

## TRANSMITTAL SHEET

This sheet transmits Revision A, dated June 28, 2016, to Gulfstream G650ER Aircraft Service Change 037, issued November 6, 2015, and titled Flight Controls (ATA 27) – FCC Software Update.

### **Reason for Revision:**

Approving Authority:

Added EASA design change classification and approval

Approved Engineering Data:

Updated drawing revision level (minor change)

Flight Manual Revision / Supplement Required:

Added EASA AFMS information

Price:

Updated pricing contact information and notes

Modification instructions:

Step B.2. Removed yaw and pitch trim value requirements and updated note

### **Effect of Revision on Prior Accomplishment:**

This ASC revision replaces ASC 037. Aircraft operators who have previously complied with ASC 037 are in compliance with this revision and should return the service reply card marked "Previously complied with."

**Note:** This bulletin has been reproduced in its entirety. A black bar in the left margin indicates a change in that line of text or figure.

### **List of Effective Pages:**

<u>Page</u>	<u>Date</u>
1-5	June 28, 2016

### **Revision History:**

Original Issue:	November 6, 2015
Revision A:	June 28, 2016

# Gulfstream G650ER

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## AIRCRAFT SERVICE CHANGE

NUMBER 037 REVISION A

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### SUBJECT

FLIGHT CONTROLS (ATA 27)

FCC SOFTWARE UPDATE

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JUNE 28, 2016

## **PILOTS INFORMATION SHEET**

### **FCC SOFTWARE UPDATE**

This service change updates the Flight Control Computers (FCCs) software version from the current v5.44 to v6.24. This software update supports aircraft performance improvements, allows for auto-brake function installation, improves cruise performance, introduces production yaw trim capability, and resolves multiple issues with the current software version.

Aircraft operating under FAA regulations will require G650ER FAA Airplane Flight Manual (AFM) Revision 1, or later approved version, as a result of this service change.

Aircraft operating under EASA regulations will require G650ER Airplane Flight Manual Supplement EASA-G650ER-2015-01 Revision NC, or later approved version, as a result of this service change.

**PLEASE DETACH AND GIVE TO FLIGHT DEPARTMENT PERSONNEL**

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Revision A  
June 28, 2016

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**PLEASE RETAIN THIS COPY WITH THE ASC BOOKLET**

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Revision A  
June 28, 2016

The design change effected by this Aircraft Service Change (ASC) has been classified as Major / Not Significant by the United States Federal Aviation Administration (FAA) and Level 1 Major / Not Significant by the European Aviation Safety Agency (EASA). The design change data contained here-in and effected by this document is approved and accepted by the FAA and EASA under Gulfstream Organization Designation Authorization (ODA) project number TD-01-2013-0042 and EASA Major Change Approval 10054171.

The design of this ASC is approved by aircraft type design data for installation on aircraft registered for operation in accordance with applicable regulations of the FAA and EASA.

The design of an ASC is configured to a standard (green) production aircraft. If spare wires, pin connections or locations called out have been used for another modification, the installing agency must ensure the development, documentation and approval of any required deviations.

The following instructions, in step-by-step form, are written as a guide to perform this ASC. Compliance with safe maintenance practices, as defined in the Aircraft Maintenance Manual and FAA and EASA regulations, is required.

Subject: Flight Controls (ATA 27) – FCC Software Update

Purpose / Discussion:

This service change updates the Flight Control Computers (FCCs) software version from the current v5.44 to v6.24. This software update supports aircraft performance improvements, allows for auto-brake function installation, improves cruise performance, introduces production yaw trim capability, and resolves multiple issues with the current software version. Items addressed by this software update include, but are not limited to:

**Aircraft Specification Requirements**

- Range improvement (rudder auto-trim) (symmetric aileron droop)
- Reduced landing distance (aileron ground spoilers)

**Improved Performance and Functionality**

- Modified High Incidence Protection Function (HIPF) with Flaps UP
- Production yaw-trim adjustment capability

**Problem Report Resolution**

- HIPF wing hot detection logic robustness
  - New logic allows HIPF schedule to change back to 'clean wing' if wing anti-ice overheat condition clears within the first 60 seconds following overheat detection

