wings.

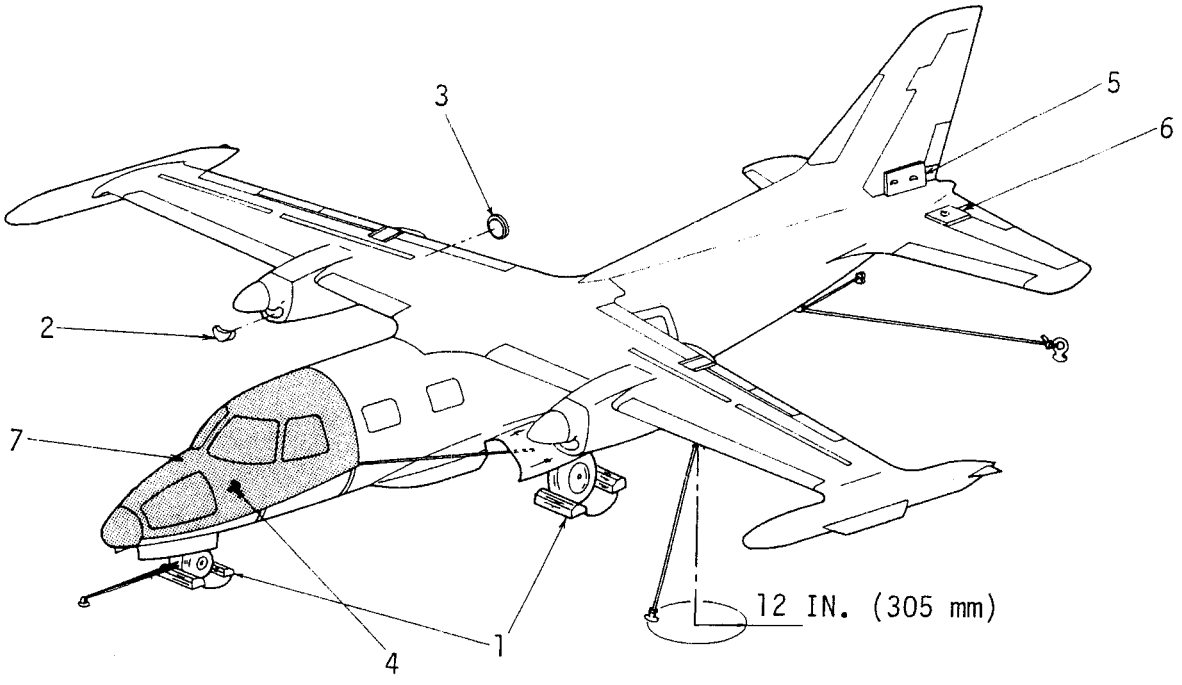
NOTE

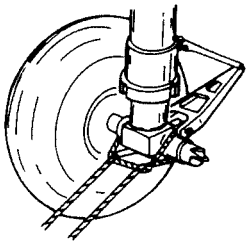
When wind velocity exceeds 60 Kts, store the airplane in a hangar.

For tie down, use rope having over 2,000 pounds tensile strength.

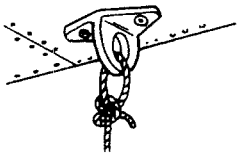
OPERATING DETAILS (CONT)

MOORING AND TIE DOWN (CONT)

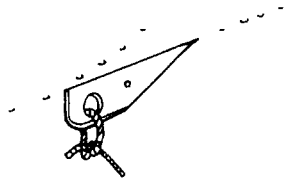




NOSE GEAR TIE DOWN



WING TIE DOWN



EMPENNAGE TIE DOWN

1. WHEEL CHOCKS
2. ENGINE INTAKE PLUG
3. ENGINE EXHAUST PLUG
4. PITOT TUBE COVER
5. RUDDER GUST LOCK PLATE
6. ELEVATOR GUST LOCK PLATE
7. WINDSHIELD COVER (IF EQUIPPED)

Mooring
Figure 3-28

OPERATING DETAILS (CONT)

TOWING

When a tow bar is attached to the nose gear, the airplane may be steered by hand and positively controlled in all ground handling operations.

Always pull or push the tow bar horizontally to keep the weight on the nose wheel for positive steering action. Do not lift the tow bar when towing. Tow the airplane in accordance with the following:

1. Remove all ground support equipment and obstacles.
2. Remove chocks from wheels. Check for normal tire pressure and strut extension.
3. Disconnect the nose gear torque arm.
4. Connect the tow bar in nose wheel axle.
5. Nose gear may be turned any direction (360°) after the torque arm has been disconnected.
6. Avoid jerky motions as serious structural damage may result.
7. Do not exceed 5 mph.

CAUTION

WHEN TOWING THE AIRPLANE, DO NOT PUSH ON THE PROPELLER, CONTROL SURFACE, FUSELAGE NOSE, TAIL CONE, NACELLES OR PITOT TUBES. DO NOT PLACE WEIGHT ON THE HORIZONTAL STABILIZER TO RAISE THE NOSE WHEEL OFF THE GROUND.

PARKING

Proceed as follows:

1. Head the airplane into the wind.
2. Install the control wheel gustlock pin which secures the elevator and spoiler in neutral position.
3. Set the parking brake.

CAUTION

DO NOT SET PARKING BRAKE WHEN THE BRAKES ARE OVERHEATED OR DURING COLD WEATHER WHEN ACCUMULATED MOISTURE MAY FREEZE.

OPERATING DETAILS (CONT)

PARKING (CONT)

4. Ground the airplane from the undersurface of wing at W.STA 3165.

5. Chock the wheels.

6. Install covers and plugs, as required.

CONTROL LOCK

The control lock for this airplane holds elevator control and spoiler control in a neutral position. The lock consists of a pin which is inserted through the control column assembly.

EXTERNAL POWER

The external power receptacle is a standard AN type plug located at the LH side of the electrical compartment marked 24V DC. If necessary, check the polarity of the external power unit as system damage may result when power is applied with reversed polarity. The battery select switch should be in the parallel position.

SERVICING

The following service procedures will help to maintain this airplane in top condition. These procedures were developed from engineering information, factory practice and the information and recommendations of engine and parts suppliers.

BATTERY

The 24 volt nickel cadmium battery can be operated in the temperature range of -65°F (-54°C) to 165°F (74°C) and accepts a charge anywhere in this range. The electrolyte does not react chemically with either the negative or positive electrode, but acts only as a current path between them. Since the electrolyte acts only as a conductor, there is no significant change in specific gravity; therefore, checking the specific gravity of the electrolyte does not indicate battery state of charging. It is recommended that electrolyte level be maintained at the top of the plate of the core assembly. To obtain continued peak performance, the battery should be kept clean and dry. The build up of metallic white-dust or any other conductive substance on the terminals will cause the cells to self-discharge.

It is advisable to flush the top of the battery with ordinary tap water. Do not attempt to clean the battery with solvents, acids or any chemical solution. Do not use wire brushes.

SERVICING (CONT)

BATTERY (CONT)

After cleaning, any excess liquid should be drained and the battery should be permitted to dry.

When battery servicing is required, connect a constant current power source. A charging rate of 8 amperes for seven hours is preferred, but higher currents with a shorter time may be used if within the battery manufacturer's specifications.

When batteries are installed in the airplane, charging is accomplished by the airplane generators. Charging rate must not exceed a maximum inrush of 200 amperes.

CAUTION

THE ELECTROLYTE OF THIS BATTERY IS ALKALINE. AVOID CONTAMINATION OF THE ELECTROLYTE FROM ACID LADEN HYDROMETERS, ETC. ADD ONLY DISTILLED WATER TO THE ELECTROLYTE.

See Maintenance Manual for battery servicing details.

LANDING GEAR

SHOCK STRUT

To check the hydraulic fluid level in the air-oil shock strut, first release the air pressure through the air valve.

WARNING

NEVER ATTEMPT TO REMOVE THE AIR VALVE UNTIL AIR PRESSURE IS COMPLETELY RELEASED.

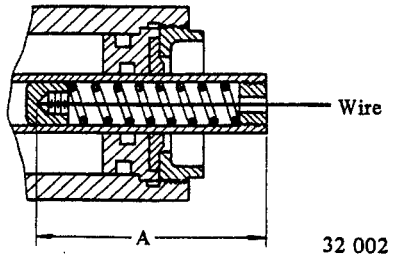
Remove the air valve and bring the fluid level up to the bottom of gauge tube on the nose strut and up to the air valve port on the main strut.

Replace the air valve. Inflate the main strut to 510 psi. Inflate the nose strut to 190 psi.

See identification plate on strut in the static condition on the ground.

SHIMMY DAMPER

Check fluid quantity by inserting a wire (0.040 in. dia) into the piston rod. If length A (normally 3.29 in.) reaches 3.94 in., fill with MIL-H-5606 hydraulic fluid.



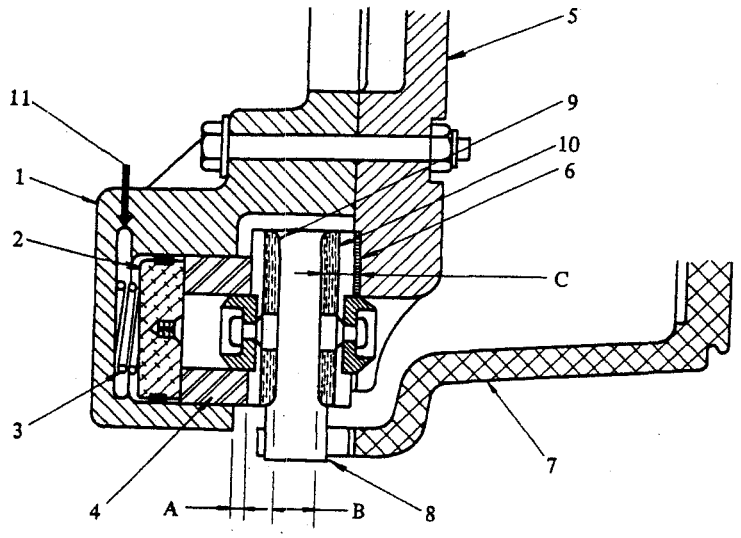
SERVICING (CONT)

LANDING GEAR (CONT)

BRAKE

Brake lining adjustment is automatic; therefore, it is not necessary to periodically adjust the brake clearance. Lining wear can be visually checked and verified by using a feeler gauge. Normal visual inspection is made from the aft side of brake assembly and consists of checking dimension A, which is the distance between the piston housing and lining assembly.

Check the hydraulic fluid level in the brake reservoir regularly. When it is below the end of the level gauge, fill with MIL-H-5606 hydraulic fluid to the middle of level gauge.



1. PISTON HOUSING
2. PISTON
3. SPRING
4. PISTON INSULATOR
5. TORQUE PLATE
6. INSULATOR
7. WHEEL
8. DISC
9. BRAKE LINING
10. CARRIER LINING
11. BRAKE PRESSURE

A More than 0.34 in. (8.5 mm) with park brake set (Replace Linings)
B Minimum thickness 0.30 in. (7.6 mm)
C Minimum thickness 0.19 in. (4.8 mm) brake and carrier lining

Braking lining inspection
Figure 3-29

SERVICING (CONT)

LANDING GEAR (CONT)

TIRES

Inflate nose gear tires ..... 55 psi
Inflate main gear tires ..... 40 - 74 psi

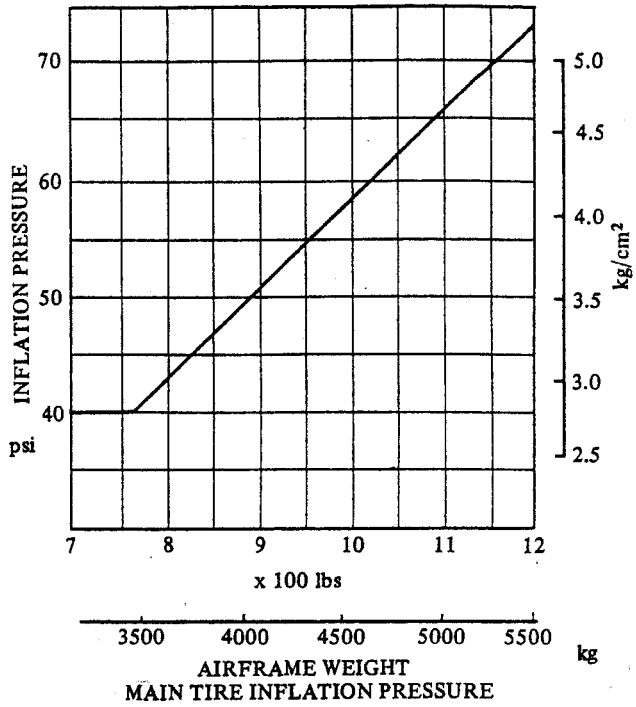


Figure 3-30

FUEL SYSTEM

REFUELING

There are filler ports on top of the wing in the main outboard tanks and outer tanks for servicing the wing tanks, and a filler port on the upper surface of each tip tank for servicing the tip tanks.

1. Ground the refueling nozzle, the airplane and fuel tank.

WARNING

A FIRE EXTINGUISHER SHOULD BE READILY AVAILABLE IN CASE OF EMERGENCY.

2. Reach the filler ports by using a ladder or appropriate work stand.

SERVICING (CONT)

FUEL SYSTEM (CONT)

REFUELING (CONT)

3. Remove filler cap.

NOTE

Release tip tank air pressure by pressing the sniffle valve with a non-metallic rod.

WARNING

DO NOT STAND DIRECTLY IN FRONT OF THE SNIFFLE VALVE WHEN RELEASING TIP TANK PRESSURE DUE TO POSSIBLE FUEL EJECTION THROUGH THE VALVE.

4. Service fuel.

NOTE

When servicing fuel in the main tank to a partial tank capacity, first feed three-fifths of total fuel to be serviced through one of either outboard section filler ports, then feed the remaining total fuel through the other filler port. This procedure will equalize the fuel quantity in the left and right outboard sections of the main tank.

R When servicing fuel in the tip tanks, first service 45
R gallons of fuel in either tip tank, then fill up the other
R tip tank. Fill up the remaining 45 gallons of fuel in the
R first tip tank.

5. Secure the filler cap immediately after servicing each tank.

6. Allow 30 minutes for water to settle and drain water from fuel sumps.

DRAINING

Open each drain valve to drain off any water or other contamination collected.

There are 18 drain valves located in the undersurface of the wing and bottom of tip tanks:

Center tank	2
Outboard tanks (both sides)	2
Boost pumps (both sides)	2
Fuel filters (both sides)	2
Transfer pumps (both sides)	2
Tip tanks (both sides)	8

SERVICING (CONT)

OIL SYSTEM

A 6.25 quart tank is located in the lower forward end of each engine nacelle. The oil should be changed every 800 hours under normal conditions. Approved lubricating oils, which meet MIL-L-23699, should be used. Total capacity of the airplane's system is approximately 21 U.S. quarts including oil tanks, propellers and other systems. (See CONSUMABLE MATERIALS chart)

The oil filter should be inspected each 100 hours, replaced every 200 hours, and at each oil change.

WARNING

DO NOT MIX VARIOUS BRANDS OF OIL. SEE GARRETT MAINTENANCE MANUAL BEFORE CHANGING BRANDS OF OIL. REFER TO ENGINE LOG BOOK FOR TYPE OIL INSTALLED.

OXYGEN SYSTEM

An oxygen cylinder is located aft of the entrance door.

The pressure indication on the pressure gauge should be checked prior to every flight and if gauge indicates below full, recharge.

WARNING

DO NOT USE OIL OR LUBRICANTS IN ANY FORM ON ANY COMPONENT OF THE OXYGEN SYSTEM. OIL, EVEN IN MINUTE QUANTITY, COMING IN CONTACT WITH OXYGEN, CAN CAUSE AN EXPLOSION OR FIRE. USE ONLY APPROVED TYPE LEAK DETECTOR TO CHECK OXYGEN SYSTEM CONNECTIONS FOR LEAKS. DO NOT RECHARGE WITH FIRE OR FLAME NEARBY.

PITOT AND STATIC SYSTEM

DRAINING

Open the drain plugs to release any trapped moisture after washing the airplane or exposure to rain.

1. Slide the pilot and copilot seats backward.

2. Pull out the carpets located just outside the rudder pedals.

3. Remove the pitot and static drain plugs.

4. Reinstall the drain plugs after draining.

SERVICING (CONT)

EXTERIOR CLEANING

Cover the wheels prior to cleaning the exterior, making certain that brake discs are covered. Attach pitot covers securely. Mask off static ports before washing or waxing.

NOTE

Any rubbing of the painted surface should be done gently and held to a minimum to avoid cracking the paint film.

Loose dirt should be flushed away first with clear water.

TURCO JET CLEAN 2 (TURCO PRODUCT INC.) is recommended as a detergent, one part TURCO JET CLEAN 2 to ten parts water will produce good results in cleaning the exterior surface. For heavy duty cleaning one part TURCO JET CLEAN 2 should be mixed with two parts water, plus twenty parts noncrazing petroleum solvent. Mix the TURCO JET CLEAN 2 with water first, agitate, then add solvent slowly with agitation. Apply by spray and scrub this mixture with brush or mop on the surface of the airplane, allowing it to penetrate into the soil deposits. Rinse with a volume of high pressure water.

Soft cleaning cloths or a chamois should be used to prevent scratches when cleaning and polishing. Any good grade automotive wax may be used to preserve the painted surface. (See Maintenance Manual.)

INTERIOR CLEANING

Vacuum clean interior from time to time to remove as much surface dust and dirt as possible.

TURCO JET CLEAN 2 may be used for interior cleaning. The mixture of TURCO JET CLEAN 2, water and solvent as specified in EXTERIOR CLEANING, should be diluted with twenty parts water. This solution will produce excellent results in wiping down paint, plastic or metal surfaces within the cabin. This cleaning process should be followed by wiping with a clean, wet cloth.

SERVICING (CONT)

WINDSHIELD CLEANING

Never attempt to clean windows when dry. Flush the surface with clean water or a mild soap solution then rub lightly with a grit free soft cloth, sponge, or chamois and dry. To remove stubborn grease and oil deposits, use cleaner (Naptha TT-N-95A) as a detergent, rinse with clean water and avoid prolonged rubbing. When anti-icing fluid is used, the windshield glasses should be flushed with clean water as described in the Maintenance Manual.

CAUTION

THE USE OF GASOLINE, BENZENE, ACETONE, CARBON TETRACHLORIDE, FIRE EXTINGUISHER FLUID, LACQUER THINNER, TOLUOL, ISOPROPYL ALCOHOL, ETHYL ALCOHOL, NEUTRAL CLEANER FOR AUTOMOBILES, ETC., IS STRICTLY PROHIBITED BECAUSE THE EFFECTS OF THOSE FLUIDS, WHEN INTRODUCED TO THE PANES, WILL CAUSE THEM TO CRAZE OR SOFTEN.

SERVICING (CONT)

CONSUMABLE MATERIAL CHART

ITEM	MATERIAL	SPECIFICATIONS
1	Engine Fuel	Aviation Turbine Fuels ASTM D 1655-68T Type: Jet A Jet A-1 Jet B MIL-T-5624-1 Grade JP-4 JP-5 MIL-F-5616-1 Grade JP-1 MIL-F-46005A (MR)-1 Type I Type II British Ministry of Supply Specification D.Eng.R.D.2482 Issue No. 2 D.Eng.R.D.2486 Issue No. 2 D.Eng.R.D.2494 Issue No. 4 MIL-G-5572, Aviation Gasoline Grade 80/87, Grade 100/130LL (As emergency fuel only) NOTE: For MIL-G-5572 Quantities, see Section II, Operating Limitations.
2	Fuel Anti-ice Additive	MIL-I-27686 HI-FLO Prist
3	Anti-static Additive	Shell ASA-3
R R R 4	Engine Oil	See Allied Signal Aerospace Company Service Information Letter SIL P331-2 latest revision.

SERVICING (CONT)

CONSUMABLE MATERIAL CHART

ITEM	MATERIAL	SPECIFICATIONS
5	ASA 7A (SHELL) Grease 2 (MOBIL)	MIL-G-23827
6	ASG 5 (SHELL) ANDOK 260 (ESSO)	MIL-L-3545
7	Aero Shell Fluid (ASF) 5L (SHELL) Aerocraft Gear Oil EP Light (CALTEX) Aviation Gear Oil Light (ESSO)	MIL-L-6808 Grade L
8	ASF 4 (SHELL) Aviation Instrument Oil (MOBIL)	MIL-L-7870
R 9	ASF 3 (SHELL) UNIVIS-J-43 (ESSO) Aero Hydraulic Oil HFA (MOBIL)	MIL-H-5606
10	Roex 65 (MOLYKOTE) ASG 17 (SHELL) Grease Special (MOBIL)	MIL-G-21164
11	Detergent Exterior	TURCO JET CLEAN 2
12	Solvent	Federal Spec P-S-661 Type 1
13	Aviator Breathing Oxygen	Federal Spec BB-O-925 Type 1 Grade A or equivalent gas

SERVICING (CONT)

LAMP REPLACEMENT GUIDE

PART NUMBER	LOCATION
MS25237-327	Master caution light, Annunciator panel light, Instrument lights, Standby compass light, Fire extinguisher handle light, Warning lights, Indicator lights
ASA 334	Engine instrument light
ASA 7512	Wing Tip light (Navigation light)
MS25232-1683	Tail light (Navigation light)
A-7079B-24 (*1)	Rotating beacon light, Ice inspection light
MS25069-1495	Map light, Reading light
4553 (*2)	Landing light
4626 (*2)	Taxi light

*1: Grimes Mfg. Co. *2: General Electric Co.

SPARE LAMPS AND FUSES LIST

ITEMS	PART NUMBER	QUANTITY
Lamp	A-7079B-24 (*1)	2 ea
Lamp	MS25237-327	2 ea
Lamp	ASA 334	3 ea
Lamp	MS25232-1683	1 ea
Lamp	MS25232-307	1 ea
Lamp	ASA 7512	1 ea
Lamp	MS25069-1495	2 ea
Lamp	961-2020/961-Ta00 (*3)	2 ea
Fuse	AGC-5 (*2)	2 ea
Fuse	AGC-1 (*2)	2 ea

*1: Grimes Mfg. Co. *2: Bussman Mfg. Co. #3: Ichiko Industries Ltd. (Japan)

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INTRODUCTION TO PERFORMANCE AND FLIGHT PLANNING

The charts and tables in this section, and the charts in the FAA Approved Airplane Flight Manual, are used to calculate takeoff, climb, cruise and landing requirements by utilizing the various factors of weight, power, altitude and temperature.

All of the charts in the Flight Planning Data section include an example listing specific data and a corresponding broken line with directional arrows. The arrow and example line can be followed to arrive at the data listed per the example.

The following sample flight plan utilizes the necessary charts and tables required for calculating data for a typical flight. The sample calculations used correspond to the example shown on the charts. Although many of the charts are not used for the sample flight plan, the examples shown will also match the data used for the sample flight.

FLIGHT PLANNING

To use the charts effectively all of the various conditions must be readily available. To simplify using the charts, all of the conditions necessary are listed here as preparation data with the necessary instructions for items that require calculation.

Conditions that must be derived by calculation are indicated (1), (2), (3), (4), (5) with correlating instructions following Preparation Data.

TYPICAL FLIGHT PLAN

PREPARATION DATA

Departure:	Dallas-Fort Worth (DFW)
Destination:	New Orleans (MSY)
Flight Plan:	DFW-J58-AEX-J58-MSY
Requested Altitude:	19,000 Ft.

TYPICAL FLIGHT PLAN (CONT)

PREPARATION DATA (CONT)

DEPARTURE CONDITIONS - DFW

(1)	Outside Air Temperature (OAT)	25°C (77°F)
(4)	ISA TEMPERATURE	ISA +12°C
	Elevation	596 ft.
(2)	Pressure Altitude	886 ft.
	Runway Length	11,387 ft.
	Runway Heading	350°
	Altimeter Setting	29.63 in. Hg.
	Surface Wind	360° at 10 kts.
(3)	Wind Parallel to Runway	10 kts.

EN ROUTE CONDITIONS AT 19,000 FT:
(Reference - En Route High Altitude Chart US (HI)3)

	1st Segment	DFW-J58-AEX
	Range	250 nm at (102° 107 nm)(106° 143 nm)
	Wind	330° at 28 kts.
(1)	OAT	-8°C (18°F)
(4)	ISA	ISA +15°C
	2nd Segment	AEX-J58-MSY
	Range	142 nm at (119° 81 nm)(109° 61 nm)
	Wind	150° at 17 kts.
(1)	OAT	-8°C (18°F)
(4)	ISA	ISA +15°C

DESTINATION CONDITIONS - MSY

(1)	OAT	30°C (86°F)
	Elevation	4 ft.
(2)	Pressure Altitude	24 ft.
	Runway Length	9,227 ft.
	Runway Heading	280°
	Altimeter Setting	29.90 in. Hg.
	Surface Wind	290° at 10 kts.
(3)	Runway Head Wind	10 kts.

