Maverick
AVIATION GROUP

November 16, 2021

DEPARTMENT OF TRANSPORTATION
2021 NOV 22 P 3:16
DOCKET OPERATIONS

Docket Management Facility
U.S. Department of Transportation
1200 New Jersey Avenue, S.E.
West Building, Ground Floor, Room W12-140 Washington, D.C. 20590

Re: Petition for Exemption from 14 CFR 136.9(a) and 136.11(c)(2)

To Whom It May Concern:

Maverick Airstar Certificate# Q2KQ218L, hereby submits the following petition for exemption from the requirements of FAR 136.9(a) and FAR 136.11(c)(2) for tour operations it conducts that incidentally cross over bodies of water and beyond shorelines as defined in FAR 136.l(d). Maverick Airstar, proposes instead to comply with FAR 136.9(b)(2) with specific additional conditions that could be implemented either through letter of agreement or through permanent changes to Maverick's Training Program.

Pertinent Regulations:

On February 13, 2007 FAA issued a final rule implementing new national air tour safety standards that became effective March 15, 2007. This rule modified the prior part 136 regulations that were enacted to implement the requirements of the National Air Tour Management Act of 2000. The final rule established three subparts to part 136: Subpart A National Air Tour Safety Standards, Subpart B-National Parks Air Tour Management and Subpart C-Grand Canyon National Park.

This petition for exemption seeks relief from FAR 136.9(a) which requires passengers and flight crew to don life preservers on air tour flights under certain circumstances. Maverick Airstar generally agrees that under certain circumstances, FAR 136.9(a) is necessary; however, under the circumstances described herein Maverick Airstar, believes FAR 136.9(a) to be unduly burdensome, costly, and impractical. Moreover, it is a provision that would discourage passengers from taking "commercial air tours" as defined in FAR 136.l(d) and could, in Maverick Airstar opinion, create a less safe situation if exemption is not granted.

Maverick Airstar thus is proposing to comply with FAR l 36.9(b)(2) with additional conditions. The grant of relief from FAR 136.9(a) also requires that an exemption from FAR 136.ll(c)(2) be granted. FAR 136.l l(c)(2) states that helicopters used in commercial air tours over water beyond the shoreline must be equipped with fixed floats or an inflatable floatation system unless each occupant wears a life preserver from before take-off until the aircraft is no longer over water.

FAR 136.9 provides that "(a) Except as provided in paragraphs (b) or (c) of this section the operator and pilot in command of commercial air tours over the water beyond the shoreline must insure that each occupant is wearing a life preserver from before take-off until the flight is no longer over water. " Paragraph 136.9(b) prescribes that life preservers only must be readily available (not worn) if (b)(l) the "aircraft is equipped with floats", or "If (b) (2) the airplane is within power off gliding distance of the shoreline" or "if, (b) (3) the aircraft is a multi-engine and meets the critical engine climb performance contained therein. " Paragraph 136.9(c) exempts the requirement for life preservers *"if the over water operation is necessary only for takeoff or landing."*

FAR 136.11 prescribes the requirements for when helicopters must be equipped with floats or an inflatable floatation system. FAR 136.ll(a) states "a helicopter used in commercial air tours over water beyond the shoreline must be equipped with fixed floats or an inflatable floatation system adequate to accomplish a safe emergency ditching if (a)(l) it is a single engine helicopter; " FAR 136.ll(c) then states that "fixed floats or an inflatable floatation system is not required for a helicopter under this section if (c)(l) the helicopter is over water only during take-off or landing, or, (c) (2) the helicopter is operated within power off gliding distance to the shoreline for the duration of the flight and each occupant is wearing a life preserver from before take-off until the aircraft is no longer over water."

"Shoreline is defined in FAR 136.l(d) to mean "that area of land adjacent to the water of an ocean, sea, lake, pond, river or tidal basin that is above the high-water mark and excludes land areas unsuitable for landing such as vertical cliffs or land intermittently under water during a particular flight."

Finally, FAR 136.l(d) defines suitable landing area for helicopters as "an area that provides the operator reasonable capability to land without damage to equipment or injury to persons. The definition of a suitable landing area then requires that it must be "site specific, designated by the operator and accepted by FAA." The definition of a suitable landing area describes it as "an emergency landing area for a single engine helicopter."

Thus, under FAR 136.9(a) each person on board any commercial air tour conducted by Maverick Airstar from Grand Canyon Airport, regardless of the altitude at which they are flown or the minimal amount of time they may spend over "water" must wear a life preserver since these flights, cross the "shoreline" of the Colorado River and since none of the exclusions in sections 136.9(b) and (c) apply. Because each occupant will be required to wear a life preserver from before take-off until landing, Maverick Airstar will not be required to equip its helicopters with fixed floats or an inflatable floatation system as provided in FAR 136.11(c)(2). However, if FAA grants relief from FAR 136.9(a), then Maverick Airstar, petitions FAA for relief from FAR 136.11(c)(2) as a condition of relief from FAR 136. 9(a).