## Purpose / Discussion continued:

- AFM flight envelope limitation for dispatch with single IRS failed
  - Current AFM/MMEL limits aircraft speed at light gross weight, if dispatching with a single IRS failed – new logic will clear this limitation
- AFCS activation/deactivation can cause small transients
  - Minor modification to Control Law (CLAW) logic to provide smoother transitions for AFCS engagement / disengagement
- AFCS pitch performance degraded during high acceleration / deceleration
  - Minor modification to CLAW to prevent deviations in AFCS target performance
- Transition from cruise (NzU) mode to Alternate mode is abrupt
  - Minor modification to CLAW to smooth transition
- Elevator trim is unavailable in Alternate mode
  - CLAW modification to allow elevator trim function in Alternate mode with horizontal stabilizer failed
- Turn coordination is limited during single engine operations
  - Minor CLAW modification to improve availability of turn coordination
- Transition to Direct mode has excessive rate limiting
  - Improved handling following mode change
- Transients due to loss of TAT data
- FCC on-ground stationary logic susceptible to momentary set during touchdown
- FCC portion of LVDT monitor disconnect issue

Description / Labor-Hours  
Required Per Aircraft:

This service change loads new software to the FCC modules and new Loadable Diagnostic Information (LDI) software to the aircraft. Approximately 51 labor-hours will be required for installation.

## Approved Engineering Data:

The source data for this aircraft service change is:  
60A2700037-001 Rev. "C" Top Drawing ASC 037  
FCS/FBW FCC Software Update

## Prerequisites:

ASC 901 – PlaneView Master Operating Software Update

Prerequisites continued:	Prior to, or at the time this ASC is ordered, operators will be required to supply a Central Maintenance Computer (CMC) configuration report. The CMC configuration report can be stored on the aircraft PC laptop then electronically submitted to Gulfstream at <a href="mailto:asc.software@gulfstream.com">asc.software@gulfstream.com</a> . <b>Allow up to 10 days for the creation of a new LDI disk.</b>
Concurrent Requirements:	Customer Bulletin No. 102 – FCC Software 6.24 Update (ASC 037)
Associated Documents:	Aircraft Maintenance Manual (AMM), Chapters 20, 27 & 31 GVI-GER-6018 – PlaneView Software Loading, Verification and Return To Service Procedures GVI-GER-0535 – G650 Flight Control Computer (FCC) Software Upload Procedure GVI-GER-0536 – G650 FCS Return to Service (RTS) Procedure Post Flight Control Computer (FCC) Software Upload
Flight Manual Revision / Supplement Required:	Aircraft operating under FAA regulations will require FAA Airplane Flight Manual (AFM) Revision 1, or later approved version, as a result of this service change. Aircraft operating under EASA regulations will require Airplane Flight Manual Supplement EASA-G650ER-2015-01 Revision NC, or later approved version, as a result of this service change.
Publications Data:	Data concerning this service change will be published in a future revision of the affected manual(s). This booklet will provide technical data until the revision(s) is published.
Effectivity:	This service change is applicable to aircraft serial numbers 6001 – 6164. This, or a similar change, will be installed during production on aircraft serial numbers 6165 and subsequent.
Effect on Spares:	Version 2 (V2) hardware post update: FCC Module A, PN 60P2700001Z104 FCC Module B, PN 60P2700001Z204 Version 3 (V3) hardware post update: FCC Module A, PN 60P2700001Z105 FCC Module B, PN 60P2700001Z205

**Special Equipment / Tools  
Required:**

Aircraft PC Laptop with Remote Terminal Data Loading System Tool version 26.1 or later. Refer to Gulfstream PlaneView Maintenance Applications version 7.1.0 or later, reference GVI-GER-0270.

Thales PMAT Tool kit, PN B12940AA. These kits will only be available at select facilities and maintained by the facility's tool crib.

**Skill Type Required:**

Knowledge of the G650ER PlaneView II avionics system, flight control system, and software loading procedures will be required for this installation.