AIRPLANE WEIGHT

Compute airplane weight per the following. Equipped empty weight as known or derived from the WEIGHT AND BALANCE, Section 7 of the FAA Approved Airplane Flight Manual.

TYPICAL FLIGHT PLAN (CONT)

PREPARATION DATA (CONT)

SAMPLE CALCULATION

	Equipped Empty Weight	7,650 lbs.
	Crew and Passengers at 200 lbs. ea.	1,000 lbs.
	Extra Baggage or Cargo	0 lbs.
(5)	Total Fuel	1,750 lbs.
	RAMP WEIGHT	10,400 lbs.
	Fuel Consumed - Start - Taxi, Takeoff	-50 lbs.
	TAKEOFF WEIGHT	10,350 lbs.

PREPARATION DATA CALCULATIONS

(1) TEMPERATURE CONVERSION (F° to C°)

If outside air temperatures are given in fahrenheit only, convert to celsius by using chart on page 4-14.

(2) PRESSURE ALTITUDE

Pressure altitude is derived from the difference between airport altimeter setting and barometric pressure at sea level of 29.92 in. Hg.

Altimeter Setting above 29.92:

Subtract 100 feet from airport elevation for each 0.1 in. Hg. that altimeter setting is above 29.92 in. Hg.

Altimeter Setting below 29.92:

Add 100 feet to airport elevation for each 0.1 in. Hg. that altimeter setting is below 29.92 in. Hg.

SAMPLE CALCULATION - (DFW)

29.92 in. Hg.
-29.63 Altimeter Setting
0.29 = 290 ft.
+596 field elevation
886 ft. Pressure Altitude

(3) WIND COMPONENT

Wind components are obtained from the Wind Component Chart, Section 6 in the FAA Approved Airplane Flight Manual.

TYPICAL FLIGHT PLAN (CONT)

PREPARATION DATA CALCULATIONS (CONT)

SAMPLE CALCULATION - DFW

To use the chart determine the difference between wind direction and runway direction.

DFW - Runway 350°, Wind 360°
Difference is 10°

A. Enter Chart on 10° wind direction from runway.
B. Follow line down to intersect 10 knots wind arc.
C. Move left to read head wind or tail wind component of 10 kts.
D. Move down to read crosswind component of 2 kts.

RUNWAY HEAD WIND - 10 kts.

(4) ISA - Pressure Altitude vs. OAT

ISA is determined by using the chart on page 4-15.

SAMPLE CALCULATION

Flight Altitude	19,000 ft.,	-8°C = ISA +15°C
DFW	886 ft.,	25°C = ISA +12°C

(5) ESTIMATING FUEL REQUIREMENTS

For critical weight situations an estimate of fuel required can be made as follows:

Preparation Data:

Flight Altitude	19,000 ft.
Distance	392 nm
Temperature	ISA +15°C

Use Recommended Cruise Power Tables or Maximum Range Power Tables as desired.
For temperatures such as ISA +15°C use ISA +10°C and ISA +20°C tables and average conditions.

SAMPLE CALCULATION: RECOMMENDED CRUISE POWER TABLES

Average the total fuel flow figures for 18,000 ft. and 20,000 ft. for ISA +10°C and ISA +20°C.

$$\frac{576 + 542 + 530 + 498}{4} \text{ lbs/hr} = \frac{2,146}{4} \text{ lbs/hr} = 537 \text{ lbs/hr}$$

TYPICAL FLIGHT PLAN (CONT)

PREPARATION DATA CALCULATIONS (CONT)

Average TAS for 10,500 lbs. conditions for 18,000 ft. and 20,000 ft.

$$\frac{282 + 280 + 267 + 264}{4} \text{ KTAS} = \frac{1,093}{4} \text{ KTAS} = 273 \text{ KTAS}$$

Divide distance by speed for time required

$$\frac{392 \text{ nm}}{273 \text{ KTAS}} = 1.44 \text{ hr}$$

Multiply fuel flow by time for fuel
537 lbs/hr x 1.44 hr = 773 lbs.
Multiply fuel by 125% to allow for climb and possible head wind
773 lbs x 1.25 = 966 lbs.
Multiply fuel flow (537 lbs/hr) by 0.75 hr for 45 minute fuel reserve
537 lbs/hr x 0.75 hr = 403 lbs.
Add fuel and reserve to determine fuel required
966 lbs + 403 lbs = 1,369 lbs.
ESTIMATED FUEL REQUIRED - 1,369 lbs. *

* This figure is not used for the Sample Flight Plan

TAKEOFF DISTANCE

For Takeoff Distances, use PERFORMANCE, Section 6 in the FAA Approved Airplane Flight Manual.

SAMPLE CALCULATION
(Using Takeoff Distance 5° Flaps Chart)

Preparation Data from page 4-1 through 4-3:

Temperature	25°C
Pressure Altitude	886 ft.
Takeoff Weight	10,350 lbs.
Head Wind	10 kts.

Enter Chart using data as shown by the example on the chart.

TAKEOFF DISTANCE over 50 foot obstacle = 3,325 ft.

TAKEOFF SPEED = 102 KCAS (Using Takeoff Speed Schedule 5° Flaps)

NOTE

Takeoff power as listed for charts is based on a stable condition prior to brake release.

TYPICAL FLIGHT PLAN (CONT)

PREPARATION DATA CALCULATIONS (CONT)

CLIMB

The Twin Engine Cruise Climb charts, pages 4-19, 4-20, 4-21, will provide the following: fuel consumed, elapsed time, and ground distance traveled during initial or step climbs to the cruise flight level.

SAMPLE CALCULATION
(Using Twin Engine Cruise Climb Charts, pages 4-19, 4-20, 4-21)

Preparation Data from page 4-1 through 4-3:

Pressure Altitude	19,000 ft.
Takeoff Weight	10,350 lbs.
Flight Temperature	ISA +15°C
Airport Temperature	ISA +12°C

Enter chart at 19,000 ft., (A) across to curve and down to Weight Ref. Line (B).

Enter chart at Takeoff Weight 10,350 lbs. (C), move across from (C) and down from (B) to intersect at (D).

Down from (D) to ISA Ref. Line (E) and parallel chart line down to intersect ISA Temperature at (F); down to read time, distance or fuel at (G).

FIELD ELEVATION - PRESS ALT ABOVE SEA LEVEL OR STEP CLIMBS

When field pressure altitude exceeds sea level or for step climbs, data must be obtained by computing climb from sea level to highest altitude and from sea level to lower altitude. Subtract the second value from the first to obtain desired climb data.

Follow the same pattern entering chart at airport pressure altitude 886 ft. (H) and following down through (I), (J), (K), (L) and (M).

Subtract value (M) from (G) to obtain actual time, distance or fuel.

CLIMB DATA

TIME TO CLIMB	(G) 11.3 min - (M) 0.4 min = 10.9 minutes
DISTANCE	(G) 32 nm - (M) 1 nm = 31 nm
FUEL CONSUMED	(G) 132 lbs. - (M) 6 lbs. = 126 lbs.

TYPICAL FLIGHT PLAN (CONT)

PREPARATION DATA CALCULATIONS (CONT)

DESCENT

To determine the distance and time of cruise segment, the climb and descent must be subtracted from the total distance.

There are two descent charts available, one based on V_{MO}/M_{MO} and the other on 200 kts. Type of descent used will depend on performance desired, ATC procedures and personal preference. As a comparison, a V_{MO}/M_{MO}, 1,000 fpm descent will result in the best ground speed, while a 200 KIAS, 2,000 fpm descent will result in greater economy.

SAMPLE CALCULATION:
(Using 200 KCAS, 1,500 fpm Descent from chart, page 4-22)

Preparation Data from page 4-1 through 4-3:

Pressure Altitude 19,000 ft.
Airport Pressure Altitude 24 ft.
Enter chart at 19,000 ft. (A) across to 1,500 fpm (B) and down to Descent Ref. Line (E).
Parallel chart line to Rate of Descent (F) and down to read Fuel at (G).
Read time at (C) and Distance at (D).

NOTE

If airport pressure altitude is below 500 ft. such as MSY in example, use values derived at (C), (D) and (G).

For airport pressure altitudes above 500 ft. compute values using airport pressure altitude to sea level. The difference between the first and second values will be actual values to use for descent.

19,000 ft. to Sea Level:	Time: 12.7 minutes
Distance: 47 nm	Fuel: 86 lbs.
24 ft. to Sea Level:	Time: 0 minutes
Distance: 0 nm	Fuel: 0 lbs.

DESCENT:

TIME: 12.7 min - 0 min = 12.7 min
DISTANCE: 47 nm - 0 nm = 47 nm
FUEL: 86 lbs. - 0 lbs. = 86 lbs.

TYPICAL FLIGHT PLAN (CONT)

PREPARATION DATA CALCULATIONS (CONT)

CRUISE

Cruise data tables are provided in two sets: one based on 96% rpm, EGT 650°C, which reflects Recommended Cruise Power and the other set based on 96% rpm, 43%-80% torque which reflects Maximum Range Power.

SAMPLE CALCULATIONS:

Preparation Data from page 4-1 through 4-3:

Takeoff Weight	10,350 lbs.	ISA Temperature	ISA +15°C
Fuel for Climb	-126 lbs.	Pressure Altitude	19,000 ft.
Weight at Start of Cruise	10,224 lbs.		

Airplane weight at start of cruise determines amount of data (in relation to weight) that have to be averaged. The following applies to both Recommended Cruise Power and Maximum Range Power Tables.

Airplane Weight (at start of cruise)

8,000 lbs. to 9,500 lbs. - use 9,500 lbs. weight data
9,500 lbs. to 10,000 lbs. - average 9,500 lbs. and 10,500 lbs. weight data
10,000 lbs. to 10,500 lbs. - use 10,500 lbs. weight data
10,500 lbs. to 11,000 lbs. - average 10,500 lbs. and 11,500 lbs. weight data
11,000 lbs. to 11,500 lbs. - use 11,500 lbs. weight data

Select table(s) corresponding to required conditions. Enter data per table and average data to determine conditions.

For conditions between tables, such as ISA +15°C, use tables ISA +10°C and ISA +20°C.

Data from Recommended Cruise Power tables Page 4-34, 4-36

	ISA +10°C 10,500 lbs.			ISA +20°C 10,500 lbs.		
Press Alt ft	Percent Torque	Total Fuel Flow lbs/hr	TAS KTS	Percent Torque	Total Fuel Flow lbs/hr	TAS KTS
18,000	76	576	282	66	530	267
20,000	72	542	280	63	498	264

TYPICAL FLIGHT PLAN (CONT)

PREPARATION DATA CALCULATIONS (CONT)

CRUISE (CONT)

Average the data from tables to obtain the following:

Average torque	69%
Average Fuel Flow	537 lbs/hr
Average TAS*	273 kts.

* See AVERAGE CRUISE WT. VS. CRUISE SPEED

Cruise Fuel (ESTIMATE ONLY - Use for determining Average Cruise Weight)

To determine cruise fuel, subtract climb (31 nm) and descent (47 nm) from total range (392 nm), divide by cruise speed (273 kts.) and multiply answer by total fuel flow (537 lbs/hr).

Cruise Range = 392 nm - 31 nm - 47 nm = 314 nm

$$\text{Cruise Time} = \frac{314 \text{ nm}}{273 \text{ KTAS}} = 1.15 \text{ hr}$$

ESTIMATED CRUISE FUEL = 537 lbs/hr x 1.15 hr = 618 lbs.

Average Cruise Weight vs. Cruise Speed

By determining average cruise weight, average cruise speed can be calculated more accurately.

Cruise weight equals ramp weight (10,400 lbs.) minus takeoff fuel (50 lbs.) minus climb fuel (126 lbs.) minus one-half of estimated cruise fuel (309 lbs.).

Average Cruise Weight

= 10,400 lbs. - 50 lbs. - 126 lbs. - 309 lbs.
= 9,915 lbs.

Since this figure (9,915 lbs.) is above 9,500 lbs., data for both 9,500 lbs. and 10,500 lbs. must be averaged to determine cruise speed. In this case it will raise the average cruise speed from 273 kts. to 277 kts.

TYPICAL FLIGHT PLAN (CONT)

PREPARATION DATA CALCULATIONS (CONT)

CRUISE (CONT)

	ISA +10°C		ISA +20°C	
	10,500 lbs	9,500 lbs	10,500 lbs	9,500 lbs
Press Alt ft	KTAS	KTAS	KTAS	KTAS
18,000 20,000	282 280	287 286	267 264	274 272

Average the data from tables to obtain average cruise speed:

AVERAGE CRUISE SPEED = 277 KTAS

Reserve Fuel

Reserve fuel is usually based on a 45 minute reserve; however, conditions such as traffic and weather should be considered when determining fuel reserve.

Calculation of reserve fuel is based on data from Maximum Range Power Tables.

SAMPLE CALCULATION
(Using Maximum Range Power Tables, pages 4-48, 4-50)

Select table(s) corresponding to ISA temperature.

For conditions between tables such as ISA +15°C use two tables, ISA +10°C and ISA +20°C. Enter data as shown and average the conditions to determine Reserve Fuel.

Weight to use is determined by following:

Takeoff Weight	10,350 lbs.
Fuel for Climb	-126 lbs.
	10,224 lbs.
Estimated Cruise Fuel	-618 lbs.
Weight at Cruise End	9,606 lbs.

TYPICAL FLIGHT PLAN (CONT)

PREPARATION DATA CALCULATIONS (CONT)

CRUISE (CONT)

	ISA +10°C		ISA +20°C	
	10,500lbs	9,500lbs	10,500lbs	9,500lbs
Press Alt ft	Total Fuel Flow (lbs/hr)/KTAS		Total Fuel Flow (lbs/hr)/KTAS	
18,000	518/262	518/267	516/262	516/268
20,000	502/264	502/270	498/264	498/272

Average the data to determine:
Fuel flow 509 lbs/hr at 266 kts.

45 MINUTE RESERVE FUEL = 509 lbs/hr x 0.75 hr = 382 lbs. (at 266 KTAS)

Ground Speed, Cruise Time and Cruise Fuel

Preparation Data

1st segment	250 nm
Heading and Distance	102° - 107 nm, 106° - 143 nm
Wind	330° at 28 kts.
2nd segment	142 nm
Heading and Distance	119° - 81 nm, 109° - 61 nm
Wind	150° at 17 kts.
Fuel Flow	537 lbs/hr
Average Cruise Speed	277 kts.
Climb Distance	31 nm
Descent Distance	47 nm

1ST SEGMENT CALCULATIONS

Ground Speed equals Cruise Speed plus or minus wind.

$$\text{Average Heading} \quad \frac{102° + 106°}{2} = 104°$$

Difference between wind and heading equals 46° tail wind.
Actual tail wind in kts. is determined from Wind Component Chart in the FAA Approved Airplane Flight Manual, Section 6.
Enter chart on 46° line moving to intersect wind arc of 28 kts. Move across to read tail wind component of 21 kts.

TYPICAL FLIGHT PLAN (CONT)

PREPARATION DATA CALCULATIONS (CONT)

CRUISE (CONT)

Ground Speed, Cruise Time and Cruise Fuel (Cont)

GROUND SPEED = 277 kts. + 21 kts. = 298 kts.

Cruise Time and Fuel Calculations (1st Segment)

Range	250 nm
Climb	- 31 nm
Cruise Distance	219 nm

CRUISE TIME $\frac{219 \text{ nm}}{298 \text{ kts.}}$ = 0.73 hr = 44 min

CRUISE FUEL 537 lbs/hr x 0.73 hr = 392 lbs.

2ND SEGMENT CALCULATIONS

Average Heading $\frac{119° + 109°}{2}$ = 114°

Difference between wind and heading equals 36° head wind.
Determine actual head wind in kts. from Wind Component Chart in the FAA Approved Airplane Flight Manual, Section 6.
Actual Head wind is 14 kts.
GROUND SPEED = 277 kts. - 14 kts. = 263 kts.

Cruise Time and Fuel Calculations (2nd Segment)

Range	142 nm
Descent	- 47 nm
Cruise Distance	95 nm

CRUISE TIME $\frac{95 \text{ nm}}{263 \text{ kts.}}$ = 0.36 hr = 22 min

CRUISE FUEL 537 lbs/hr x 0.36 hr = 193 lbs.

TYPICAL FLIGHT PLAN (CONT)

PREPARATION DATA CALCULATIONS (CONT)

Ground Speed, Cruise Time and Cruise Fuel (Cont)

TOTAL FLIGHT TIME AND FUEL	Time-Min	Fuel-Lbs	
Taxi and Takeoff	0	50	
Climb (43 nm)	10.9	126	
Cruise (1st Segment)	44	392	
Cruise (2nd Segment)	22	193	
Descent (64 nm)	12.7	86	
	89.6 min	847	lbs.*
Reserve (45 Min)		382	
TOTALS	1 hr 30 min	1,229	lbs.

*USE TO DETERMINE LANDING WEIGHT.

Block Speed

If Block Speed is desired divide total distance by flight time.

$$1 \text{ hr } 30 \text{ min} = 1.5 \text{ hr}$$

$$\text{BLOCK SPEED} = \frac{392 \text{ nm}}{1.5 \text{ hr}} = 261 \text{ kts.}$$

LANDING DISTANCE

For Landing distance, use PERFORMANCE, Section 6 of the FAA Approved Airplane Flight Manual.

SAMPLE CALCULATION (Using Landing Distance 20° or 40° Flaps Chart)

Preparation Data from page 4-3:

Temperature	30°C (86°F)
Pressure Altitude	24 ft.
Head Wind	10 kts.
Ramp Weight	10,400 lbs.

Landing weight equals ramp weight minus fuel consumed.

Ramp Weight	10,400 lbs.
Fuel Consumed	-847 lbs.
Landing Weight	9,553 lbs.

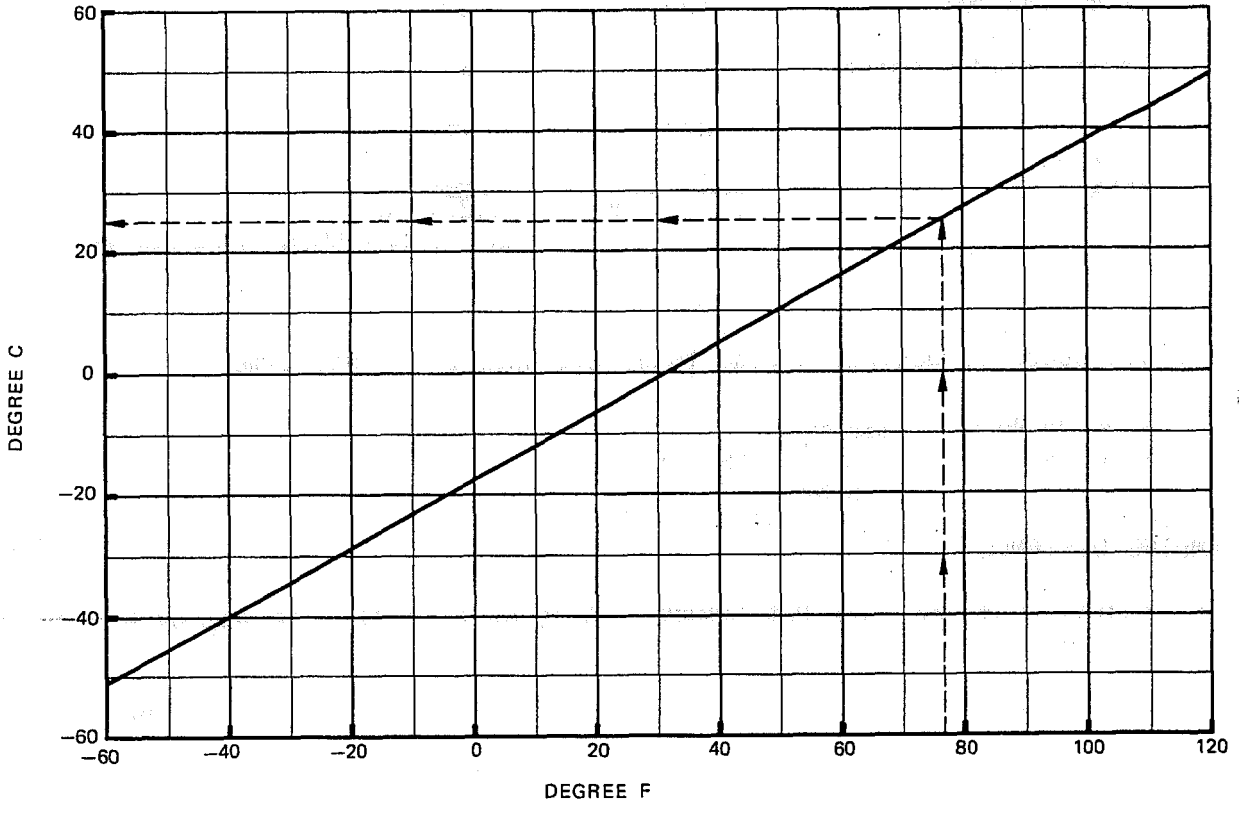
Enter data on Landing Distance Chart as shown.

LANDING DISTANCE = 2,320 ft. (Over 50 ft. obstacle)

APPROACH SPEED = 103 KCAS (Using Landing Approach Speed 20° Flap Chart)

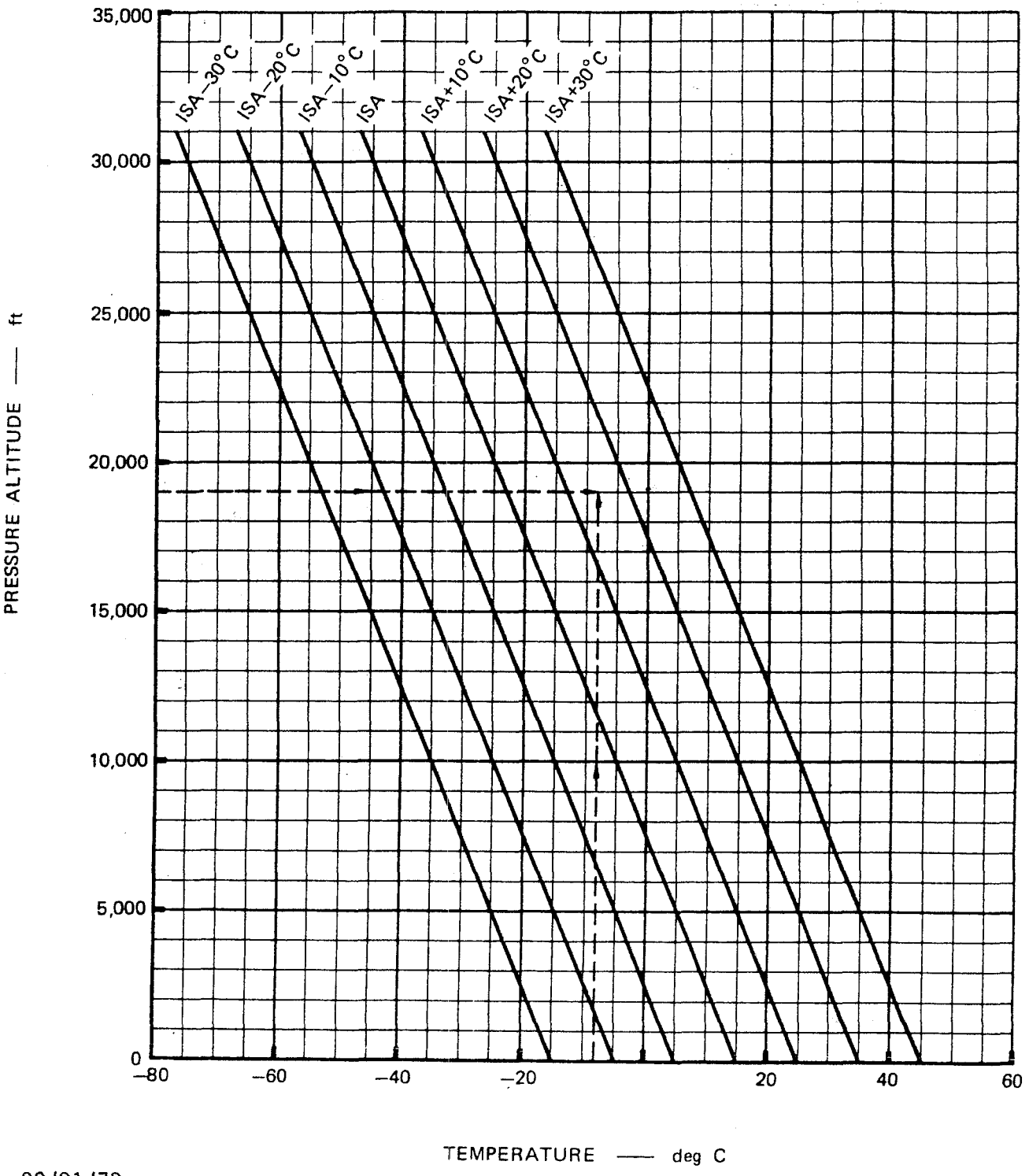
FAHRENHEIT TO CELSIUS TEMPERATURE CONVERSION