Maverick Airstar conducts helicopter tours within the South Rim of the Grand Canyon. These tours begin and end at Grand Canyon National Park Airport (KGCN). The tours are conducted on the tour routes of the Dragon and Zuni Corridors of the GCNP SFRA, at an altitude that would allow for a safe autorotation to the shoreline in all conditions. Maverick Airstar currently operates 34 EC130 B4's and 13 EC130 T2s for Grand Canyon tours.

Maverick Airstar routes to and from the airport to the Grand Canyon environment, are in accordance with the GCNP SFRA procedures manual and the Letter of Agreement with the KGCN Tower. These routes have been developed over the last 30 years with safety being the primary component.

The only water crossings during the combined 45 minute sightseeing tour happen within gliding distance of the Colorado River shoreline. The total amount of time over water is less than 15 seconds at an altitude of 1 mile above the river. The longest time over water is less than 5 seconds. By name alone many of these water crossings meet the definition of "shoreline" as written in FAR 136.l(d); however, it is Maverick Airstar's belief that most do not meet the intent of the rule. It of course is recognized that even with the small size of most water crossings that Maverick Airstar encounters the most minute probability of an aircraft having an emergency and ending up in the water. Maverick Airstar has, and will continue to train its pilots to make all water crossing at an altitude great enough to allow for an auto rotational descent within glide distance to a suitable landing area. In addition, the only reason life-vests are required is because we go into the 50-2 SFRA, were it not for that, all things still the same, life-preservers would only need be readily available.

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As a condition of this exemption Maverick Airstar will continue to train with its approved part 135 training program with an emphasis on the glide distance of a helicopter in multiple scenarios of weight, and weather, as well as methods of extending the glide distance, and choice of suitable forced landing areas. Maverick Airstar will also continue to brief on the location of and use of life preservers to its passengers. Finally, Maverick Airstar wholeheartedly believes that the life preservers would actually be a tangle hazard in the event of a hard landing on dry land where greater than 99% of the flight takes place. All other water crossings that Maverick Airstar encounters are so incidental in nature and afford so many alternate landing areas in the event of a forced landing that Maverick Airstar believes an equal level of safety can be achieved simply by additional and specific annual training in judging the auto rotational glide distance of the helicopters flown on tour flights.

Basis for this Exemption:

FAR 11.Bl(c), (d) and (e) set forth certain conditions for the grant of exemption.

1. Maverick Airstar is seeking relief from FAR 136.9(a) insofar that life preservers must only be "available" rather than "worn" for all occupants on air tours conducted on designated tour routes in the Grand Canyon National Park Special Flight Rules Area. Passengers will be fully briefed on the location of and use of life preservers; they will be in a pouch attached to the seat, so that they are readily available. These flights always have and will continue to be operated to within safe auto rotational gliding distance to suitable forced landing sites. This exemption is based upon Maverick Airstar, complying alternatively with FAR 136(b)(2) which currently only provides relief for single engine airplanes and not single engine helicopters.

2. Maverick Airstar believes that a grant of this exemption is in the public interest because it will improve safety in part because it will lessen the chance of premature or inadvertent inflation of life preservers impeding passenger exit after an emergency landing. It is Maverick Airstar's belief that the addition of a life preserver to the Grand Canyon tours, even without premature or inadvertent inflation creates an undue hazard to passengers who may need to exit the aircraft expeditiously in the event of a forced landing. Maverick Airstar, believes this is particularly the case in aircraft fitted with four point harness type seat belts which compose all of Maverick Airstar's fleet.

3. Maverick Airstar is proposing that an equivalent level of safety to FAR 136.9(a) can be achieved through adoption of alternative procedures including having life preservers available (not worn) for each person on its commercial air tour flights, instructing all passengers as to the location and use of life preservers, instructing and training company pilots on the use of land based forced landing sites within the Grand Canyon area and training that emphasizes the auto rotational glide distance of the type helicopters it operates.

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4. This grant of exemption to FAR 136.9(a) must also recognize that it would be even more burdensome, costly and impractical to require Maverick Airstar to equip its helicopters with fixed floats or an inflatable floatation system just because Maverick Airstar proposes that occupants on board its air tours need not wear life preservers as required by FAR 136.ll(cX2).