Only trained / certified Gulfstream personnel will perform the FCC software update as described within this ASC.

**Price:**

Contact your Regional Sales Manager for pricing information after the 24 month period has expired.

NOTE:	This ASC is a managed program that may only be accomplished at a Gulfstream Aerospace G650ER Authorized Warranty Facility or Factory Authorized Service Center equipped with the Thales PMAT Tool kit. This ASC must be coordinated through the program office via e-mail at <a href="mailto:pmoretro@gulfstream.com">pmoretro@gulfstream.com</a> or by calling Gulfstream Scheduling at 800-810-GULF (4853), or 912-965-4178.
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NOTE:	This ASC will be provided and installed at no charge for a period of 24 months from the original release date of ASC 037 (November 6, 2015) if installed at Gulfstream Aerospace, a Gulfstream Authorized Warranty Facility or a Gulfstream Factory Authorized Service Center and the aircraft is within the applicable labor warranty period. All other installations shall be subject to the prevailing labor rate of the installing agency.
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NOTE:	Coverage is granted per the terms and conditions of the Gulfstream Aircraft Sales Agreement to the original purchaser or subsequent owner with appropriate Assignment of Warranties on file with Gulfstream.
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**MODIFICATION INSTRUCTIONS:**

NOTE:	Correct setup of the aircraft laptop with the CMC Remote Terminal Tool is <b>critical</b> to the successful loading and operation of all software. Follow Data Load Guide procedures CAREFULLY. <b>Ensure any firewalls, anti-virus programs or wireless LAN connections are disabled, if necessary, and the laptop is connected to 60 Hz aircraft power.</b>
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**A.** Preparation for modification:

1. Remove all electrical power. Refer to AMM, Chapter 20.
2. Gain access to FCC 1 and 2 in the LEER and REER. Refer to AMM Chapter 27.
3. Verify HDMI receptacles on the front of the FCC modules are clear of FOD and in good condition. Anything that prevents a good connection must be resolved prior to tool connection and software update loading.

**B.** Software loading procedures:

1. Apply power to aircraft. Refer to AMM, Chapter 20.
2. Capture the roll trim values and record in Appendix A of ASC CCD 60A2700037-001. Refer to GVI-GER-0536- FCC RTS Section 5.3.3.2 steps 1-5 for instructions on how to locate these values from the CMC stored values. These numbers will be utilized during accomplishment of the RTS.

NOTE:	Prior to beginning software loading, make a note of any fault codes or CAS messages to help distinguish which messages are resultant of the software loading process and prevent unnecessary troubleshooting post modification. Notes should be recorded in Appendix A of the ASC CCD 60A2700037-001. It is recommended the FCC Nonvolatile Memory (NVM) be retrieved before and after the FCC software loading procedure. Refer to AMM 45-27-00.
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3. Load CMC Loadable Diagnostic Information (LDI) software. Refer to GVI-GER-6018 – PlaneView Software Loading, Verification and Return To Service Procedures.

NOTE:	New software is issued with an Authorization Report (AR) and contains data which will match the information on the disk; including aircraft specific information. Individual RTS procedures for new software, as stated on the AR, must be completed in addition to any other RTS procedure identified within an ASC. ARs for current software load should be maintained with aircraft maintenance records for availability anytime it is necessary to reload software.
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4. Verify software load and perform all test procedures on Authorization Report (AR).

**C.** FCC software update:

<b>WARNING:</b>	<b>ALL OTHER MAINTENANCE ON THE AIRCRAFT MUST BE STOPPED, AND REMAIN STOPPED, UNTIL THE FCC SOFTWARE UPDATE PROCESS IS COMPLETED. DAMAGE TO THE FCC MODULES, LOADING HARNESSSES, OR FAILURE OF THE LOADING PROCESS IS AT RISK FOR FAILURE TO COMPLY.</b>
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1. Configure aircraft and connect PMAT tool as directed in GVI-GER-0535 – G650 FCC Software Upload Procedure – FCC SW 6.2.
2. Load FCC software by incorporating appropriate Thales service bulletin as directed in GVI-GER-0535.
  - Aircraft 6001 – 6159 equipped with V2 hardware will incorporate FCC Thales SBs C13204G-27-004 for Module A and C13212G-27-006 for Module B.
  - Aircraft 6160 – 6164 equipped with V3 hardware will incorporate FCC Thales SBs C13204N-27-001 for Module A and C13212N-27-001 for Module B.