EXAMPLE
77°F
25°C



ISA CONVERSION
PRESSURE ALTITUDE VS OUTSIDE AIR TEMPERATURE

EXAMPLE:
PRESSURE ALTITUDE 19,000 FT
OUTSIDE AIR TEMPERATURE –8°C
ISA CONVERSION ISA+15°C



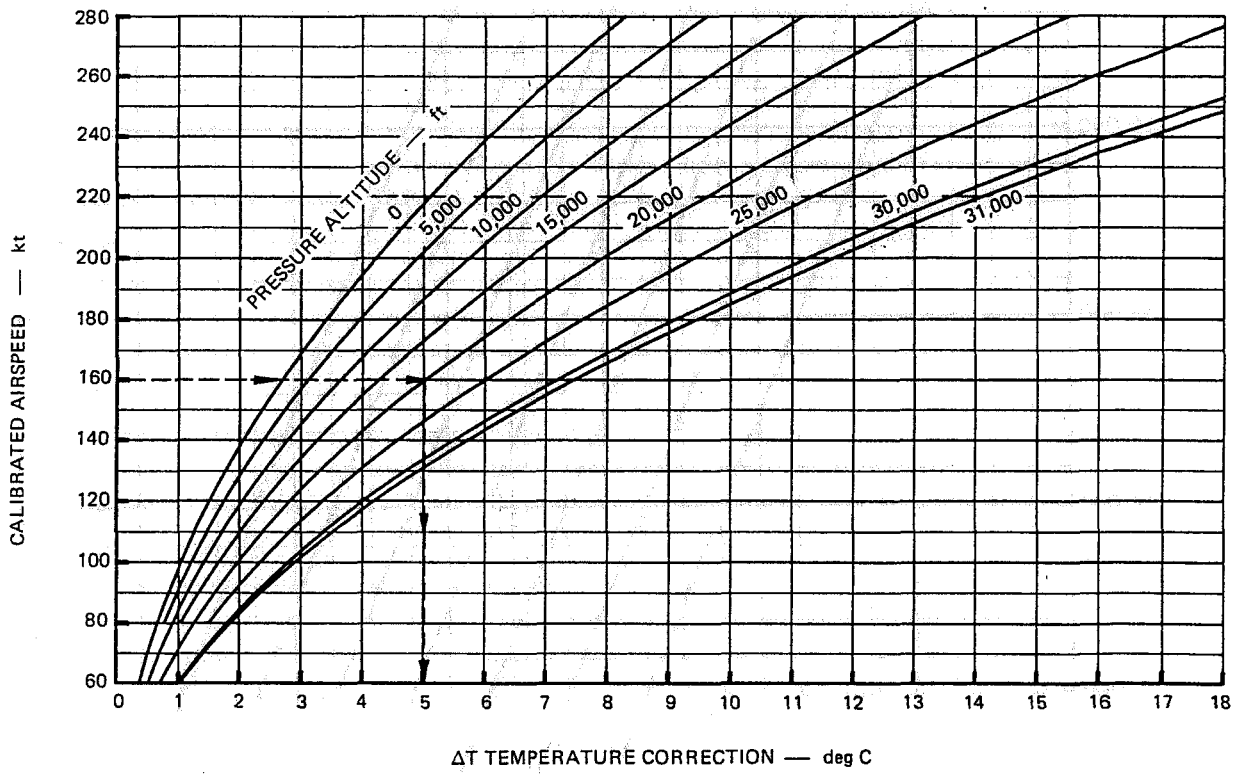
INDICATED OUTSIDE AIR TEMPERATURE CORRECTION

STANDARD DAY (ISA)

NOTE: SUBTRACT △T FROM INDICATED (GAGE OAT) TO OBTAIN TRUE OAT (△T ASSUMES A RECOVERY FACTOR OF 0.8)

EXAMPLE:

PRESSURE ALTITUDE	20,000 FT
CALIBRATED AIRSPEED	160 KTS
TEMPERATURE CORRECTION	5°C

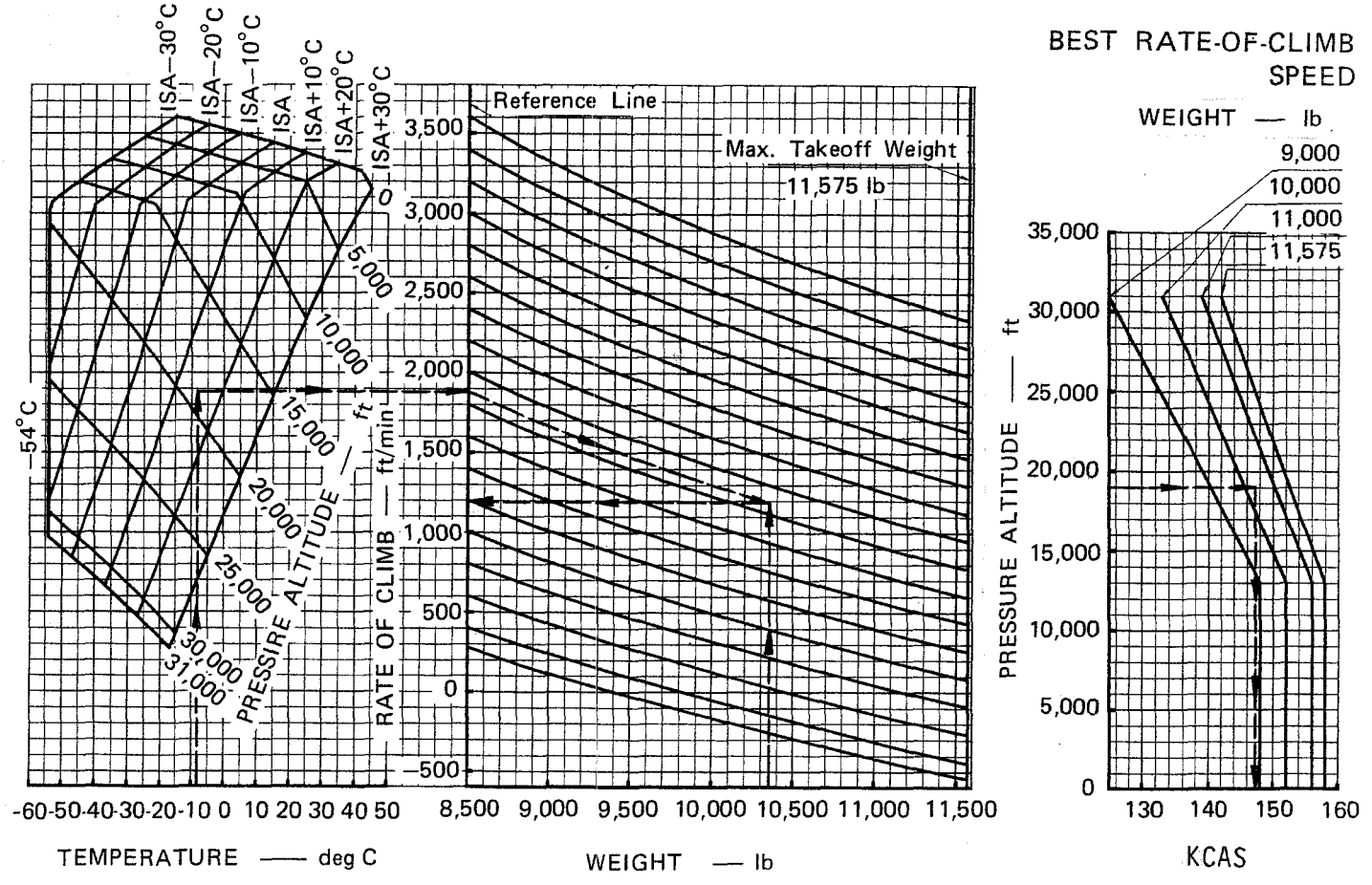


BEST RATE OF CLIMB - MAXIMUM CONTINUOUS POWER

ENGINE POWER:	MAXIMUM CONTINUOUS POWER (EGT = 650°C OR TORQUE 100%) (BLEED AIR IS ON BOTH)
ENGINE SPEED:	100% RPM
GEAR AND FLAPS:	UP
CLIMB SPEED:	BEST RATE OF CLIMB SPEED

EXAMPLE:

OAT	-8°C = ISA +15°C
PRESSURE ALTITUDE	19,000 FT.
WEIGHT	10,350 LBS.
RATE OF CLIMB	1,190 FT/MIN
CLIMB SPEED	147 KCAS

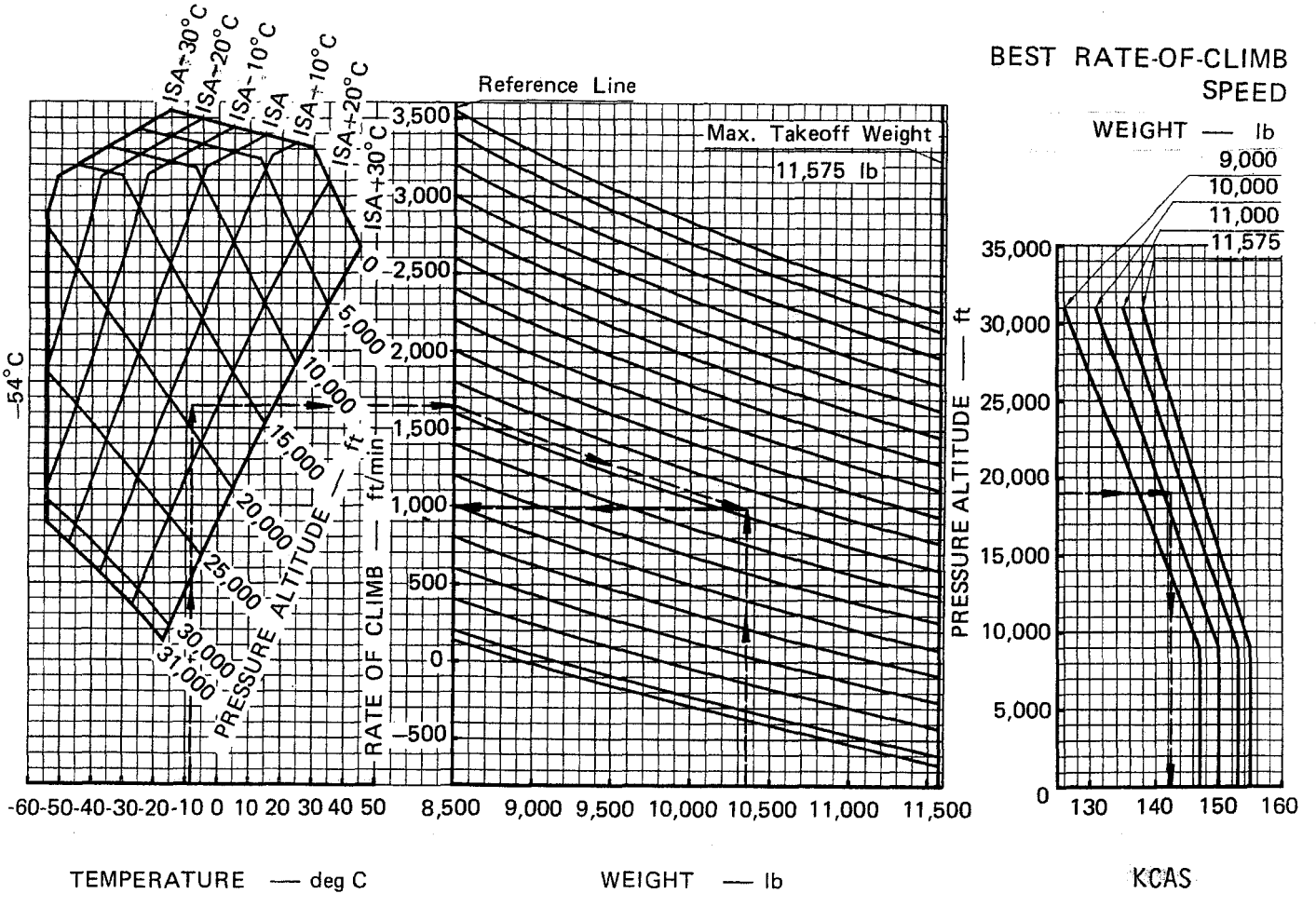


BEST RATE OF CLIMB - MAXIMUM CRUISE POWER

ENGINE POWER:	MAXIMUM CRUISE POWER (EGT = 650°C OR TORQUE 100%) (BLEED AIR IS ON BOTH)
ENGINE SPEED:	98% RPM
GEAR AND FLAPS:	UP
CLIMB SPEED:	BEST RATE OF CLIMB SPEED

EXAMPLE:

OAT	-8°C = ISA +15°C
PRESSURE ALTITUDE	19,000 FT.
WEIGHT	10,350 LBS.
RATE OF CLIMB	980 FT/MIN
CLIMB SPEED	143 KCAS

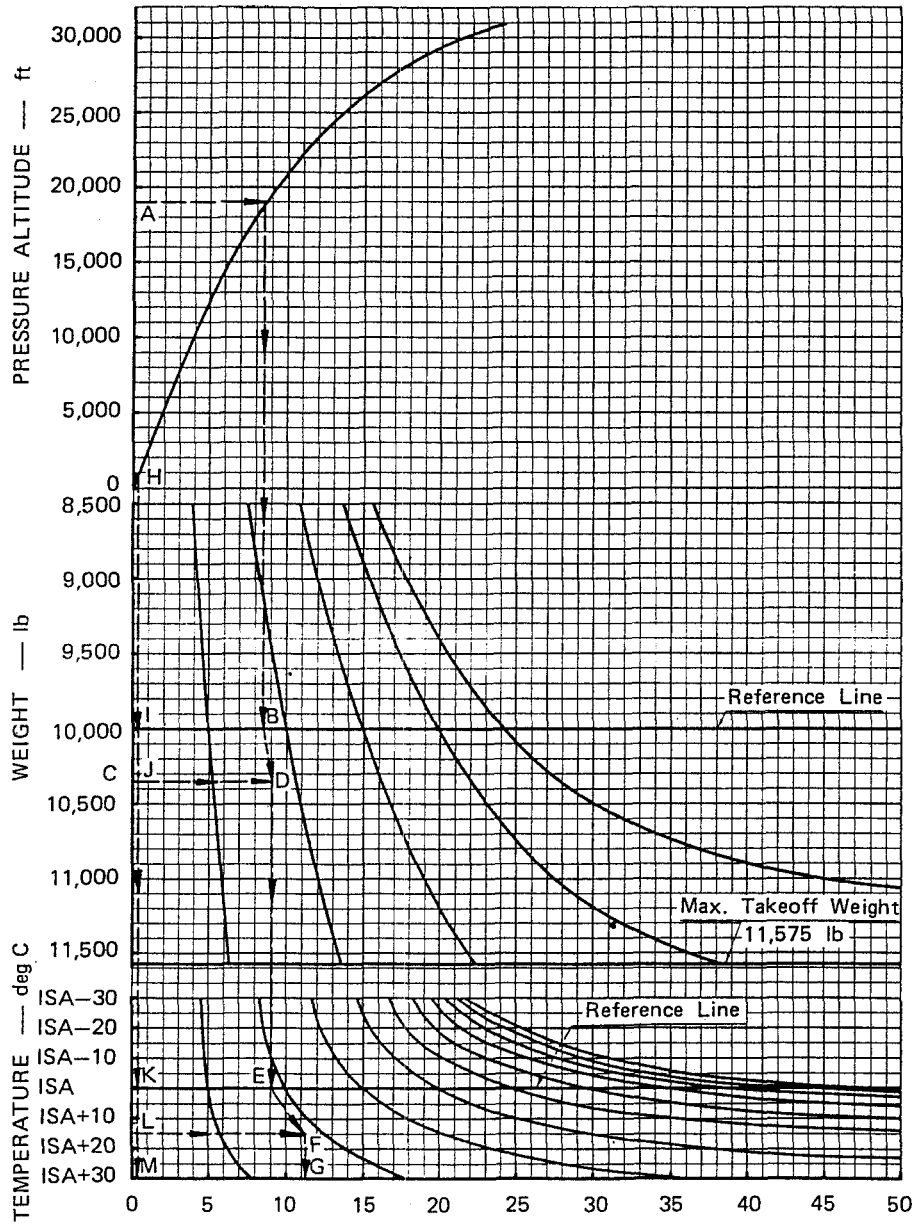


CRUISE CLIMB - TIME REQUIRED

ENGINE POWER: MAXIMUM CRUISE POWER
(EGT = 650°C OR TORQUE 100%)
ENGINE SPEED: 98% RPM
GEAR AND FLAPS: UP
CLIMB SPEED: BEST RATE OF CLIMB SPEED
AIR CONDITIONING: ON

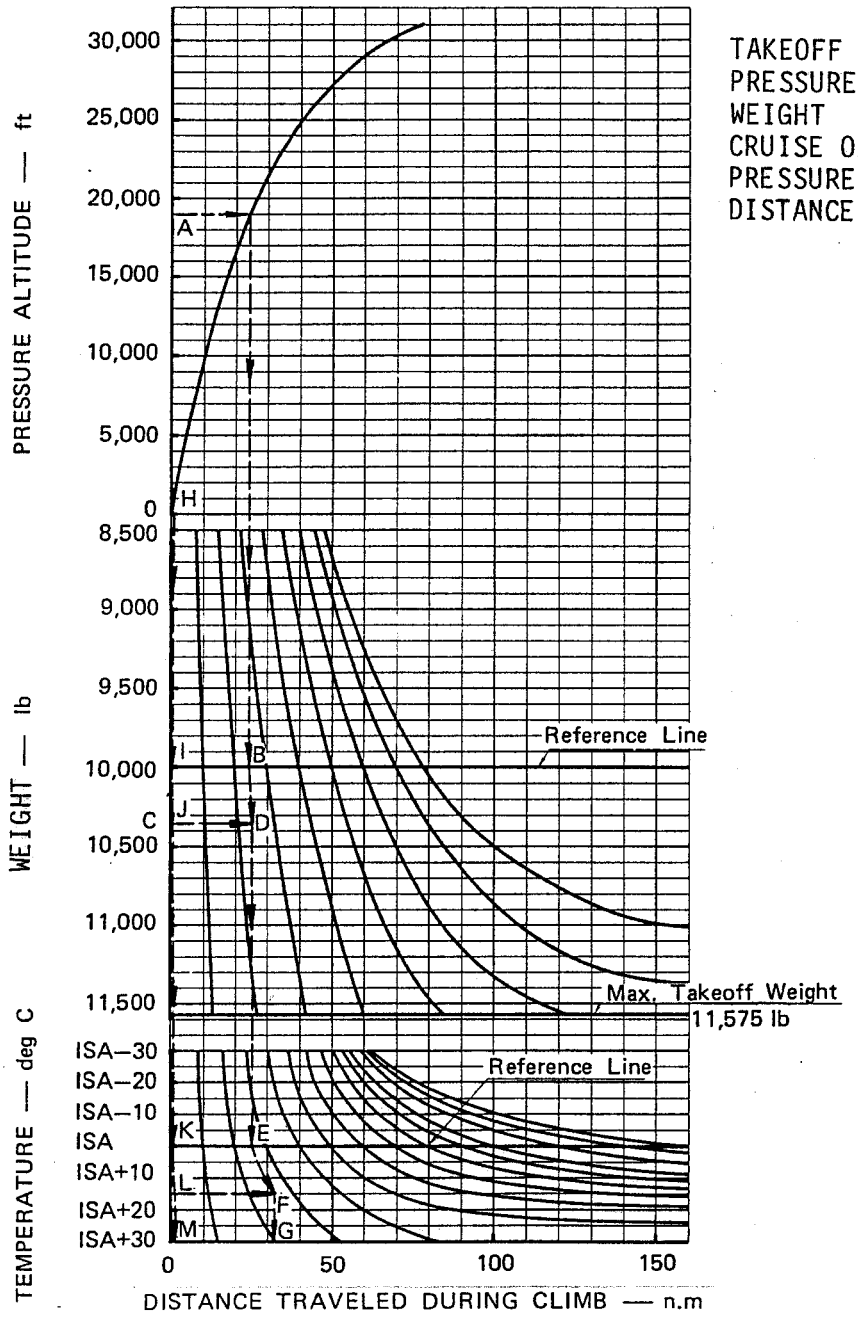
EXAMPLE:

TAKEOFF OAT	25°C = ISA+12°C
PRESSURE ALTITUDE	886 FT
WEIGHT	10,350 LB
CRUISE OAT	–8°C = ISA+15°C
PRESSURE ALTITUDE	19,000 FT
TIME TO CLIMB	11.3 MIN–0.4 MIN = 10.9 MIN



CRUISE CLIMB - DISTANCE TRAVELED

ENGINE POWER: MAXIMUM CRUISE POWER
(EGT = 650°C OR TORQUE 100%)
ENGINE SPEED: 98% RPM
GEAR AND FLAPS: UP
CLIMB SPEED: BEST RATE OF CLIMB SPEED
AIR CONDITIONING: ON



EXAMPLE:

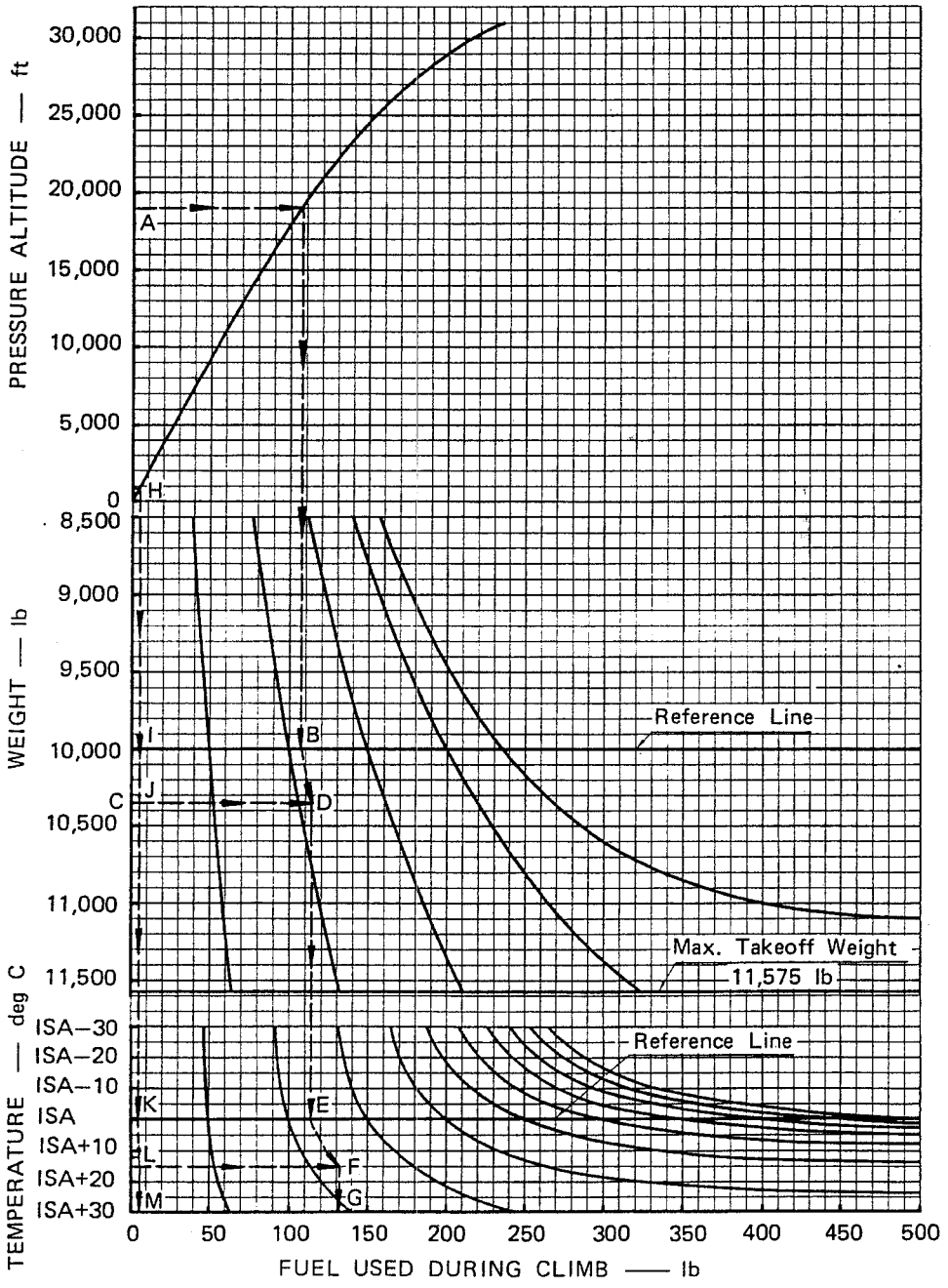
TAKEOFF OAT	25°C = ISA +12°C
PRESSURE ALTITUDE	886 FT.
WEIGHT	10,350 LBS.
CRUISE OAT	-8°C = ISA +15°C
PRESSURE ALTITUDE	19,000 FT.
DISTANCE TO CLIMB	32 NM - 1 NM = 31 NM