This exemption is sought in part because of the overly broad definition given for "shoreline" and the lack of the verbiage necessary for local FSDOs to give appropriate deviations where common sense would dictate that neither floats nor life preservers are necessary. Maverick Airstar believes the FAA should consider amending part 136 to incorporate the verbiage necessary for local FSDOs to allow for deviations. FAA must recognize that simply because a source of water is named a River, a Lake or a Pond. That said water source does not necessarily pose any undue risk of a water ditching. One example among many in Maverick Airstar's case is the Colorado River on the tour route being 600ft at its widest, while flying 5300 ft above it.

Clearly, FAA contemplates in subpart A of Part 136, circumstances where having life preservers "available" rather than "worn" provide an adequate level of safety. FAR 136.9(b)(2) provides such relief for **airplanes** that remain within power-off gliding distance to a shoreline. FAR 136.11 (c)(2) recognizes the principle that helicopters can indeed "glide" in a power-off situation. Why then, shouldn't similar relief be extended to helicopter operators where such air tour flights can also glide power off to the shoreline? Rather than approving this grant for exemption, perhaps FAA should amend FAR 136.9(b)(2) by replacing "airplane" with "aircraft." It is confusing that an individual can fly the same route, same helicopter, same altitude, same day with the same pilot and in the case of a pure part 135 charter not entering the Grand Canyon will not be required to wear a life preserver, but if that individual is on a commercial air tour they would be required to. This exemption is for the cruise phase of flight. Mechanical failures resulting in forced landings under such conditions are very rare. Yet FAA specifically exempts, twice in FAR 136 occupant protection including having life preservers FAR 136.9(c) or requiring floats FAR136.11(c)(1) if the over water operation is necessary only for takeoff and landing. Those phases of flight are far more prone to mechanical failure and certainly provide precious altitude for recovery from any mechanical failure. The benefit to the public for the grant of exemption is three-fold. First and foremost is the issue of safety. (1) The pouch type life preserver used in the air tour industry fastens around the waist where it can shift or be adjusted over the latching mechanism of the seat belt by the passenger during flight, thereby impeding the ability to unfasten their seatbelt expeditiously. Panicked passengers while struggling to unfasten their seatbelt could also inadvertently inflate their life preserver thereby further impeding exits. In the case of an aircraft with single shoulder harness (which is what 2/3 of our aircraft have) the possibility exists that a panicked passenger may try to don their life preserver in the event of a forced landing, prior to removing their seatbelt This situation would in essence strap the passenger to the aircraft and completely prevent evacuation of the aircraft.

Maverick Airstar agrees that if a flight route has a significant amount of time over water and that route takes the helicopter beyond glide distance to shoreline, life preservers make good sense, regardless if there is an additional risk that they might otherwise inhibit or delay exiting the aircraft in the event of an unscheduled landing. Most water crossings within Maverick Airstar tour area spend literally seconds over water and are well within glide distance to shoreline at all times and all under all conditions. Maverick Airstar's air tour helicopters operating within the Grand Canyon area are not required to be equipped with fixed floats or an inflatable floatation system under FAR 136.11 (c)(2) because its operations always remain within power-off gliding distance to the shorelines. However, if granted relief from FAR 136.9(a) Maverick Helicopters Inc. would no longer be exempt from equipping its air tour helicopters with floats since a condition of FAR 136(c)(2) is that life preservers must be worn from takeoff until the helicopter is no longer over water. Fixed or inflatable floats are expensive to purchase, install, and maintain.

These systems are heavy and reduce revenue payload on each and every flight and in some cases, would require that one passenger be left behind. In some cases, these systems will restrict use of tour aircraft for other than tour flights due to the increase in empty weight, and for casual charter it is not practical to assume the floats can be removed and replaced each time a charter is requested. For the addition of certain model aircraft floatation systems, it would require that pilots depart on tours with absolute minimum fuel. Thus, if FAA grants relief from FAR 136.9(a), Maverick Airstar also seeks relief from FAR 136.ll(c)(2).

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Maverick
AVIATION GROUP

Petitioner: Maverick Airstar LLC. Cert# Q2KQ218L

Sections of 14 CFR affected; FAR 136.9(a) and 136.11(c)(2)

Description of Relief Sought: Maverick Airstar is seeking relief from having all occupants on its helicopter air tour flights within the Grand Canyon Area, wear life preservers and if granted then relief from equipping its helicopters with floats that otherwise would not be required.

Maverick Airstar is proposing alternatively that it would make life preservers readily available to all occupants on board its air tour flights, instruct occupants on the location and use of life preservers, instruct occupants of emergency egress procedures. In addition, emphasize on training of glide distance of the type helicopters flown, ways to extend the glide, and factors that decrease the glide. Training will be conducted annually in accordance with the approved 135 Training Manual. Maverick Airstar currently operates a fleet of 9 EC130 B4 & T2 helicopters for its tour operation in Arizona. Maverick Airstar will mount pouch type life preservers in each of the helicopters where they will be easily accessible to all occupants. A major alteration to the helicopters will not be necessary. Maverick Airstar proposes to secure the life preservers in a manner acceptable to its local FSDO.