<b>NOTE:</b>	It is possible for aircraft to possess a combination of V2 and V3 modules. If aircraft contains a mixed configuration, follow appropriate instructions for software loading as stated in GVI-GER-0535.
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<b>WARNING:</b>	<b>AVOID MOVING FCS CONTROLS DURING THE UPLOADING PROCESS. INADVERTENT FCS SURFACE MOVEMENT IS NOT EXPECTED / TOLERATED DURING UPDATE.</b>
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3. During FCC software loading, ensure the Local Intervention Report (LIR) is completed according to the requirements in the Thales Service Bulletin as noted in GVI-GER-0535. Three copies of the report will be required; the original should be submitted to Thales, one retained for Gulfstream records, and one for the aircraft records. Inspection should be present during the completion of the LIR.
4. Upon completion of software load to the FCCs, disconnect the PMAT tool and remove power from the FCCs by opening the following CBs: FCC 1A, FCC 1B, FCC 2A, FCC 2B, BFCU as directed in GVI-GER-0535.

**D.** Replace all items back into the PMAT kit.**E.** Follow on:

<b>NOTE:</b>	Although FCC modules are not physically removed from the aircraft, for the purposes of this installation upgraded units are treated as removed and replaced. Refer to AMM, Chapter 27 FCC module removal / installation. Refer to AMM Chapter 20 Safe Ground Maintenance procedures as required during all follow-on checks.
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1. Perform GVI-GER-0536 – G650 FCS Return to Service (RTS) Procedure Post Flight Control Computer (FCC) Software Upload. This is the only required test of the flight control system following completion of the FCC software update.
  2. Clean and test Display Unit (DU) #2 in accordance with AMM, Chapter 31.
- F.** Ensure work area is clean and clear of foreign object debris (FOD).
- G.** Store current LDI software on board the aircraft with accompanying AR. Destroy obsolete LDI software upon completion and successful testing of this service change.
- H.** Document the following software information on the attached service reply card and on the PlaneView Configuration Record in the aircraft permanent maintenance records:
- Top Level System Part Number
  - Media Part Number
  - Media Serial Number
- I.** Record compliance with this ASC and store AR(s) for current software load in the aircraft permanent maintenance records. Return aircraft to flight status.
- J.** Report compliance with this service change to Gulfstream CMP by uploading the attached service reply card, along with the CMP task card(s) sign-off using MyGulfstream, MyCMP Document Upload, or e-mail to [cmp.docproc@gulfstream.com](mailto:cmp.docproc@gulfstream.com), or fax to Gulfstream CMP at 800-944-1775 or 912-963-0265.

WEIGHT AND BALANCE DATA:	The effect of this service change with regard to aircraft basic weight and balance is 0:		
	MOD	Δ WEIGHT	Δ MOMENT
	ASC 037	0.0 lbs	-
ELECTRICAL LOAD ANALYSIS DATA:	The effect of this change on the aircraft electrical loading is 0.		