CRUISE CLIMB - FUEL CONSUMED

ENGINE POWER: MAXIMUM CRUISE POWER (EGT = 650°C OR TORQUE 100%)
ENGINE SPEED: 98% RPM
GEAR AND FLAPS: UP
CLIMB SPEED: BEST RATE OF CLIMB SPEED
AIR CONDITIONING: ON

EXAMPLE:

TAKEOFF OAT	25°C = ISA+12°C
PRESSURE ALTITUDE	886 FT
WEIGHT	10,350 LB
CRUISE OAT	−8°C = ISA+15°C
PRESSURE ALTITUDE	19,000 FT
FUEL TO CLIMB	132 LB −6 LB = 126 LB

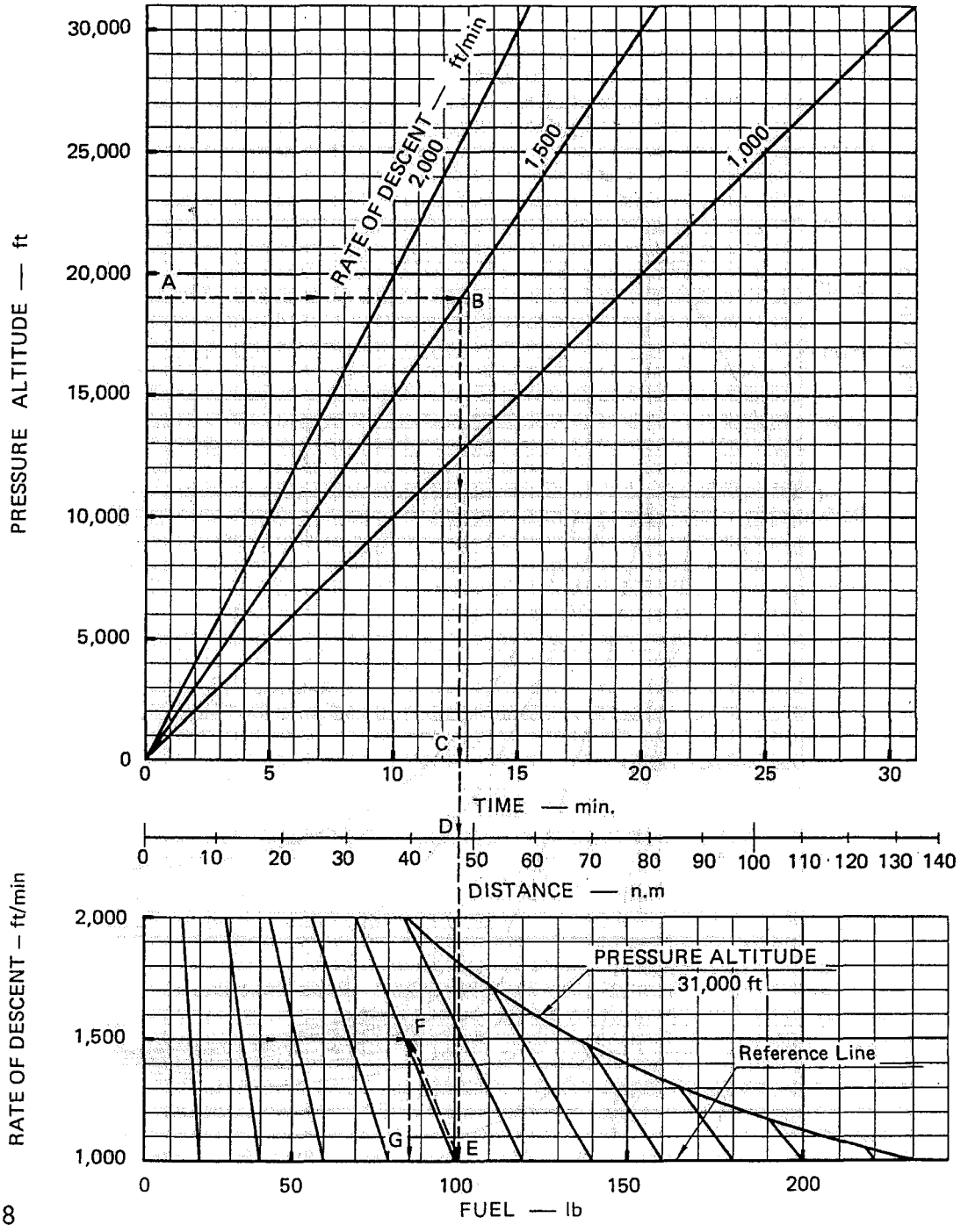


DESCENT - 200 KTS

DESCENT SPEED:	200 KCAS
ENGINE POWER:	AS REQUIRED
ENGINE SPEED:	96% RPM
GEAR AND FLAPS:	UP
WEIGHT:	ALL APPROVED
TEMPERATURE:	ALL APPROVED
WIND:	ZERO KTS.

EXAMPLE:

INITIAL ALTITUDE	19,000 FT.
FINAL ALTITUDE	0 FT.
RATE OF DESCENT	1,500 FT/MIN
TIME TO DESCEND	12.7 MIN
DISTANCE TO DESCEND	47 NM
FUEL TO DESCEND	86 LBS.



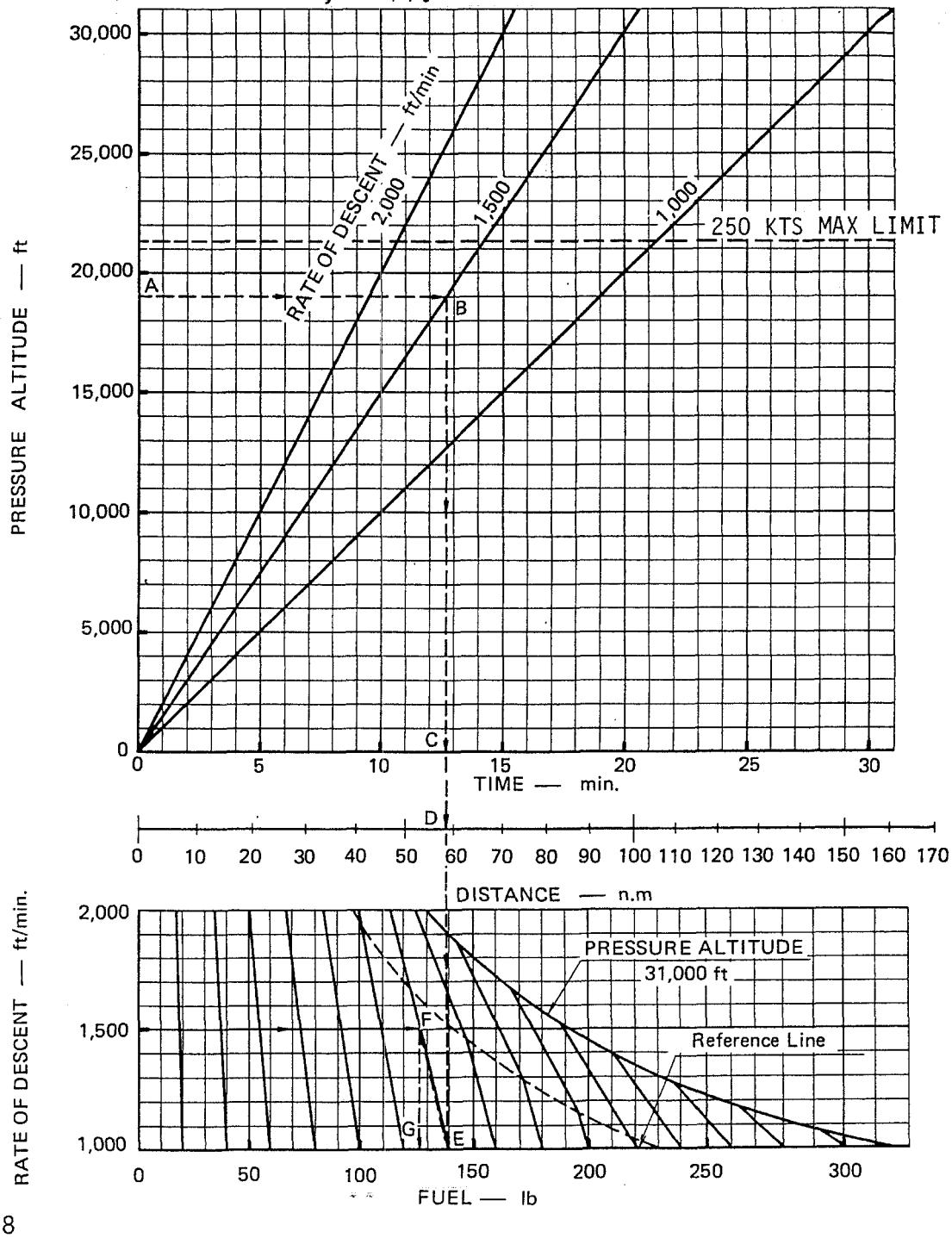
DESCENT - V_{MO} OR M_{MO}

DESCENT SPEED: V_{mo} or M_{mo}
ENGINE POWER: AS REQUIRED
ENGINE SPEED: 96% RPM
GEAR AND FLAPS: UP
WEIGHT: ALL APPROVED
TEMPERATURE: ALL APPROVED
WIND: ZERO KTS.

NOTE:
DESCENT SPEED MUST DECREASE BY 5 KTS. PER 1,000 FT. FROM 250 KTS. ABOVE 21,300 FT.

EXAMPLE:

INITIAL ALTITUDE	19,000 FT.
FINAL ALTITUDE	0 FT.
RATE OF DESCENT	1,500 FT/MIN
TIME TO DESCEND	12.7 MIN
DISTANCE TO DESCEND	58 NM
FUEL TO DESCEND	126 LBS.

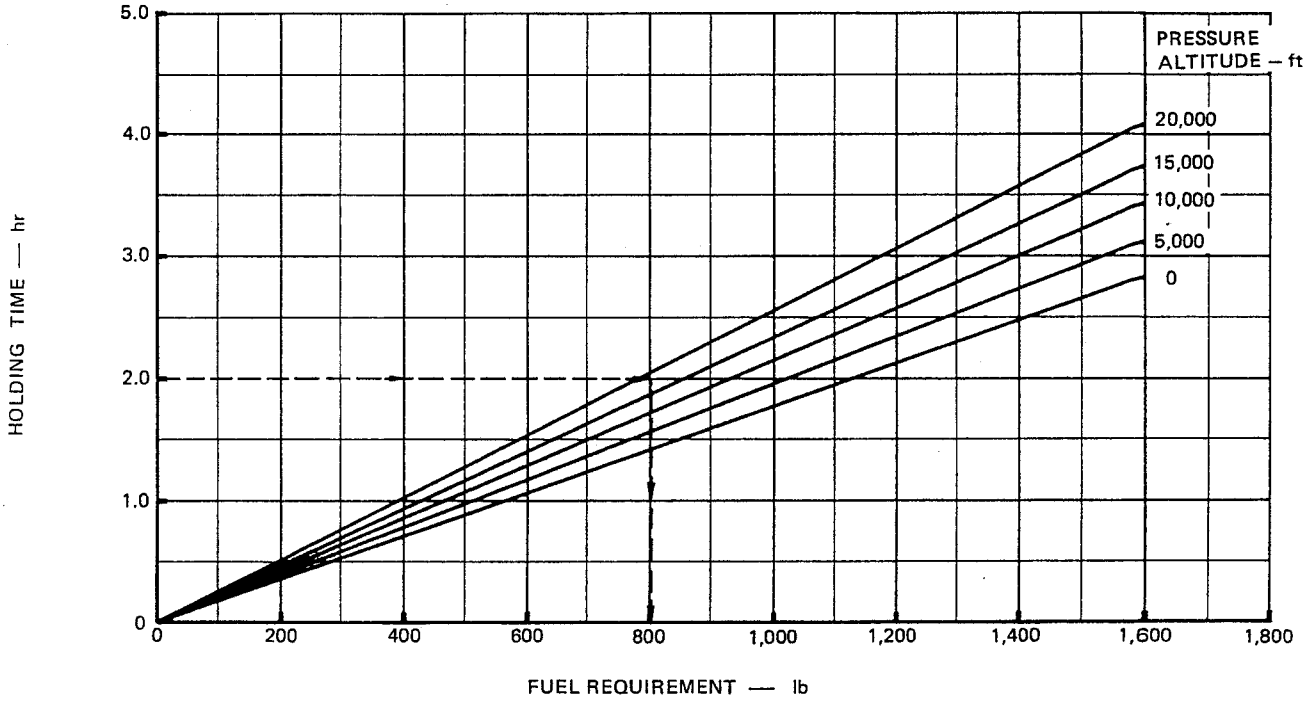


HOLDING TIME

TORQUE SETTING: 40%
ENGINE SPEED: 96% RPM

EXAMPLE:

HOLDING TIME 2 HR
PRESSURE ALTITUDE 19,000 FT.
FUEL REQUIREMENT 805 LBS.

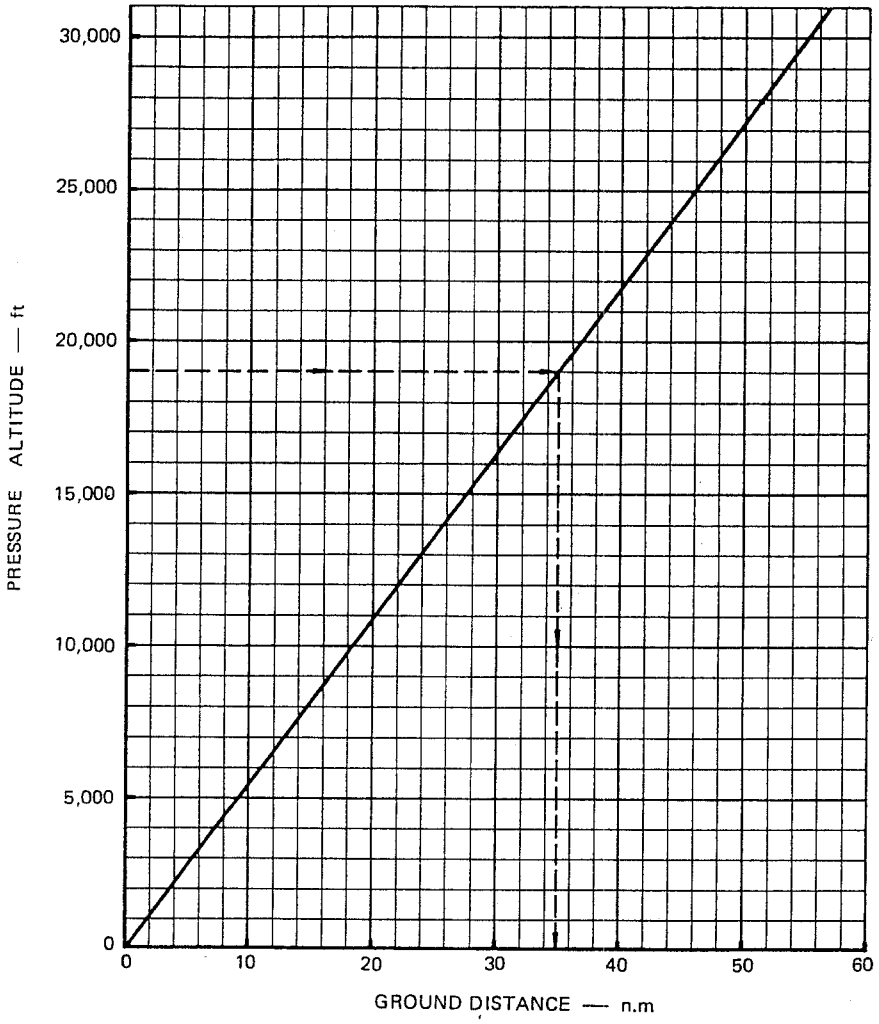


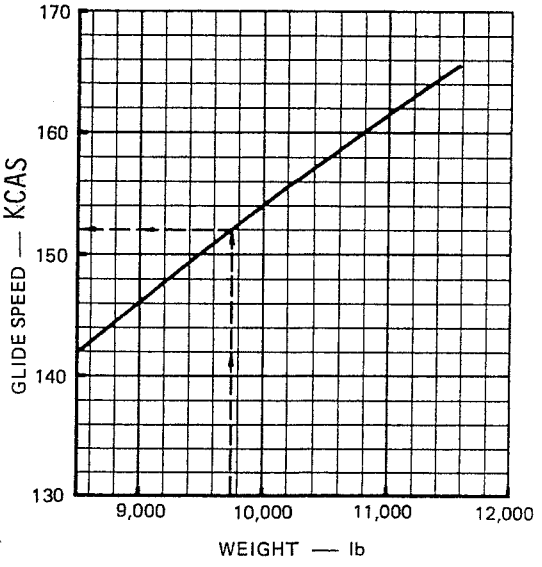
MAXIMUM GLIDE DISTANCE

PROPELLER: BOTH FEATHERED
GEAR AND FLAPS: UP
WIND: ZERO KTS.

EXAMPLE:

INITIAL PRESSURE ALTITUDE	19,000 FT.
FINAL PRESSURE ALTITUDE	0 FT.
WEIGHT	9,750 LBS.
MAXIMUM GLIDE DISTANCE	34 NM
GLIDE SPEED	152 KCAS





RECOMMENDED CRUISE POWER

ISA -30°C 96% RPM EGT = 650°C OR 100% TORQUE

PRESSURE ALTITUDE	IOAT		TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11,500LB		10,500LB		9,500LB	
FEET	°C	°F	%	LBS/HR	LBS/HR	CAS	TAS	CAS	TAS	CAS	TAS
0	-9	16	84	388	776	250	237	250	237	250	237
2,000	-13	9	86	379	758	250	244	250	244	250	244
4,000	-16	3	88	372	744	250	251	250	251	250	251
6,000	-20	-4	90	368	736	250	258	250	258	250	258
8,000	-24	-10	92	365	730	250	266	250	266	250	266
10,000	-27	-18	94	363	726	250	274	250	274	250	274
12,000	-31	-23	96	361	722	250	283	250	283	250	283
14,000	-34	-29	99	360	720	249	290	250	292	250	292
16,000	-38	-36	100	357	714	247	296	249	299	250	301
18,000	-41	-42	100	351	702	245	302	247	305	249	308
20,000	-45	-49	100	345	690	243	308	246	312	247	314

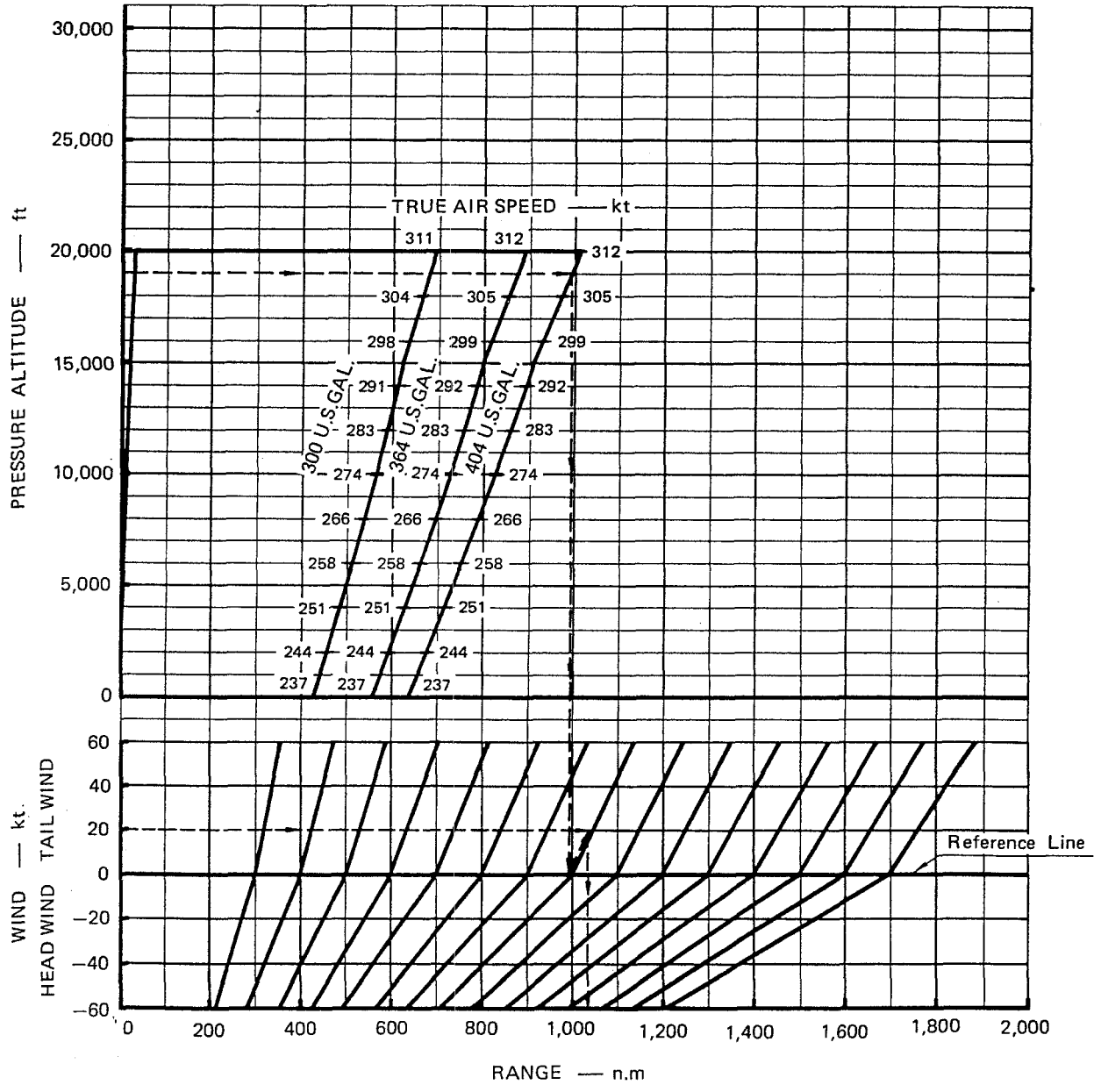
NOTE: 1. Cruise power may be established by setting EGT.
2. Observe V_{MO} limit of 250 knots CAS.

RANGE PROFILE - RECOMMENDED CRUISE POWER

ISA -30°C 96% RMP EGT = 650°C OR
TORQUE 100%

WEIGHT	11,625 LBS. BEFORE START	EXAMPLE:	
FUEL	AVIATION KEROSENE		
FUEL DENSITY	6.7 LBS/GAL	PRESSURE ALTITUDE	19,000 FT.
INITIAL FUEL LOADING	404 U.S. GAL (2,705 LBS.)	WIND TAIL WIND	20 KTS.
PROPELLER SPEED	96% RPM	RANGE	1,035 NM

NOTE: RANGE INCLUDES STARTS, TAXI, CLIMB AND DESCENT WITH 45 MINUTES RESERVE FUEL AT MAXIMUM RANGE POWER.



RECOMMENDED CRUISE POWER

ISA -20°C 96% RPM EGT = 650°C OR 100% TORQUE

PRESSURE ALTITUDE	IOAT		TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11,500LB		10,500LB		9,500LB	
FEET	°C	°F	%	LBS/HR	LBS/HR	CAS	TAS	CAS	TAS	CAS	TAS
0	1	34	85	388	776	250	241	250	241	250	241
2,000	-3	27	86	379	758	250	248	250	248	250	248
4,000	-6	21	88	373	746	250	255	250	255	250	255
6,000	-10	14	90	370	740	250	263	250	263	250	263
8,000	-13	9	93	368	736	250	271	250	271	250	271
10,000	-17	1	97	367	734	250	280	250	280	250	280
12,000	-20	-4	99	365	730	249	288	250	289	250	289
14,000	-24	-11	100	362	724	248	294	249	296	250	298
16,000	-27	-17	100	356	712	245	299	248	303	249	305
18,000	-31	-24	100	350	700	243	305	246	309	248	312
20,000	-35	-31	100	345	690	241	311	244	315	247	319
22,000	-38	-36	97	330	660	234	311	239	317	243	323
24,000	-43	-45	91	310	620	224	308	229	315	233	321

NOTE: 1. Cruise power may be established by setting EGT.
2. Observe V_{MO} limit of 250 knots CAS.

RANGE PROFILE - RECOMMENDED CRUISE POWER

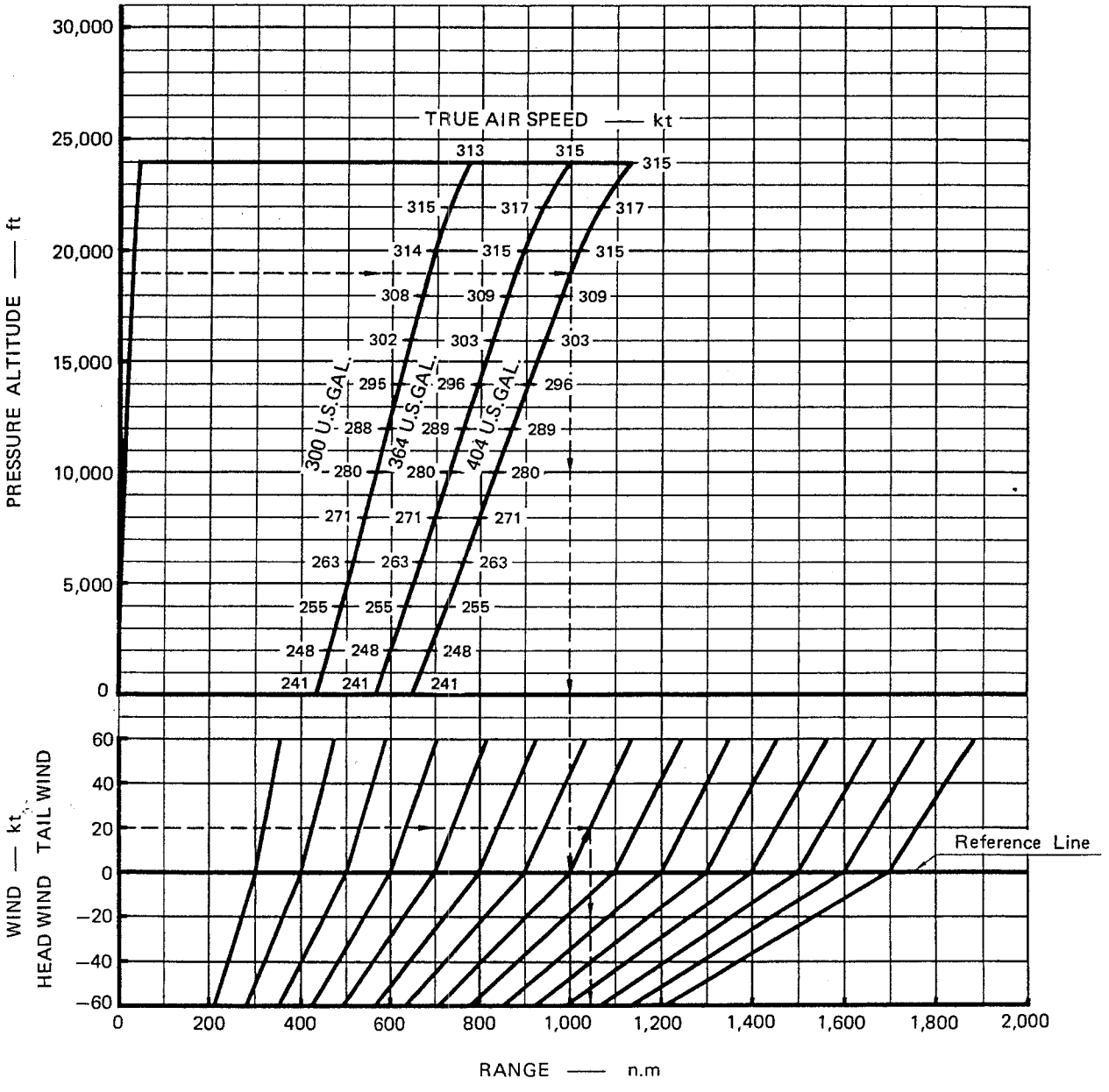
ISA -20°C 96% RMP EGT = 650°C OR TORQUE 100%

WEIGHT	11,625 LBS. BEFORE START
FUEL	AVIATION KEROSENE
FUEL DENSITY	6.7 LBS/GAL
INITIAL FUEL LOADING	404 U.S. GAL (2,705 LBS.)
PROPELLER SPEED	96% RPM

EXAMPLE:

PRESSURE ALTITUDE	19,000 FT.
WIND TAIL WIND	20 KTS.
RANGE	1,045 NM

NOTE: RANGE INCLUDES STARTS, TAXI, CLIMB AND DESCENT WITH 45 MINUTES RESERVE FUEL AT MAXIMUM RANGE POWER.



RECOMMENDED CRUISE POWER

ISA -10°C 96% RPM EGT = 650°C OR 100% TORQUE

PRESSURE ALTITUDE	IOAT		TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11,500LB		10,500LB		9,500LB	
FEET	°C	°F	%	LBS/HR	LBS/HR	CAS	TAS	CAS	TAS	CAS	TAS
0	11	52	87	392	784	250	246	250	246	250	246
2,000	8	46	88	381	762	250	253	250	253	250	253
4,000	4	39	91	377	754	250	260	250	260	250	260
6,000	1	34	93	374	748	250	268	250	268	250	268
8,000	-3	27	96	371	742	250	277	250	277	250	277
10,000	-6	21	98	370	740	249	284	250	285	250	285
12,000	-10	14	100	367	734	247	290	249	293	250	295
14,000	-14	7	100	361	722	245	296	248	299	249	301
16,000	-17	1	100	355	710	243	302	246	305	248	308
18,000	-21	-6	96	338	676	237	302	240	306	243	310
20,000	-25	-13	91	321	642	228	301	232	306	235	310
22,000	-29	-20	86	304	608	220	299	224	305	228	310
24,000	-33	-27	81	283	566	209	295	215	303	219	309
26,000	-38	-36	76	269	538	199	290	206	300	211	308
28,000	-42	-44	70	251	502	188	283	196	296	202	305
30,000	-46	-51	65	233	466	174	272	184	288	191	299

NOTE: 1. Cruise power may be established by setting EGT.
2. Observe V_{MO} limit of 250 knots CAS.

RANGE PROFILE - RECOMMENDED CRUISE POWER

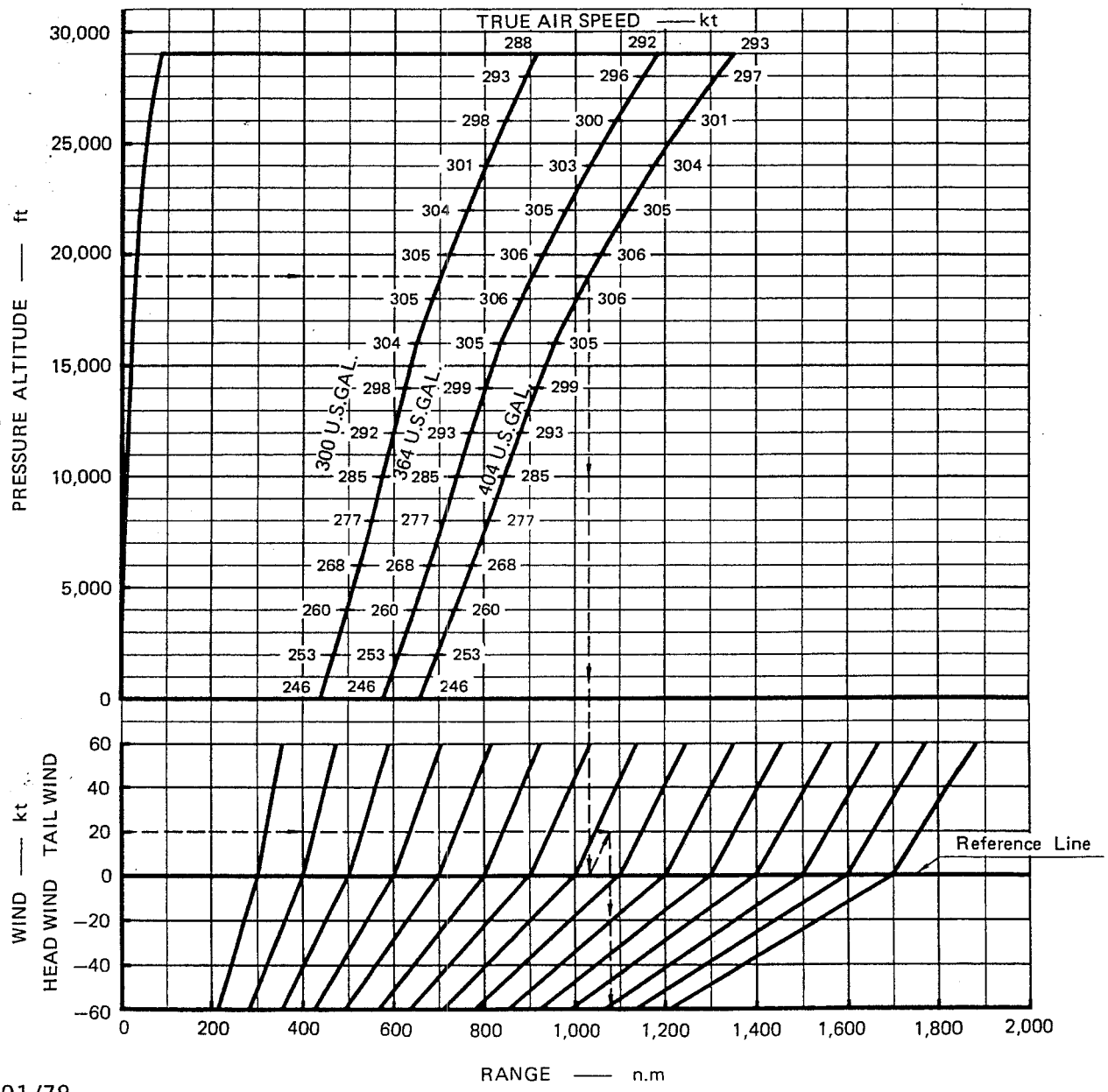
ISA -10°C 96% RMP EGT = 650°C OR
TORQUE 100%

WEIGHT	11,625 LBS. BEFORE START
FUEL	AVIATION KEROSENE
FUEL DENSITY	6.7 LBS/GAL
INITIAL FUEL LOADING	404 U.S. GAL (2,705 LBS.)
PROPELLER SPEED	96% RPM

EXAMPLE:

PRESSURE ALTITUDE	19,000 FT.
WIND TAIL WIND	20 KTS.
RANGE	1,080 NM

NOTE: RANGE INCLUDES STARTS, TAXI, CLIMB AND DESCENT WITH 45 MINUTES RESERVE FUEL AT MAXIMUM RANGE POWER.



RECOMMENDED CRUISE POWER

ISA 96% RPM EGT = 650°C OR 100% TORQUE

PRESSURE ALTITUDE	IOAT		TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11,500LB		10,500LB		9,500LB	
FEET	°C	°F	%	LBS/HR	LBS/HR	CAS	TAS	CAS	TAS	CAS	TAS
0	22	72	89	395	790	250	250	250	250	250	250
2,000	18	64	91	388	776	250	258	250	258	250	258
4,000	14	57	93	383	766	250	266	250	266	250	266
6,000	11	52	95	380	760	250	273	250	273	250	273
8,000	7	45	98	378	756	248	281	250	282	250	282
10,000	4	39	100	374	748	247	287	249	290	250	291
12,000	0	32	100	366	732	245	292	248	295	249	298
14,000	-4	25	95	349	698	238	292	242	296	244	299
16,000	-8	18	91	331	662	230	291	234	296	236	299
18,000	-12	10	86	314	628	222	290	226	295	229	299
20,000	-16	3	81	296	592	213	288	218	294	221	299
22,000	-20	-4	77	280	560	203	284	209	292	213	298
24,000	-24	-11	72	264	528	193	279	200	289	205	297
26,000	-28	-18	68	248	496	182	272	191	286	197	295
28,000	-33	-27	64	232	464	170	263	181	280	188	291
30,000	-37	-35	59	216	432	-	-	169	271	178	286
31,000	-40	-40	57	208	416	-	-	162	264	172	282

NOTE: 1. Cruise power may be established by setting EGT.
2. Observe V_{MO} limit of 250 knots CAS.

RANGE PROFILE - RECOMMENDED CRUISE POWER

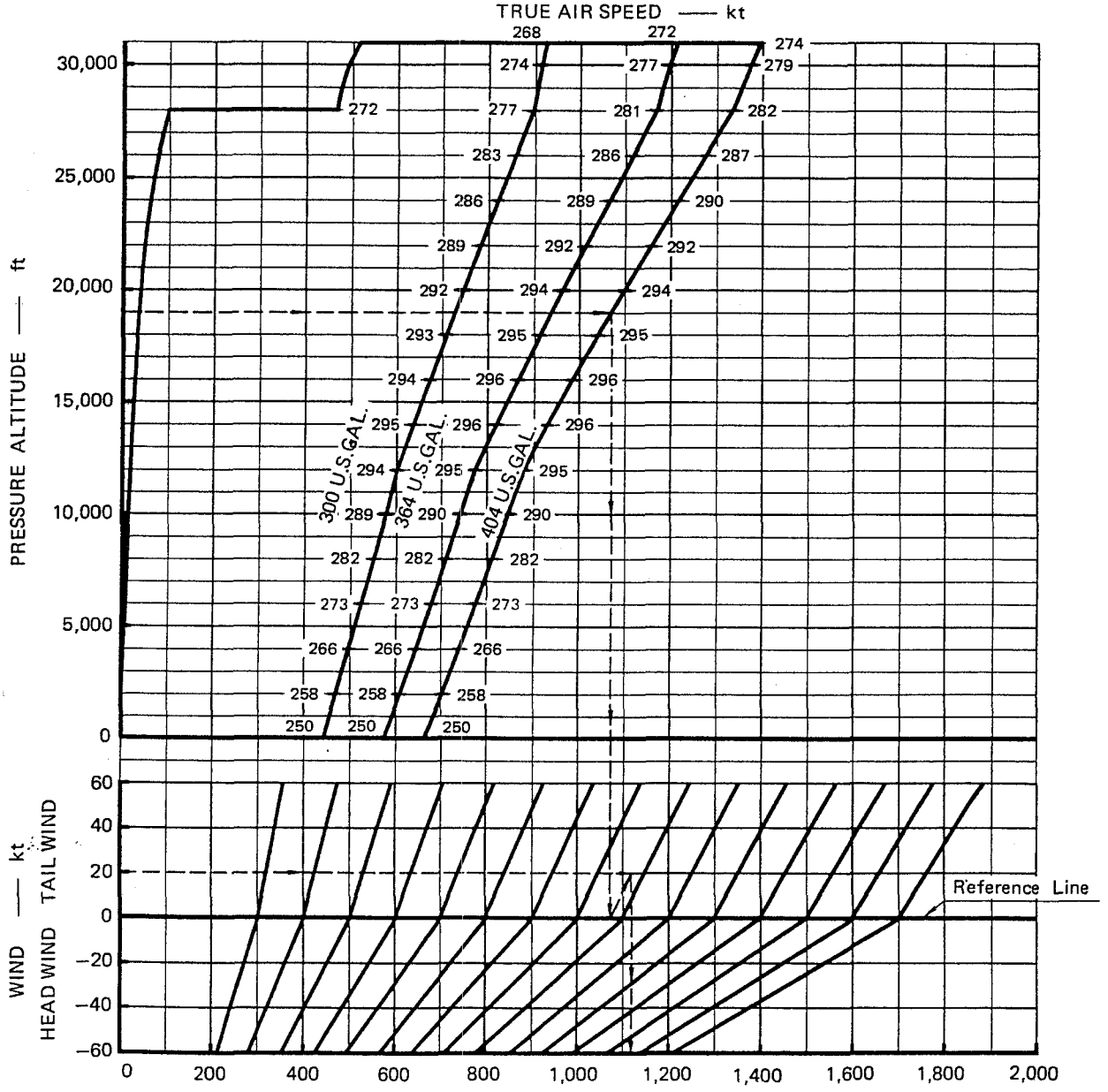
ISA 96% RMP EGT = 650°C OR
TORQUE 100%

WEIGHT	11,625 LBS. BEFORE START
FUEL	AVIATION KEROSENE
FUEL DENSITY	6.7 LBS/GAL
INITIAL FUEL LOADING	404 U.S. GAL (2,705 LBS.)
PROPELLER SPEED	96% RPM

EXAMPLE:

PRESSURE ALTITUDE	19,000 FT.
WIND TAIL WIND	20 KTS.
RANGE	1,120 NM

NOTE: RANGE INCLUDES STARTS, TAXI, CLIMB AND DESCENT WITH 45 MINUTES RESERVE FUEL AT MAXIMUM RANGE POWER.



RECOMMENDED CRUISE POWER

ISA +10°C 96% RPM EGT = 650°C OR 100% TORQUE

PRESSURE ALTITUDE	IOAT		TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11,500LB		10,500LB		9,500LB	
FEET	°C	°F	%	LBS/HR	LBS/HR	CAS	TAS	CAS	TAS	CAS	TAS
0	32	90	90	399	798	250	254	250	254	250	254
2,000	28	82	93	394	788	250	262	250	262	250	262
4,000	25	77	96	391	782	250	270	250	270	250	270
6,000	21	70	98	388	776	250	278	250	278	250	278
8,000	18	64	99	380	760	245	281	247	284	249	287
10,000	14	57	94	360	720	239	281	242	285	244	287
12,000	10	50	90	341	682	232	281	234	284	237	288
14,000	6	43	85	323	646	224	280	227	284	230	288
16,000	1	34	81	305	610	215	278	219	283	222	287
18,000	-3	27	76	288	576	207	276	212	282	216	287
20,000	-7	19	72	271	542	198	272	203	280	208	286
22,000	-11	12	68	255	510	188	267	195	277	200	284
24,000	-15	5	64	240	480	176	259	185	272	191	282
26,000	-20	-4	59	225	450	161	247	173	265	181	278
28,000	-24	-11	56	211	422	-	-	160	255	171	272
30,000	-28	-18	52	197	394	-	-	-	-	159	263
31,000	-30	-22	50	189	378	-	-	-	-	151	254

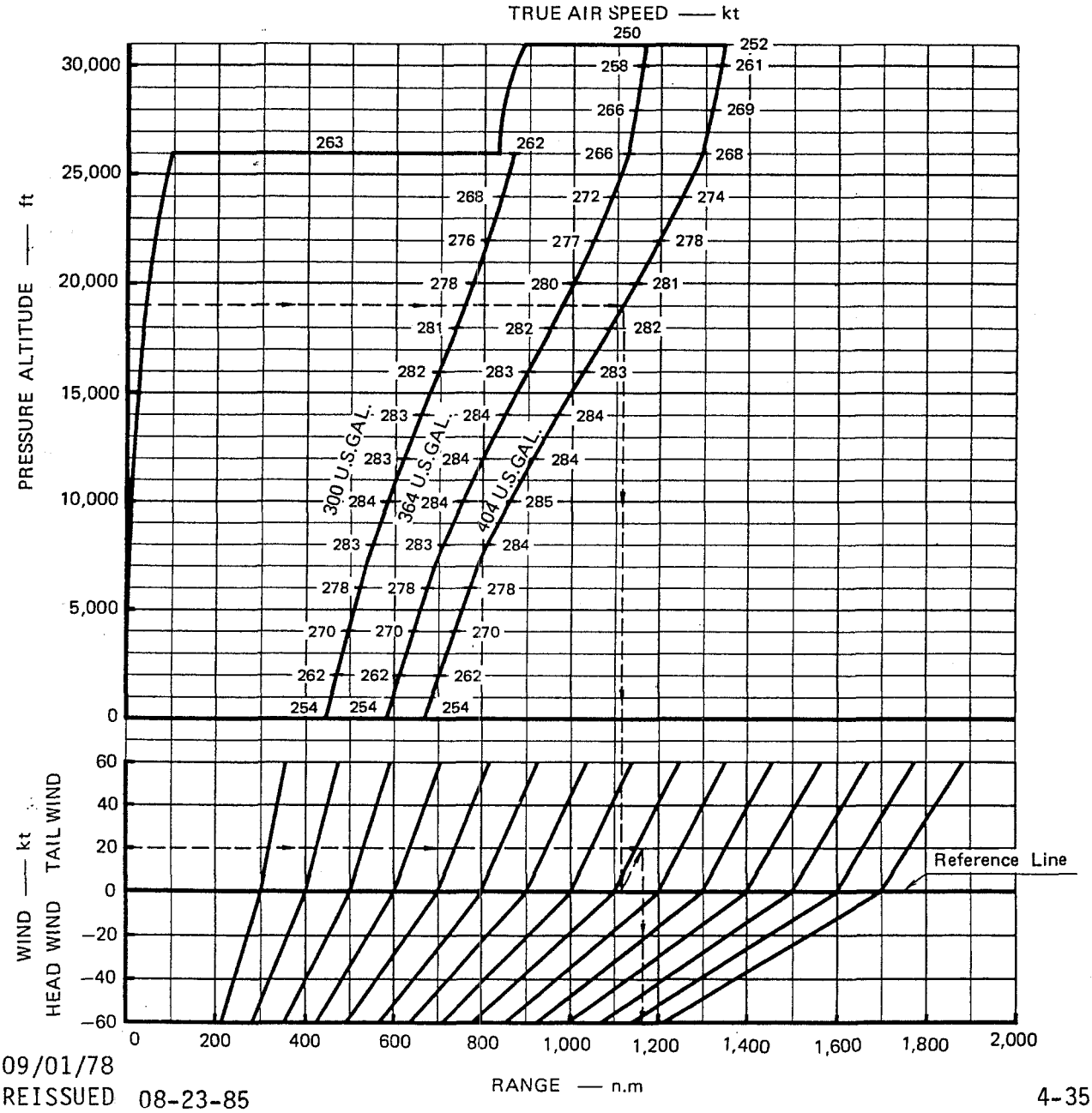
NOTE: 1. Cruise power may be established by setting EGT.
2. Observe V_{MO} limit of 250 knots CAS.

RANGE PROFILE - RECOMMENDED CRUISE POWER

ISA +10°C 96% RMP EGT = 650°C OR TORQUE 100%

WEIGHT	11,625 LBS. BEFORE START	EXAMPLE:	
FUEL	AVIATION KEROSENE		
FUEL DENSITY	6.7 LBS/GAL	PRESSURE ALTITUDE	19,000 FT.
INITIAL FUEL LOADING	404 U.S. GAL (2,705 LBS.)	WIND TAIL WIND	20 KTS.
PROPELLER SPEED	96% RPM	RANGE	1,165 NM

NOTE: RANGE INCLUDES STARTS, TAXI, CLIMB AND DESCENT WITH 45 MINUTES RESERVE FUEL AT MAXIMUM RANGE POWER.



RECOMMENDED CRUISE POWER

ISA +20°C 96% RPM EGT = 650°C OR 100% TORQUE

PRESSURE ALTITUDE	IOAT		TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11,500LB		10,500LB		9,500LB	
FEET	°C	°F	%	LBS/HR	LBS/HR	CAS	TAS	CAS	TAS	CAS	TAS
0	42	108	92	406	812	250	259	250	259	250	259
2,000	38	100	96	402	804	249	265	250	266	250	266
4,000	35	95	93	384	768	242	266	245	269	247	271
6,000	31	88	89	365	730	237	267	239	270	242	273
8,000	27	81	85	348	696	229	267	233	271	235	274
10,000	23	73	81	331	662	222	267	226	272	229	275
12,000	19	66	77	313	626	215	266	219	271	222	275
14,000	15	59	74	297	594	208	265	212	270	216	275
16,000	11	52	70	281	562	200	263	204	269	209	275
18,000	7	45	66	265	530	191	260	196	267	201	274
20,000	2	36	63	249	498	180	254	187	264	193	272
22,000	-2	28	59	234	468	169	246	178	259	185	270
24,000	-6	21	56	221	442	155	233	167	252	176	266
26,000	-11	12	52	207	414	-	-	155	242	167	261
28,000	-14	7	49	194	388	-	-	-	-	154	250
30,000	-19	-2	46	181	362	-	-	-	-	138	232
31,000	-	-	-	-	-	-	-	-	-	-	-

NOTE: 1. Cruise power may be established by setting EGT.
2. Observe V_{MO} limit of 250 knots CAS.