Kit Effectivity:	Kit 1 – 6001 – 6159 or equipped with V2 hardware Kit 2 – 6160 – 6164 or equipped with V3 hardware Aircraft having both V2 and V3 hardware will require both kits.
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NOTE:	All software media required for this ASC will be issued as a separate package by PN 60A2700037-SW. All drawings and media software will be issued to the latest revision.
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PARTS REQUIRED PER AIRCRAFT:					
Item	Part Number	Nomenclature	QTY		Notes/Alt/Sub
			-1 Kit	-2 Kit	
1.	60A2700037-001	FCC S/W v6.24 CCD	1	1	
2.	F1431731	Mod kit A C13204N	-	4	
3.	F1431732	Mod kit B C13212N	-	4	
4.	F1431733	Mod kit A C13204G	4	-	
5.	F1431734	Mod kit B C13212G	4	-	
6.	C13204N-27-001	Thales FCC SW 6.2.4 Module A	-	1	Not included in kit – See *Note
7.	C13212N-27-001	Thales FCC SW 6.2.4 Module B	-	1	
8.	C13204G-27-004	Thales FCC SW 6.2.4 Module A	1	-	
9.	C13212G-27-006	Thales FCC SW 6.2.4 Module B	1	-	
10.	GVI-GER-6018	GVI PlaneView Software Verification, Loading & RTS Procedures	1	1	
11.	GVI-GER-0535	FCC Software Upload	1	1	
12.	GVI-GER-0536	FCC Software Update RTS	1	1	
13.	60A2700037 -SW	Software Package	1	1	Item 14 included ✓
14.	60BSWCD055	Loadable Diagnostic Information (LDI)	✓	✓	
15.	60P2700001Z104/GA03	FCC A modules	4	-	Not included in kit – See *Note
16.	60P2700001Z204/GA03	FCC B modules	4	-	
17.	60P2700001Z105/NB03	FCC A modules	-	4	
18.	60P2700001Z205/NB03	FCC B modules	-	4	

*NOTE:	Thales service bulletin software resides on the PMAT tool. No Thales software will be included in the ASC kit. FCC Module part numbers are the result of the upgrade and are marked appropriately as part of the modification. No units are included as a part of this kit. Existing aircraft unit is modified to the new part number.
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## SERVICE REPLY CARD (1 of 2)

Please upload this page, along with the CMP task card(s) sign-off using MyGulfstream, MyCMP Document Upload, or e-mail to [cmp.docproc@gulfstream.com](mailto:cmp.docproc@gulfstream.com) or fax to Gulfstream CMP at 800-944-1775 or 912-963-0265.

THE FOLLOWING AIRCRAFT SERVICE CHANGE HAS BEEN COMPLIED WITH:

ASC NUMBER	A/C	AIRCRAFT TYPE	COMPLIANCE DATE
970371		G650ER	

AIRCRAFT HOURS: \_\_\_\_\_

AIRCRAFT LANDINGS: \_\_\_\_\_

PREVIOUSLY

COMPLIED WITH (PCW): \_\_\_\_\_

DATE: \_\_\_\_\_

NOT APPLICABLE: \_\_\_\_\_

DATE: \_\_\_\_\_

DISC INFORMATION				
MEDIA TITLE		TOP LEVEL SYSTEM PART NUMBER	MEDIA PART NUMBER	MEDIA SERIAL NUMBER
LDI	OFF:			
	ON:			

PARTS INFORMATION				
NOMENCLATURE		PART NUMBER	SERIAL NUMBER	CMP CODE
FCC #1 A MON MODULE	OFF:			
	ON:			
FCC #1 A COM MODULE	OFF:			
	ON:			
FCC #1 B MON MODULE	OFF:			
	ON:			
FCC #1 B COM MODULE	OFF:			
	ON:			
FCC #2 A MON MODULE	OFF:			
	ON:			
FCC #2 A COM MODULE	OFF:			
	ON:			

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June 28, 2016

**SERVICE REPLY CARD (2 of 2)**

**Please upload this page, along with the CMP task card(s) sign-off using MyGulfstream, MyCMP Document Upload, or e-mail to [cmp.docproc@gulfstream.com](mailto:cmp.docproc@gulfstream.com) or fax to Gulfstream CMP at 800-944-1775 or 912-963-0265.**

<b><u>PARTS INFORMATION</u></b>				
<b>NOMENCLATURE</b>		<b>PART NUMBER</b>	<b>SERIAL NUMBER</b>	<b>CMP CODE</b>
FCC #2 B MON MODULE	<b>OFF:</b>			
	<b>ON:</b>			
FCC #2 B COM MODULE	<b>OFF:</b>			
	<b>ON:</b>			

SIGNATURE	TITLE / CERTIFICATE NUMBER	COMPANY
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COMMENTS / SUGGESTIONS / ACTIONS TAKEN:

[illegible]

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