RANGE PROFILE - RECOMMENDED CRUISE POWER

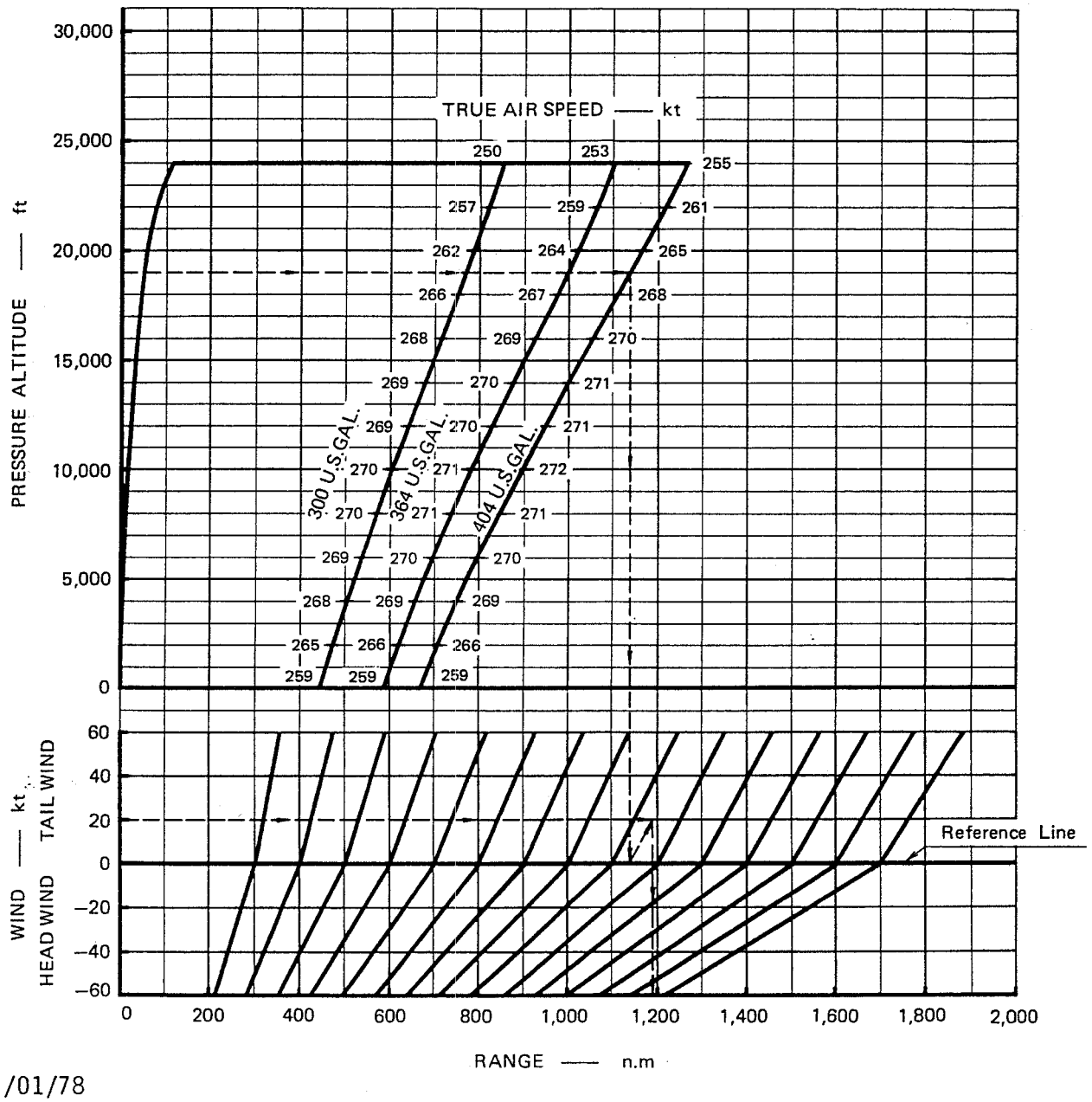
ISA +20°C 96% RMP EGT = 650°C OR
TORQUE 100%

WEIGHT	11,625 LBS. BEFORE START
FUEL	AVIATION KEROSENE
FUEL DENSITY	6.7 LBS/GAL
INITIAL FUEL LOADING	404 U.S. GAL (2,705 LBS.)
PROPELLER SPEED	96% RPM

EXAMPLE:

PRESSURE ALTITUDE	19,000 FT.
WIND TAIL WIND	20 KTS.
RANGE	1,190 NM

NOTE: RANGE INCLUDES STARTS, TAXI, CLIMB AND DESCENT WITH 45 MINUTES RESERVE FUEL AT MAXIMUM RANGE POWER.



RECOMMENDED CRUISE POWER

ISA +30°C 96% RPM EGT = 650°C OR 100% TORQUE

PRESSURE ALTITUDE	IOAT		TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11,500LB		10,500LB		9,500LB	
FEET	°C	°F	%	LBS/HR	LBS/HR	CAS	TAS	CAS	TAS	CAS	TAS
0	52	126	88	397	794	428	254	244	256	246	259
2,000	48	118	85	378	756	235	255	238	258	240	260
4,000	44	111	82	360	720	228	255	232	259	234	261
6,000	40	104	78	342	684	222	255	226	259	229	262
8,000	36	97	75	324	648	216	255	219	259	222	263
10,000	32	90	71	307	614	207	253	211	258	215	263
12,000	28	82	68	290	580	199	251	204	257	209	263
14,000	24	75	65	273	546	191	247	197	255	202	262
16,000	20	68	62	257	514	181	243	188	252	195	261
18,000	16	61	58	242	484	171	237	180	249	186	258
20,000	11	52	55	228	456	161	230	170	244	178	255
22,000	7	45	52	215	430	-	-	158	236	168	250
24,000	2	36	49	202	404	-	-	146	225	158	244
26,000	-1	30	46	190	380	-	-	-	-	147	235
28,000	-6	21	43	178	356	-	-	-	-	133	221
30,000	-	-	-	-	-	-	-	-	-	-	-
31,000	-	-	-	-	-	-	-	-	-	-	-

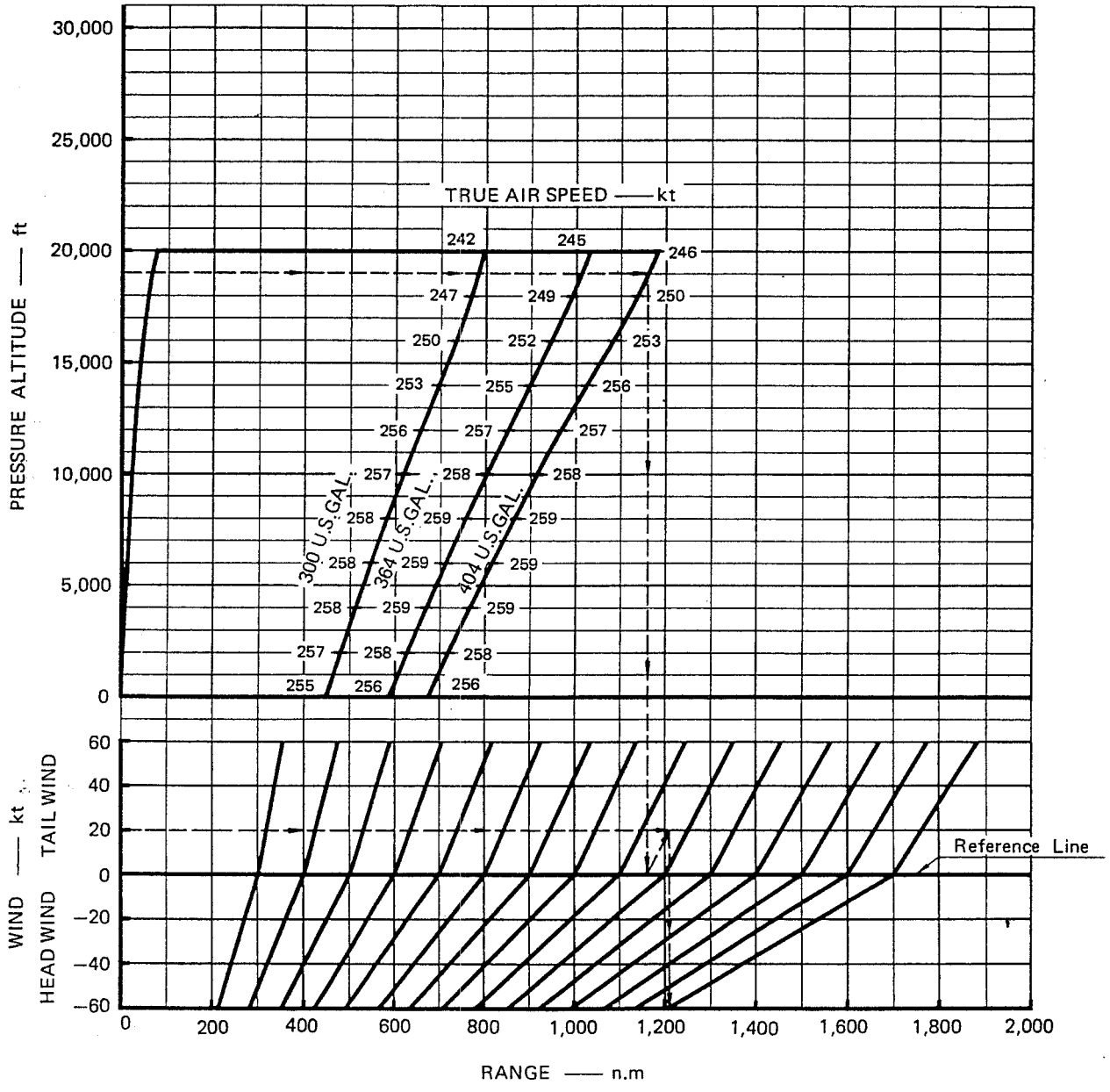
NOTE: 1. Cruise power may be established by setting EGT.
2. Observe V_{MO} limit of 250 knots CAS.

RANGE PROFILE - RECOMMENDED CRUISE POWER

ISA +30°C 96% RMP EGT = 650°C OR TORQUE 100%

WEIGHT	11,625 LBS. BEFORE START	EXAMPLE:
FUEL	AVIATION KEROSENE	
FUEL DENSITY	6.7 LBS/GAL	PRESSURE ALTITUDE 19,000 FT.
INITIAL FUEL LOADING	404 U.S. GAL (2,705 LBS.)	WIND TAIL WIND 20 KTS.
PROPELLER SPEED	96% RPM	RANGE 1,210 NM

NOTE: RANGE INCLUDES STARTS, TAXI, CLIMB AND DESCENT WITH 45 MINUTES RESERVE FUEL AT MAXIMUM RANGE POWER.



MAXIMUM RANGE POWER

ISA -30°C 96% RPM

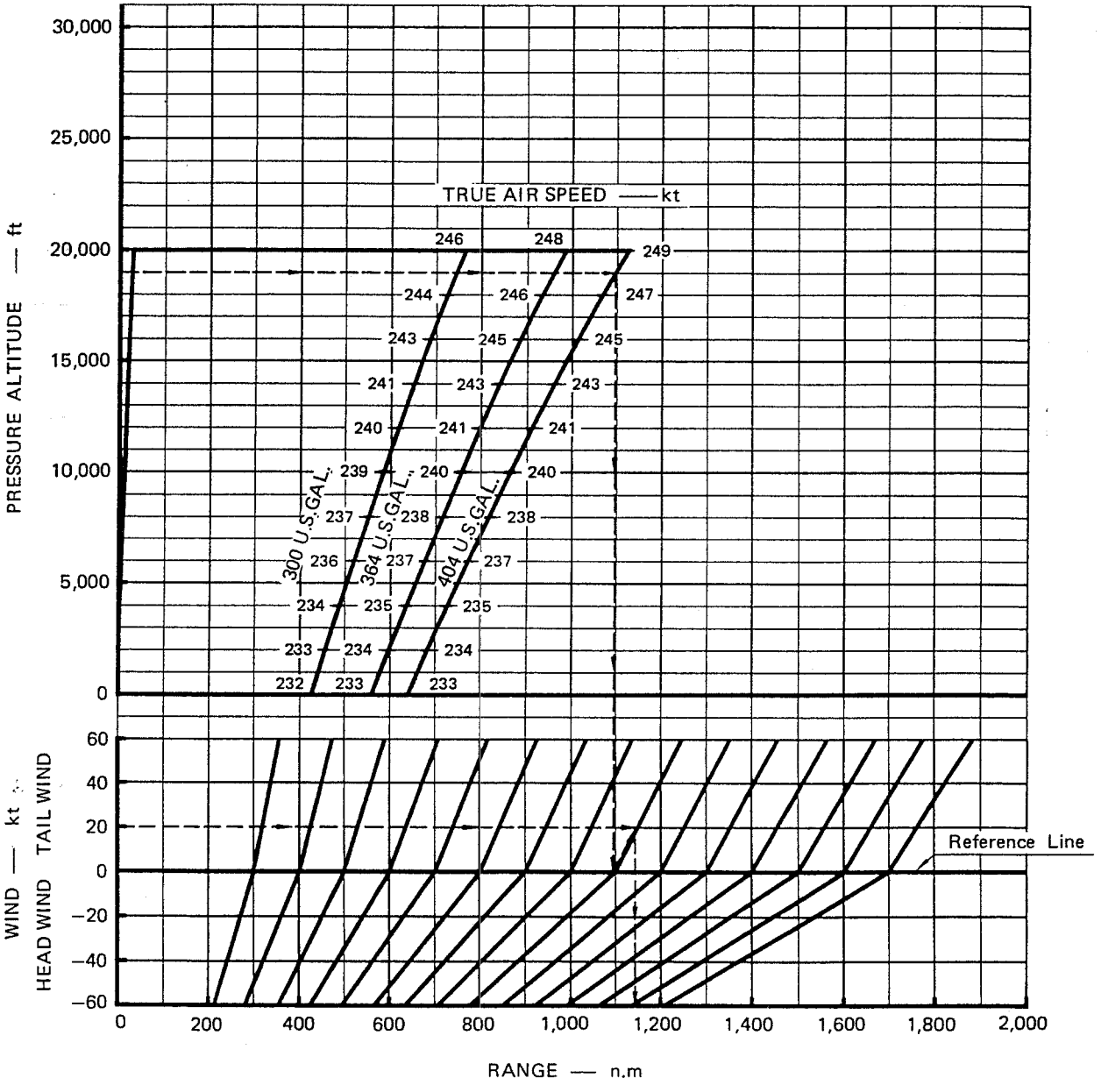
PRESSURE ALTITUDE	IOAT		TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11,500LB		10,500LB		9,500LB	
FEET	°C	°F	%	LBS/HR	LBS/HR	CAS	TAS	CAS	TAS	CAS	TAS
0	-9	16	80	380	760	244	231	246	233	247	234
2,000	-13	9	78	362	724	238	232	240	234	241	235
4,000	-17	1	75	346	692	232	233	234	235	236	237
6,000	-21	-6	72	330	660	227	234	229	237	230	238
8,000	-25	-13	70	316	632	222	235	225	238	227	240
10,000	-29	-20	68	303	606	216	236	220	240	222	242
12,000	-33	-27	66	291	582	211	237	214	241	217	244
14,000	-37	-35	65	279	558	205	238	209	243	213	247
16,000	-41	-42	63	268	536	200	239	205	245	209	249
18,000	-45	-49	62	257	514	195	240	200	246	205	252
20,000	-49	-56	60	246	492	190	241	195	248	200	254

RANGE PROFILE - MAXIMUM RANGE POWER

ISA -30°C 96% RPM

WEIGHT	11,625 LBS. BEFORE START	EXAMPLE:
FUEL	AVIATION KEROSENE	
FUEL DENSITY	6.7 LBS/GAL	PRESSURE ALTITUDE 19,000 FT.
INITIAL FUEL LOADING	404 U.S. GAL (2,705 LBS.)	WIND TAIL WIND 20 KTS.
PROPELLER SPEED	96% RPM	RANGE 1,145 NM

NOTE: RANGE INCLUDES STARTS, TAXI, CLIMB AND DESCENT WITH 45 MINUTES RESERVE FUEL AT MAXIMUM RANGE POWER.



MAXIMUM RANGE POWER

ISA -20°C 96% RPM

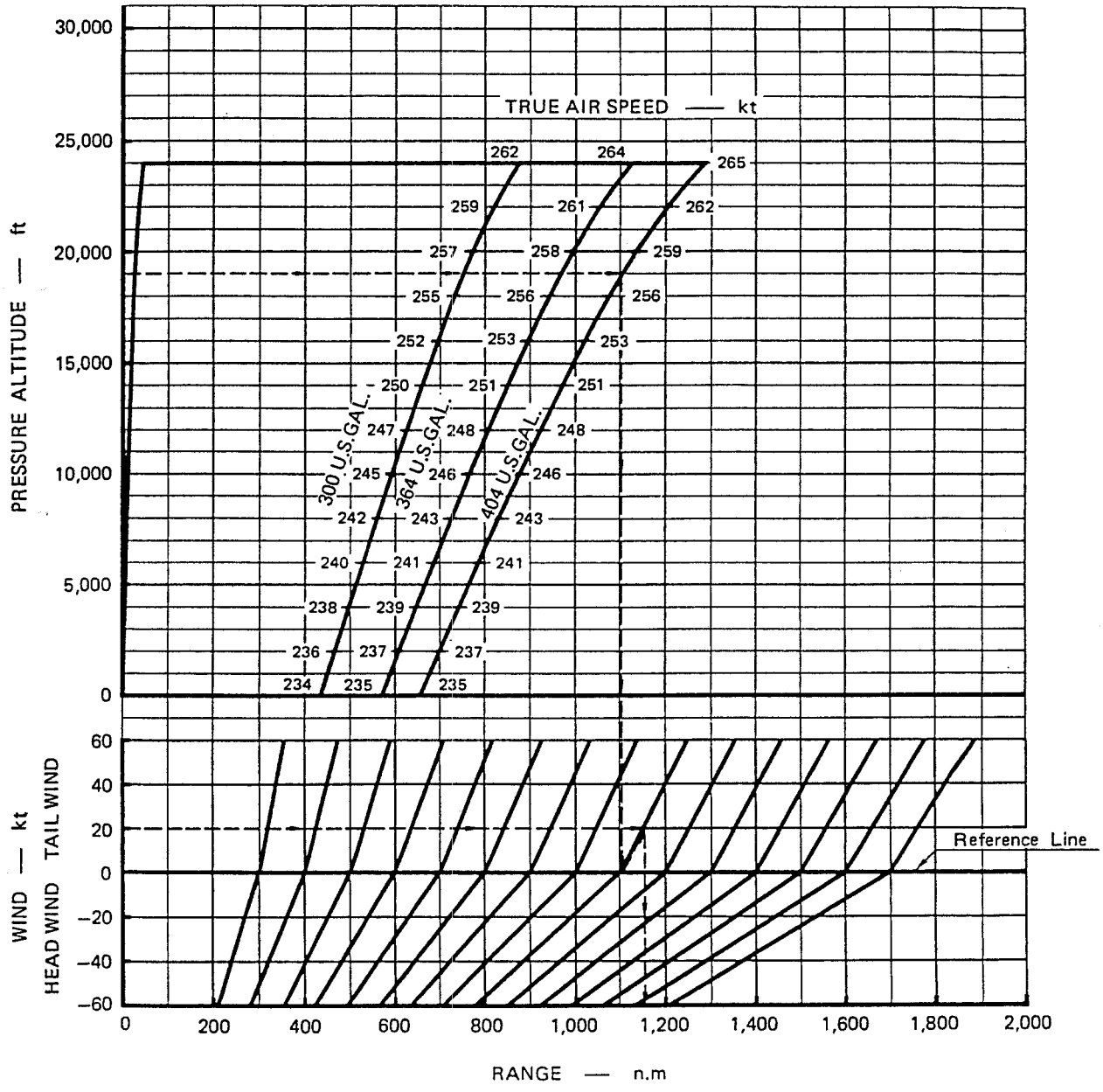
PRESSURE ALTITUDE	IOAT		TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11,500LB		10,500LB		9,500LB	
FEET	°C	°F	%	LBS/HR	LBS/HR	CAS	TAS	CAS	TAS	CAS	TAS
0	1	34	80	376	752	242	233	244	235	246	237
2,000	-3	27	78	359	718	237	235	239	237	241	239
4,000	-7	19	76	344	688	232	237	234	239	237	242
6,000	-11	12	74	330	660	227	239	229	241	232	244
8,000	-15	5	72	318	636	223	241	225	243	229	247
10,000	-19	-2	71	306	612	218	243	221	246	223	249
12,000	-23	-9	69	296	592	213	245	216	248	219	252
14,000	-26	-15	68	283	566	208	247	212	251	215	255
16,000	-30	-22	66	273	546	204	249	208	253	212	258
18,000	-34	-29	65	263	526	199	251	203	256	207	261
20,000	-38	-36	64	253	506	194	252	198	258	203	264
22,000	-42	-44	63	245	490	188	253	194	261	199	267
24,000	-46	-51	62	238	476	184	254	191	264	195	270

RANGE PROFILE - MAXIMUM RANGE POWER

ISA -20°C 96% RPM

WEIGHT	11,625 LBS. BEFORE START	EXAMPLE:
FUEL	AVIATION KEROSENE	
FUEL DENSITY	6.7 LBS/GAL	PRESSURE ALTITUDE 19,000 FT.
INITIAL FUEL LOADING	404 U.S. GAL (2,705 LBS.)	WIND TAIL WIND 20 KTS.
PROPELLER SPEED	96% RPM	RANGE 1,155 NM

NOTE: RANGE INCLUDES STARTS, TAXI, CLIMB AND DESCENT WITH 45 MINUTES RESERVE FUEL AT MAXIMUM RANGE POWER.



R **MAXIMUM RANGE POWER**

ISA -10°C 96% RPM

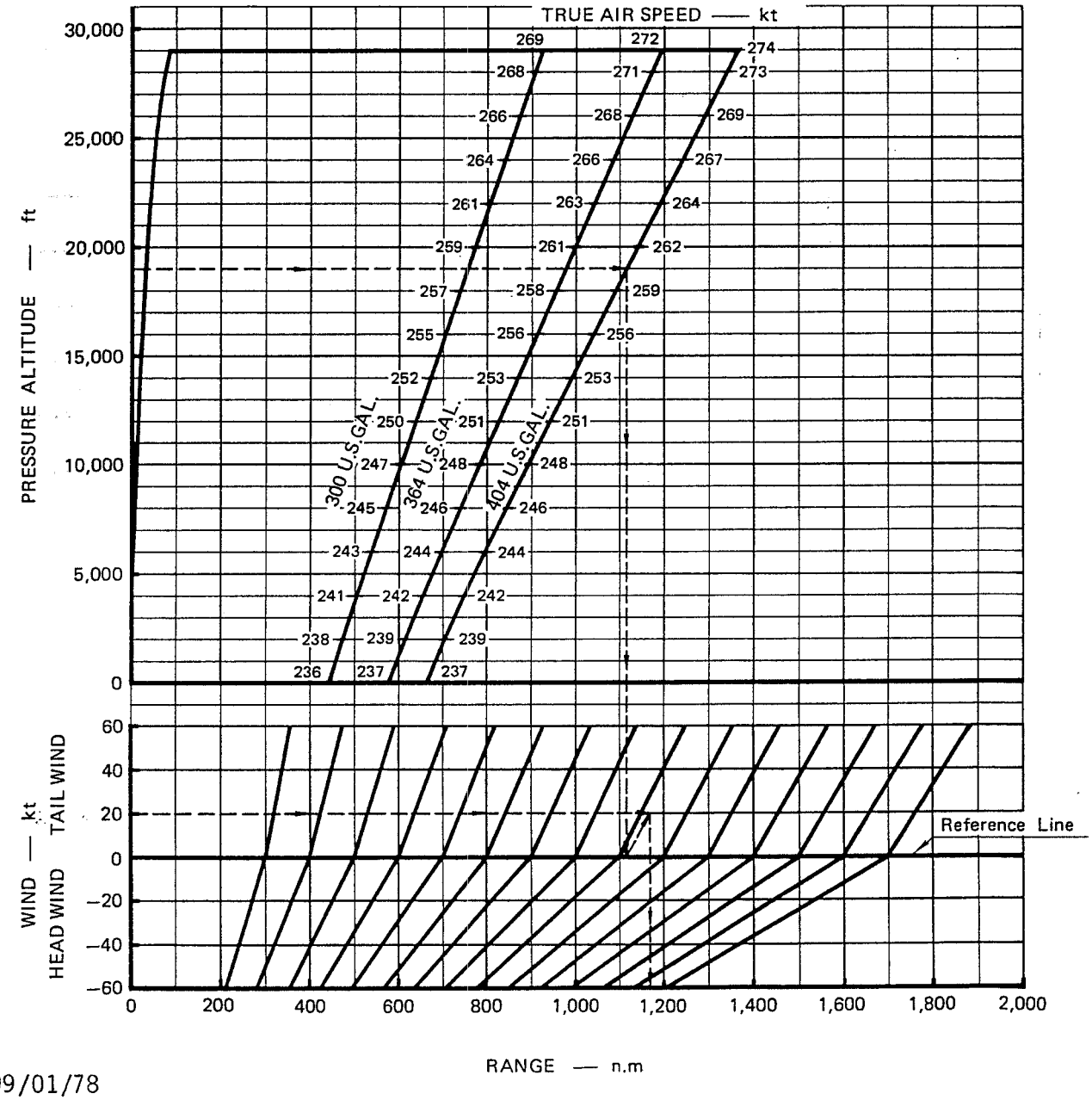
PRESSURE ALTITUDE	IOAT		TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11,500LB		10,500LB		9,500LB	
FEET	°C	°F	%	LBS/HR	LBS/HR	CAS	TAS	CAS	TAS	CAS	TAS
0	11	52	80	374	748	239	235	241	237	243	239
2,000	7	45	78	358	716	234	237	236	239	238	241
4,000	3	37	76	343	686	229	239	232	242	234	244
6,000	-1	30	74	329	658	224	241	227	244	229	246
8,000	-5	23	72	316	632	221	243	223	246	226	249
10,000	-9	16	70	303	606	216	245	218	248	221	251
12,000	-12	10	68	292	584	211	247	214	251	217	254
14,000	-16	3	67	281	562	206	249	209	253	212	257
16,000	-20	-4	66	271	542	202	251	206	256	209	260
18,000	-24	-11	65	262	524	197	253	201	258	205	263
20,000	-28	-18	64	253	506	191	254	196	261	200	266
22,000	-32	-26	63	245	490	186	255	192	263	196	269
24,000	-36	-33	62	237	474	181	256	188	266	192	272
26,000	-39	-38	61	231	462	175	256	183	268	188	276
28,000	-43	-45	60	225	450	170	257	179	271	185	280
30,000	-47	-53	60	219	438	164	257	174	273	181	284

RANGE PROFILE - MAXIMUM RANGE POWER

ISA -10°C 96% RPM

WEIGHT	11,625 LBS. BEFORE START	EXAMPLE:
FUEL	AVIATION KEROSENE	
FUEL DENSITY	6.7 LBS/GAL	PRESSURE ALTITUDE 19,000 FT.
INITIAL FUEL LOADING	404 U.S. GAL (2,705 LBS.)	WIND TAIL WIND 20 KTS.
PROPELLER SPEED	96% RPM	RANGE 1,170 NM

NOTE: RANGE INCLUDES STARTS, TAXI, CLIMB AND DESCENT WITH 45 MINUTES RESERVE FUEL AT MAXIMUM RANGE POWER.



MAXIMUM RANGE POWER

ISA 96% RPM

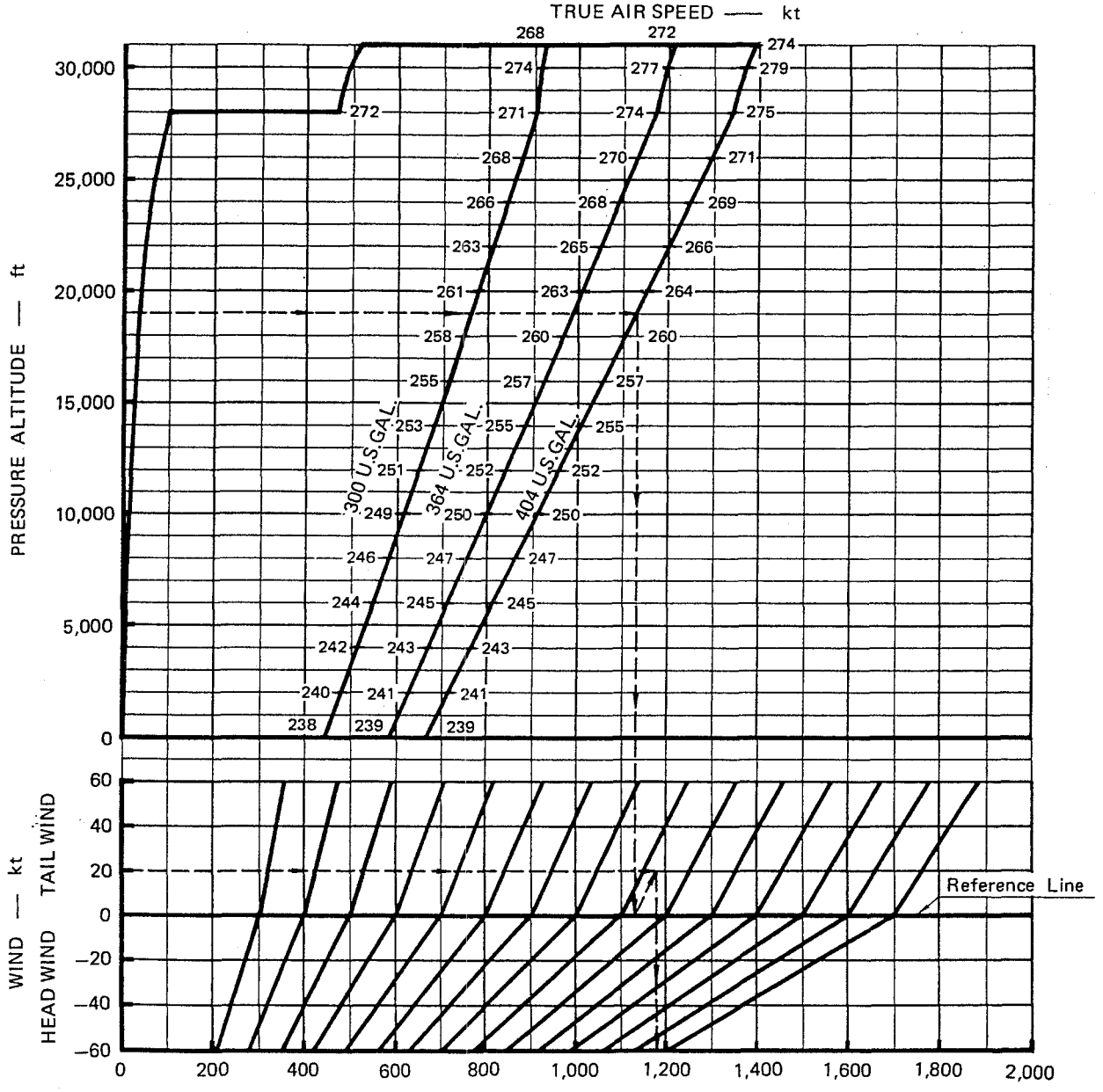
PRESSURE ALTITUDE	IOAT		TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11,500LB		10,500LB		9,500LB	
FEET	°C	°F	%	LBS/HR	LBS/HR	CAS	TAS	CAS	TAS	CAS	TAS
0	21	70	80	374	748	237	237	239	239	241	241
2,000	17	63	78	356	712	232	239	234	241	236	243
4,000	13	55	76	340	680	227	241	229	243	231	245
6,000	9	48	74	326	652	222	243	224	245	227	248
8,000	5	41	72	313	626	218	245	220	247	223	250
10,000	2	36	70	301	602	213	247	216	250	218	253
12,000	-2	28	68	290	580	208	249	211	252	214	256
14,000	-6	21	67	279	558	203	251	207	255	210	259
16,000	-10	14	66	269	538	199	253	203	257	206	262
18,000	-14	7	65	259	518	194	254	198	260	202	265
20,000	-18	0	64	250	500	188	255	194	263	198	268
22,000	-22	-8	63	243	486	183	256	189	265	194	272
24,000	-25	-13	62	236	472	178	257	186	268	190	275
26,000	-29	-20	62	231	462	172	257	181	270	186	278
28,000	-33	-27	61	225	450	166	257	176	273	182	282
30,000	-37	-35	59	216	432	-	-	169	271	178	286
31,000	-40	-40	57	208	416	-	-	162	264	172	282

RANGE PROFILE - MAXIMUM RANGE POWER

ISA 96% RPM

WEIGHT	11,625 LBS. BEFORE START	EXAMPLE:
FUEL	AVIATION KEROSENE	
FUEL DENSITY	6.7 LBS/GAL	PRESSURE ALTITUDE 19,000 FT.
INITIAL FUEL LOADING	404 U.S. GAL (2,705 LBS.)	WIND TAIL WIND 20 KTS.
PROPELLER SPEED	96% RPM	RANGE 1,180 NM

NOTE: RANGE INCLUDES STARTS, TAXI, CLIMB AND DESCENT WITH 45 MINUTES RESERVE FUEL AT MAXIMUM RANGE POWER.



MAXIMUM RANGE POWER

ISA +10°C 96% RPM

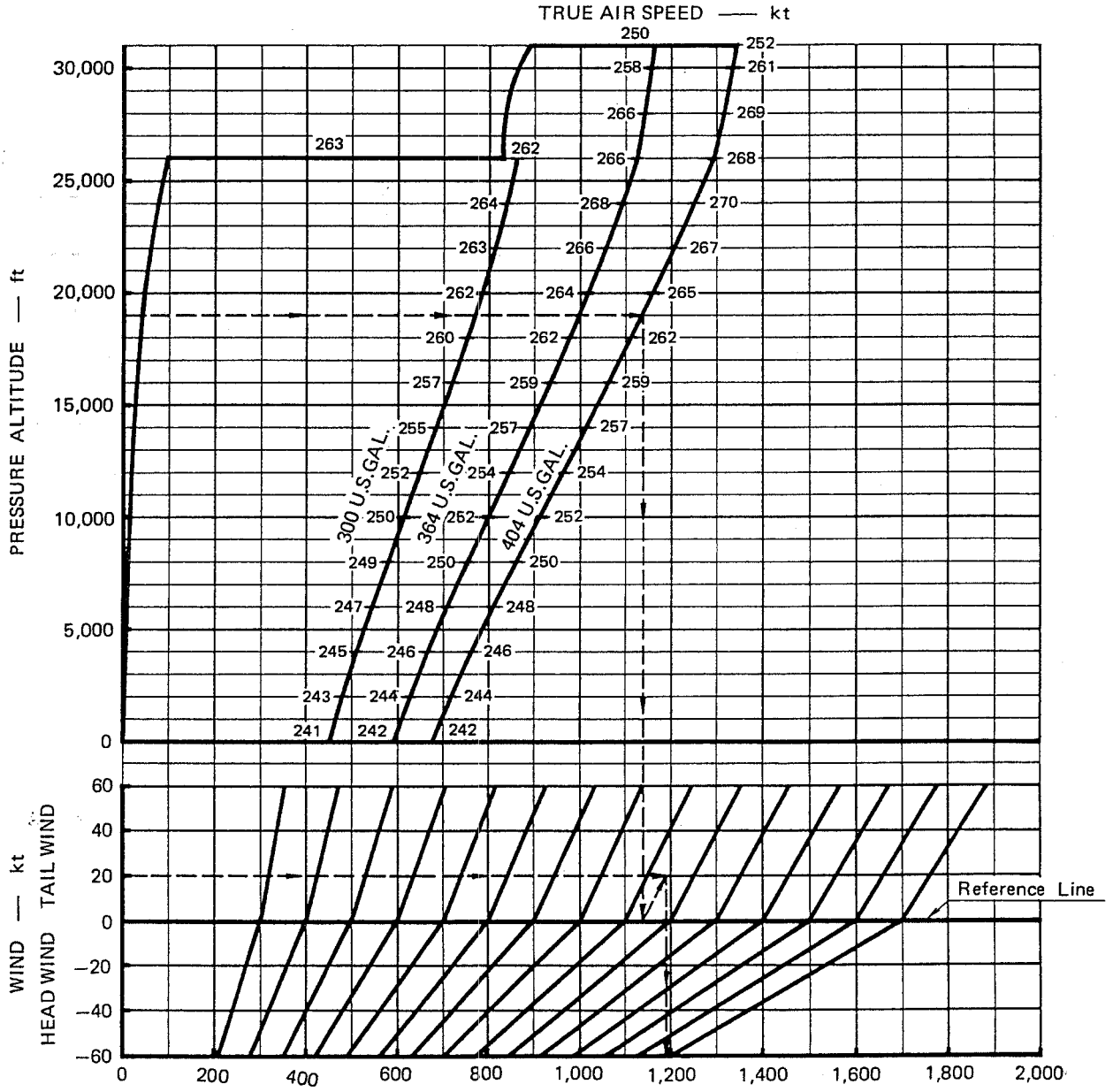
PRESSURE ALTITUDE	IOAT		TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11,500LB		10,500LB		9,500LB	
FEET	°C	°F	%	LBS/HR	LBS/HR	CAS	TAS	CAS	TAS	CAS	TAS
0	31	88	80	374	748	235	239	238	242	240	244
2,000	27	81	78	359	718	230	241	233	244	235	246
4,000	23	73	76	343	686	225	243	228	246	230	248
6,000	19	66	74	329	658	219	244	223	248	225	251
8,000	16	61	72	313	626	215	246	219	250	221	253
10,000	12	54	70	301	602	209	247	214	252	216	255
12,000	8	46	69	289	578	205	249	209	254	212	258
14,000	4	39	67	278	556	199	250	204	257	207	261
16,000	0	32	66	268	536	195	252	200	259	204	264
18,000	-4	25	64	259	518	189	253	196	262	200	267
20,000	-8	18	64	251	502	184	254	191	264	195	270
22,000	-12	10	62	242	484	179	255	186	266	191	273
24,000	-15	5	62	235	470	174	256	182	268	187	276
26,000	-20	-4	59	225	450	161	247	173	265	181	278
28,000	-24	-11	56	211	422	-	-	160	255	171	272
30,000	-28	-18	52	197	394	-	-	-	-	159	263
31,000	-30	-22	50	189	378	-	-	-	-	151	254

RANGE PROFILE - MAXIMUM RANGE POWER

ISA +10°C 96% RPM

WEIGHT	11,625 LBS. BEFORE START	EXAMPLE:	
FUEL	AVIATION KEROSENE		
FUEL DENSITY	6.7 LBS/GAL	PRESSURE ALTITUDE	19,000 FT.
INITIAL FUEL LOADING	404 U.S. GAL (2,705 LBS.)	WIND TAIL WIND	20 KTS.
PROPELLER SPEED	96% RPM	RANGE	1,190 NM

NOTE: RANGE INCLUDES STARTS, TAXI, CLIMB AND DESCENT WITH 45 MINUTES RESERVE FUEL AT MAXIMUM RANGE POWER.



MAXIMUM RANGE POWER

ISA +20°C 96% RPM

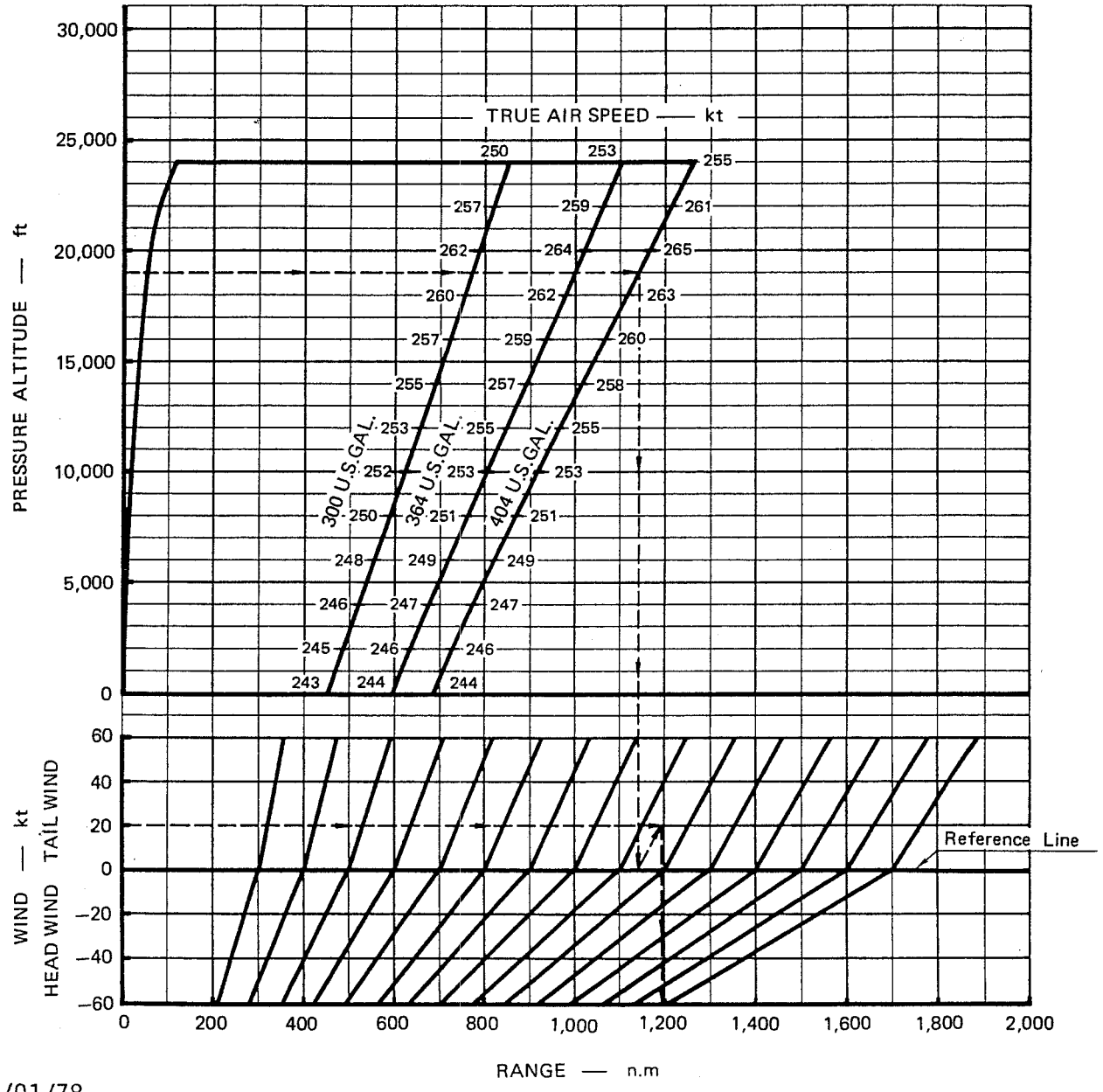
PRESSURE ALTITUDE	IOAT		TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11,500LB		10,500LB		9,500LB	
FEET	°C	°F	%	LBS/HR	LBS/HR	CAS	TAS	CAS	TAS	CAS	TAS
0	41	106	80	375	750	234	242	236	244	238	246
2,000	37	99	78	357	714	228	243	231	246	233	248
4,000	33	91	75	341	682	223	245	225	247	228	250
6,000	30	86	73	327	654	217	246	220	249	223	253
8,000	26	79	71	313	626	213	248	216	251	219	255
10,000	22	72	70	300	600	207	249	211	253	215	258
12,000	18	64	68	288	576	202	250	206	255	210	260
14,000	14	57	66	277	554	196	251	201	257	205	263
16,000	10	50	65	267	534	191	252	197	259	202	266
18,000	6	43	64	258	516	186	253	192	262	197	268
20,000	2	36	63	249	498	180	254	187	264	193	272
22,000	-2	28	59	234	468	169	246	178	259	185	270
24,000	-6	21	56	221	442	155	233	167	252	176	266
26,000	-11	12	52	207	414	-	-	155	242	167	261
28,000	-14	7	49	194	388	-	-	-	-	154	250
30,000	-19	-2	46	181	362	-	-	-	-	138	232
31,000	-	-	-	-	-	-	-	-	-	-	-

RANGE PROFILE - MAXIMUM RANGE POWER

ISA +20°C 96% RPM

WEIGHT	11,625 LBS. BEFORE START	EXAMPLE:
FUEL	AVIATION KEROSENE	
FUEL DENSITY	6.7 LBS/GAL	PRESSURE ALTITUDE 19,000 FT.
INITIAL FUEL LOADING	404 U.S. GAL (2,705 LBS.)	WIND TAIL WIND 20 KTS.
PROPELLER SPEED	96% RPM	RANGE 1,195 NM

NOTE: RANGE INCLUDES STARTS, TAXI, CLIMB AND DESCENT WITH 45 MINUTES RESERVE FUEL AT MAXIMUM RANGE POWER.



MAXIMUM RANGE POWER

ISA +30°C 96% RPM

PRESSURE ALTITUDE	IOAT		TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	AIRSPEED KNOTS					
						11,500LB		10,500LB		9,500LB	
FEET	°C	°F	%	LBS/HR	LBS/HR	CAS	TAS	CAS	TAS	CAS	TAS
0	51	124	80	377	754	231	243	234	246	236	248
2,000	47	117	78	359	718	225	244	228	247	231	250
4,000	44	111	75	343	686	219	245	223	249	226	252
6,000	40	104	73	328	656	214	247	218	251	221	254
8,000	36	97	71	314	628	210	248	214	253	216	256
10,000	32	90	69	301	602	204	249	208	254	211	258
12,000	28	82	68	290	580	199	251	204	257	209	263
14,000	24	75	65	273	546	191	247	197	255	202	262
16,000	20	68	62	257	514	181	243	188	252	195	261
18,000	16	61	58	242	484	171	237	180	249	186	258
20,000	11	52	55	228	456	161	230	170	244	178	255
22,000	7	45	52	215	430	-	-	158	236	168	250
24,000	2	36	49	202	404	-	-	146	225	158	244
26,000	-1	30	46	190	380	-	-	-	-	147	235
28,000	-6	21	43	178	356	-	-	-	-	133	221
30,000	-	-	-	-	-	-	-	-	-	-	-
31,000	-	-	-	-	-	-	-	-	-	-	-

RANGE PROFILE - MAXIMUM RANGE POWER

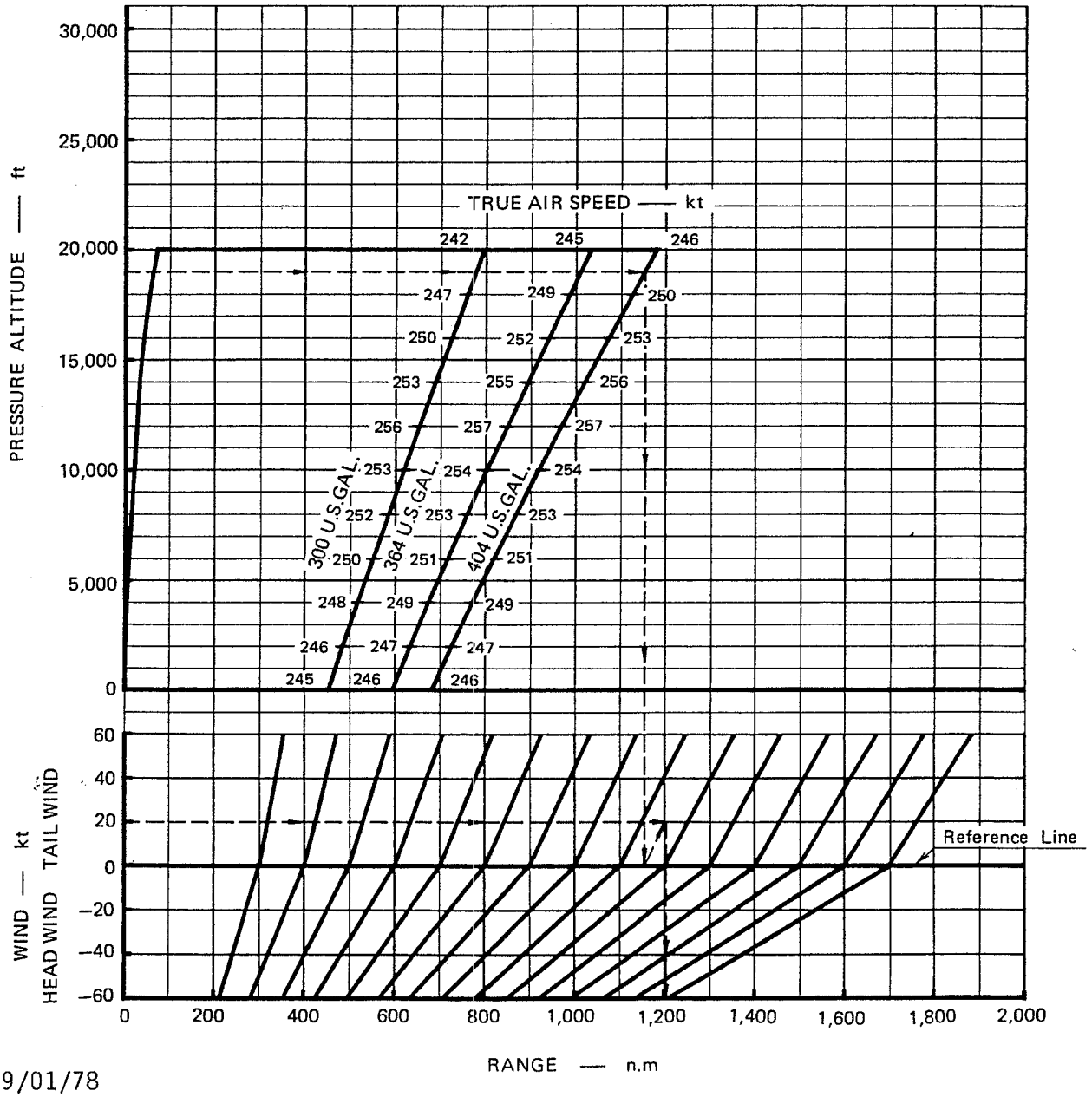
ISA +30°C 96% RPM

WEIGHT	11,625 LBS. BEFORE START
FUEL	AVIATION KEROSENE
FUEL DENSITY	6.7 LBS/GAL
INITIAL FUEL LOADING	404 U.S. GAL (2,705 LBS.)
PROPELLER SPEED	96% RPM

EXAMPLE:

PRESSURE ALTITUDE	19,000 FT.
WIND TAIL WIND	20 KTS.
RANGE	1,205 NM

NOTE: RANGE INCLUDES STARTS, TAXI, CLIMB AND DESCENT WITH 45 MINUTES RESERVE FUEL AT MAXIMUM RANGE POWER.



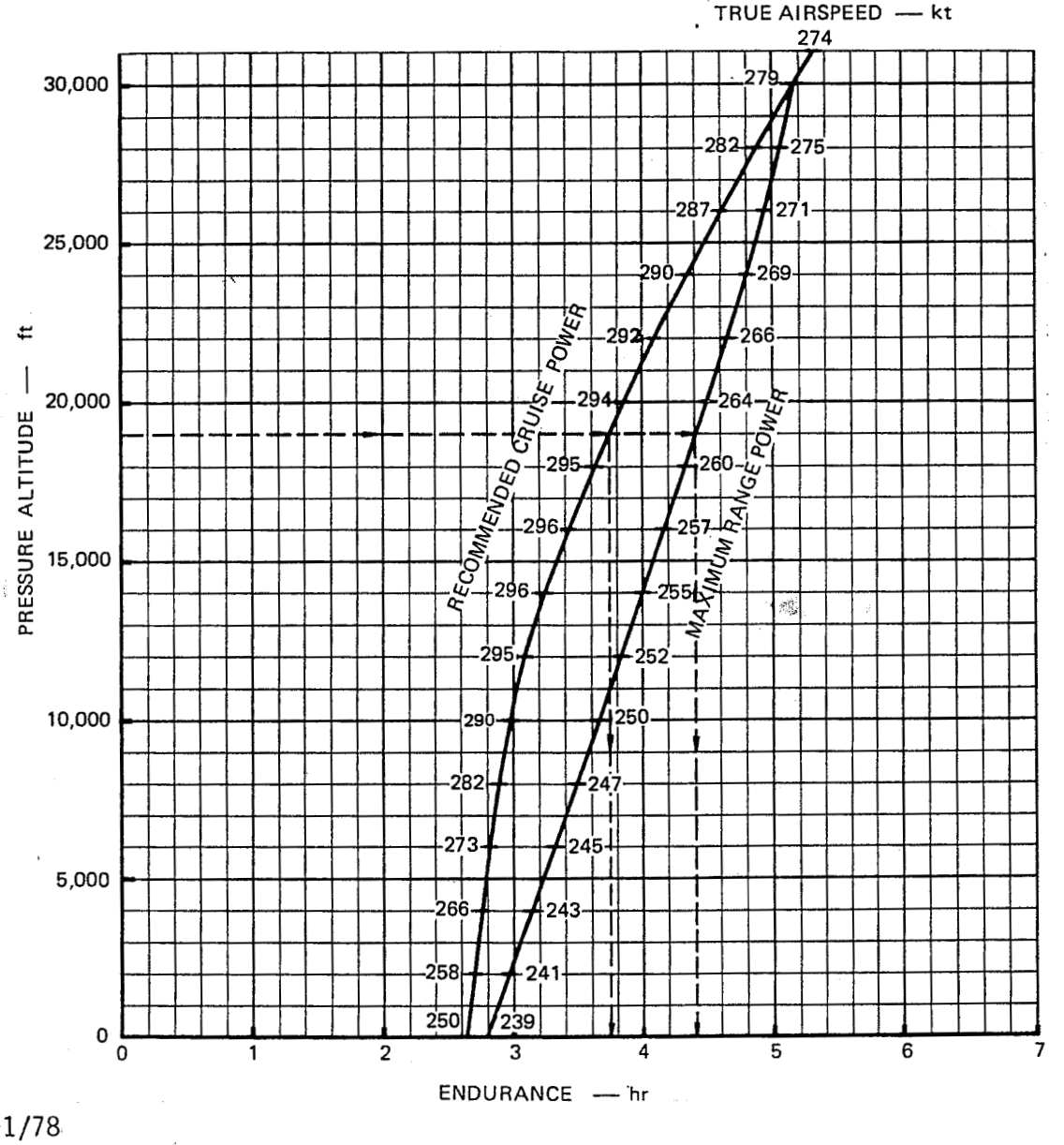
ENDURANCE PROFILE - STANDARD DAY

WEIGHT	11,625 LBS. BEFORE START
FUEL	AVIATION KEROSENE
FUEL DENSITY	6.7 LBS/GAL
INITIAL FUEL LOADING	404 U.S. GAL (2,705 LBS.)
PROPELLER SPEED	96% RPM

EXAMPLE:

PRESSURE ALTITUDE	19,000 FT.
ENDURANCE	
AT RECOMMENDED CRUISE POWER	3.75 HR
AT MAXIMUM RANGE POWER	4.40 HT

NOTE: ENDURANCE INCLUDES STARTS, TAXI, CLIMB AND DESCENT WITH 45 MINUTES RESERVE FUEL AT MAXIMUM RANGE POWER.

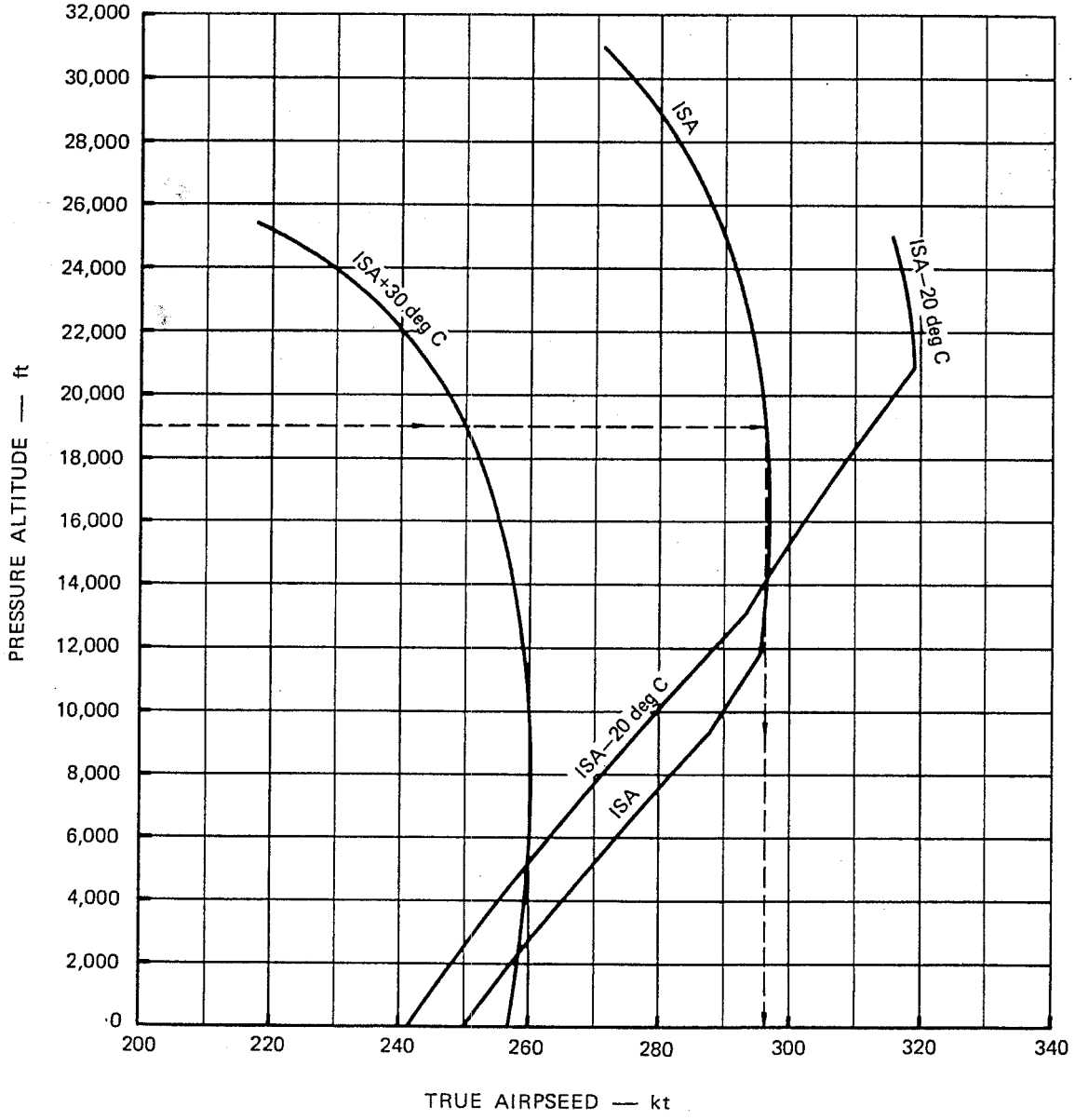


SPEEDS AT RECOMMENDED CRUISE POWER

WEIGHT: 10,200 LBS.
ENGINE POWER: RECOMMENDED CRUISE POWER
(EGT = 650°C OR TORQUE 100%)
ENGINE SPEED: 96% RPM

EXAMPLE:

PRESSURE ALTITUDE	19,000 FT.
OAT	ISA
TRUE AIRSPEED	296 KTS.

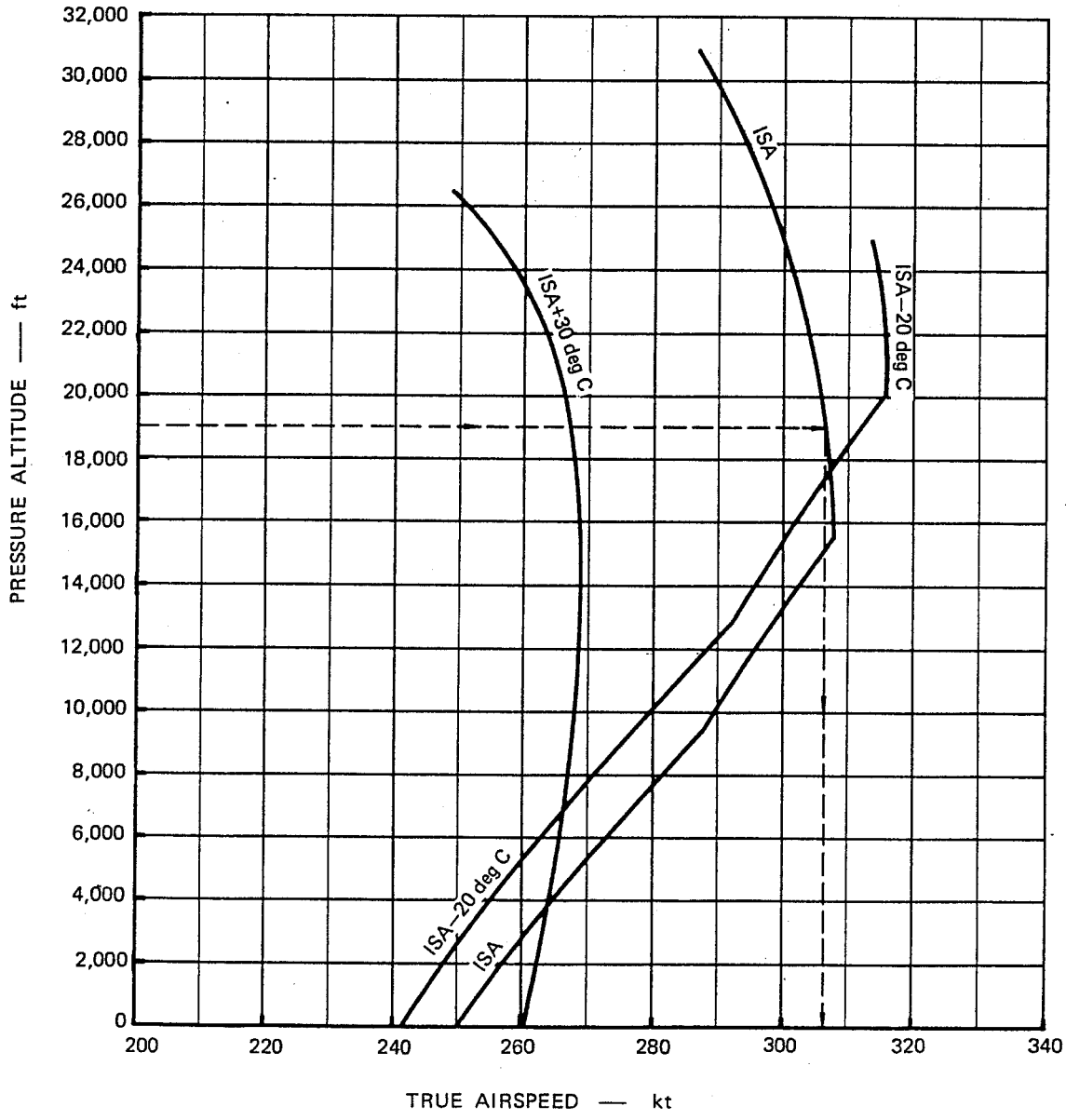


SPEEDS AT MAXIMUM CRUISE POWER

WEIGHT: 10,200 LBS.
ENGINE POWER: MAXIMUM CRUISE POWER
(EGT = 650°C OR TORQUE 100%)
ENGINE SPEED: 96% RPM

EXAMPLE:

PRESSURE ALTITUDE	19,000 FT.
OAT	ISA
TRUE AIRSPEED	306 KTS.



CONVERSION FACTORS

MULTIPLY	BY	TO OBTAIN
atmospheres	76.00	cm Hg at 0°C
	29.92	in Hg at 0°C
	14.696	lb/sq in
	2,116	lb/sq ft
	1.033	kg/sq cm
centimeters	0.3937	in
	3.281×10^{-2}	ft
cm Hg	1.934×10^{-1}	lb/sq in
	27.85	lb/sq ft
	135.95	kb/sq m
cm/second	3.281×10^{-2}	ft/sec
	2.237×10^{-2}	mph
cu	10^{-3}	liters
centimeters	6.102×10^{-2}	cu in
	2.642×10^{-4}	U.S.gal
cu ft	2.832×10^{4}	cu cm
	1,728	cu in
	3.704×10^{-2}	cu yards
	7.481	U.S.gal
	28.32	liters
cu ft/min	4.719×10^{-1}	liters/sec
	2.832×10^{-2}	cu m/min
cu in.	16.39	cu cm
	1.639×10^{-2}	liters
	4.329×10^{-3}	U.S.gal
	1.732×10^{-2}	quarts
cu meters	61,023	cu in
	1.308	cu yards
	35.31	cu ft
	264.2	U.S.gal
cu yards	27.0	cu ft
	7.646×10^{-1}	cu meters
	2.022×10^{-2}	U.S.gal

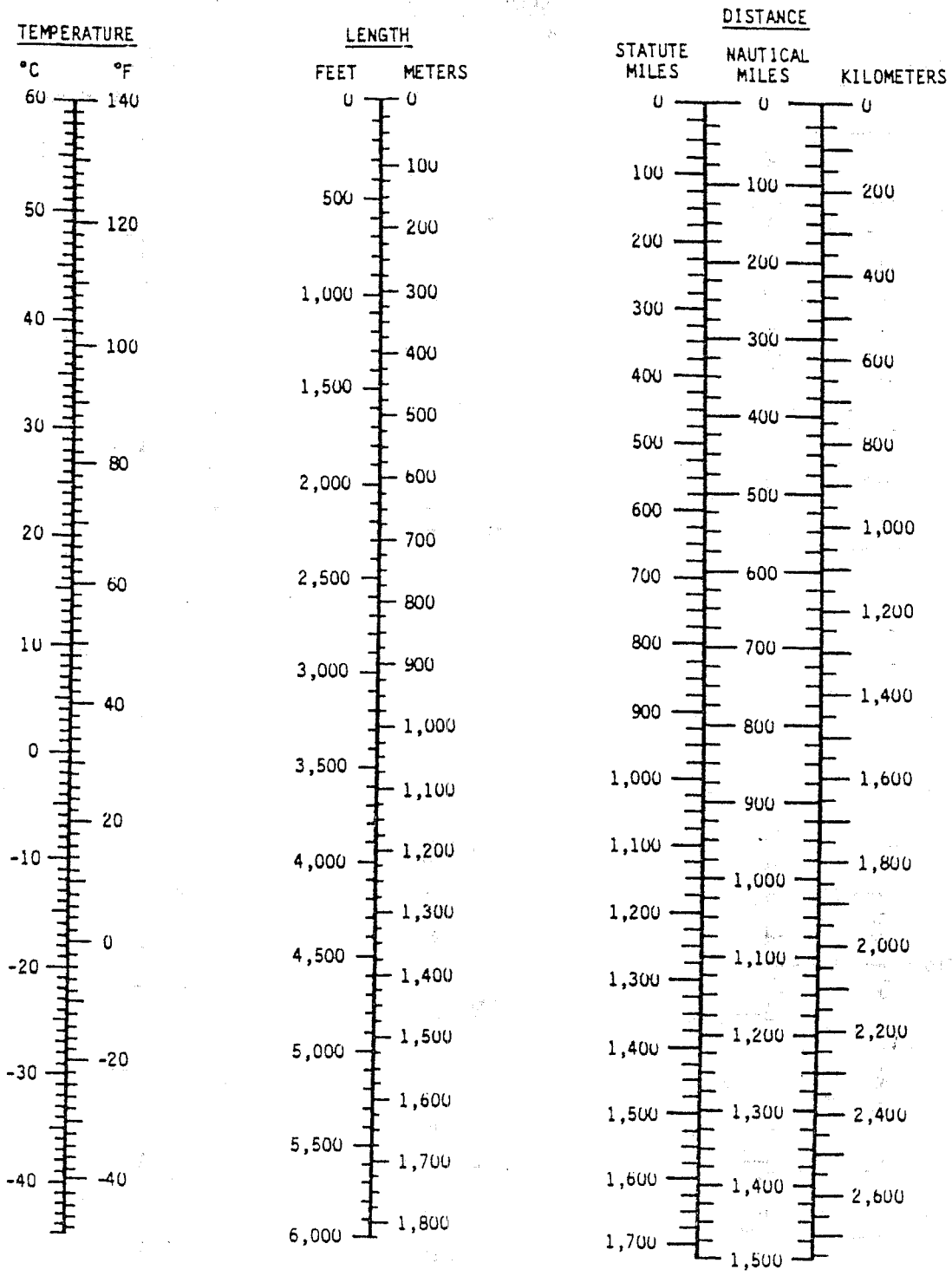
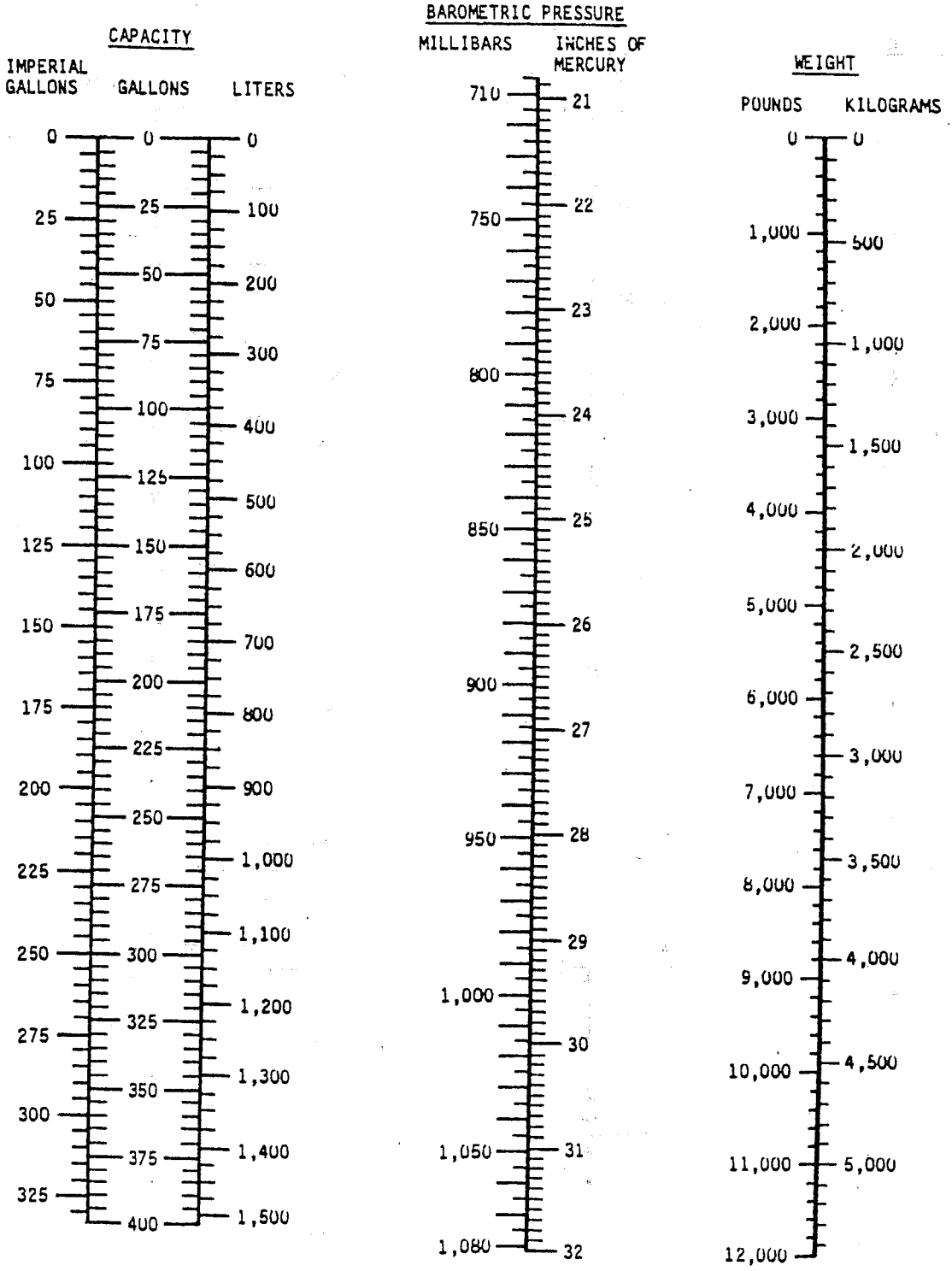
MULTIPLY	BY	TO OBTAIN
feet	3.048×10^{-1}	meters
	3.333×10^{-1}	yards
	1.894×10^{-4}	miles
	$1,646 \times 10^{-4}$	nautical miles
ft/min	1.136×10^{-2}	mph
	1.829×10^{-2}	km/hr
	5.080×10^{-1}	cm/sec
ft/sec	.6818	mph
	1.097	km/hr
	30.48	cm/sec
	.5925	knots
fluid oz	8	dram
	29.6	cu cm
gal, Imperial	277.4	cu in
	1.201	U.S.gal
	4.546	liters
gal, U.S.dry	268.8	cu in
	1.556×10^{-1}	cu ft
	1.164	U.S.gal liquid
	4.405	liters
gal.U.S. liquid	231.0	cu in
	1.337×10^{-1}	cu ft
	3.785	liters
	8.327×10^{-1}	Imperial gal
	1.280×10^{-2}	fluid oz
grams/cm	0.1	kg/m
	6.721×10^{-2}	lb/ft
	5.601×10^{-3}	lb/in
grams/cu cm	1,000	kg/cu m
	62.43	lb/cu ft
inches	2.540	cm
	83.33×10^{-3}	ft
in Hg at 0°C	3.342×10^{-2}	atmospheres
	4.912×10^{-1}	lb/sq in
	70.73	lb/sq ft
	3.453×10^{2}	kg/sq m

CONVERSION FACTORS (CONT)

MULTIPLY	BY	TO OBTAIN
kilograms	2.205	lb
	35.27	oz
	10^3	grams
kilometers	3.281×10^3	ft
	6.214×10^{-1}	miles
	5.396×10^{-1}	nautical miles
	10^5	centimeters
km/hr	9.113×10^{-1}	ft/sec
	5.396×10^{-1}	knots
	6.214×10^{-1}	mph
	2.778×10^{-1}	m/sec
knots	1.0	nautical mph
	1.688	ft/sec
	1.151	mph
	1.853	km/hr
	5.148×10^{-1}	m/sec
liters	10^3	cu cm
	61.03	cu in
	3.532×10^{-2}	cu ft
	$2,642 \times 10^{-1}$	U.S.gal
	2.200×10^{-1}	Imperial gal
	1.057	quarts
meters	39.37	in
	3.281	ft
	1.094	yards
	6.214×10^{-4}	miles
meter-kilogram	7.233	ft/lbs
meter/sec	3.281	ft/sec
	2.237	miles/hr
	3.600	km/hr
miles	5280	ft
	1.609	km
	8.609×10^{-1}	nautical miles
mph	1.467	ft/sec
	4.470×10^{-1}	m/sec
	1.609	km/hr
	8.690×10^{-1}	knots

MULTIPLY	BY	TO OBTAIN
miles/hr sq	2.151	ft/sec sq
millibars	2.953×10^{-2}	in Hg at 0°C
nautical miles	6076.1	ft
	1.151	miles
	1.853	m
ounces, fluid	29.57	cu cm
	1.805	cu in
lb/cu ft	16.02	kg/cu m
lb/cu in	1728	lb/cu ft
	27.68	grams/cu cm
lb/sq in	2.036	in Hg at 0°C
	6.850×10^{-2}	atmospheres
	7.031×10^{-2}	kg/sq m
sq cm	1.550×10^{-1}	sq in
	1.076×10^{-3}	sq ft
sq ft	929.0	sq cm
	144.0	sq in
	1.111×10^{-1}	sq yards
	2.296×10^{-5}	acres
sq in	6.452	sq cm
sq kilometers	3.861×10^{-1}	sq miles
sq meters	10.76	sq ft
	1.196	sq yards
sq miles	2.590	sq km
	640	acres
sq yards	8.361×10^{-1}	sq m
	9	sq ft
yards	9.144×10^{-1}	meters
	3.0	ft
	36.0	in

CONVERSION TABLES



CONVERSION TABLES (CONT)