Thank you for your consideration in this matter. If you have any questions regarding this request. I can be reached at (626)252-5647 or barmenta@flymaverick.com

Respectfully,

Brent Armenta

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Certificate# Q2KQ218L

Maverick
AVIATION GROUP

November 16, 2021

FAA Docket Management System
U.S. Department of Transportation
1200 New Jersey Avenue, S.E.

To Whom It May Concern,

Maverick Airstar LLC. Certificate# Q2KQ218L, hereby submits the following petition for exemption from the requirements of 14 CFR 136.9(a), 136.ll(a) and 136.ll(c)(2).

Pertinent Regulations:
This petition for exemption seeks relief from 14 CFR 136.9(a) which requires passengers and flight crew to wear life preservers for the duration of air tour flights under certain circumstances. Should relief be granted from 14 CFR 136.9(a), Maverick Airstar further requests exemption from 14 CFR 136.11, which requires fixed or inflatable floats under certain circumstances, because the mitigating conditions described within 14 CFR 136.11{c)(2) would no longer apply.

Basis for this Exemption:
This petition will outline measures that will further reduce the possibility of a forced landing in water with air tour passengers, well below the acceptable level of risk (10^{-6}) . By adhering to these measures, the petitioner assures a higher level of safety than that provided by existing regulations.

Furthermore, the risk of entrapment in a helicopter during an underwater egress scenario for untrained tourists is unacceptably high. In addition, Maverick Airstar believes that there is a higher chance that someone become entangled in the shoulder harness while trying to egress in the water or on desert land. Maverick Airstar believes safety priorities should be focused on ensuring that our aircraft are operated over specified and approved routes at an airspeed and altitude that enable the helicopter to reach dry land in the event of an emergency, the proper use of passenger restraints, and post-crash egress techniques.

Safran, the manufacturer of the Arriel 281/2D turbine engine which powers all of Maverick Helicopter's, asserts a mean-time between failures of 5 million hours. Notwithstanding the mitigating measures that follow in this petition, this factor alone is within the acceptable risk published by the FAA following the following formula:

The longest exposure time for Maverick Airstar crossing over the river is 4 seconds, which results in an exposure risk of 3.00×10^{-9}, well less than the acceptable risk. (5,000,000 hour x 60 minutes divided by 1 minutes=.000000002000 or 2.00×10^{-9}

However, the intent of this exemption request is to guarantee that Maverick Airstar's helicopters are always operated in a manner that excludes the possibility of landing in the water, even considering the statistically negligible risk of engine failure. If approved, the level of operational discipline described in this exemption request will far exceed the level of safety currently afforded by operating in accordance with 14 CFR 136.9 and 136.11.

Conditions in Support of Exemption:

1. Attached to this request for exemption are graphical depictions of Maverick Airstar's intended routes beyond the shoreline, and minimum altitudes for approval by their Principal Operations Inspector (POI) for inclusion into their 14 CFR 135 Operations Specifications.
2. These graphical depictions contain an overlay of location, river width, altitude above ground and time over river at 100kts. Aircraft manufacturer's autorotative glide data which will prove that required glide distance to shoreline reachable with a wide margin of safety.
3. Wind Effects on Depicted Routes:

a. The average wind speed at the South Rim of the Grand Canyon area is 8.0 MPH (6.9 knots) as established by the National Weather Service with prevailing winds from approximately 180°-260° and 030° depending on the meteorological pattern.

b. Wind speed and direction have little to no impact the ability to maintain an achievable glide distance to the shoreline. All tours on the prescribed routes maintain an altitude of at least 5300ft above the river. The EC-130 helicopter has a glide distance of .54 NM per 1000ft of altitude. Therefore, since the helicopter has a glide distance of 2.87 NM and the river at its widest is 600ft, the shoreline can be reached in any conditions.

Conditions in Support of Exemption: (cont.)

4. Maverick Airstar will train pilots annually and will address the glide distance of the EC130 as affected by weight and variable wind conditions. Additionally, Maverick Airstar will train pilots in techniques for extending glide distances significantly further than those depicted on the graphical depictions.
5. Any changes in engine type being operated by Maverick Airstar will require that Maverick Airstar prepare an analysis demonstrating the acceptable exposure risk due to engine failure.
6. Maverick Airstar will continue to make life preservers readily available to each passenger on all air tour flights. Life preservers are mounted in Maverick Airstar aircraft, in an open pouch in front of the passenger or between the passenger's legs in an open slot. This location is entirely free from interfering with the passenger's lap or shoulder harness and virtually eliminates the chance of an entanglement during an underwater or desert egress scenario.
7. Maverick Airstar will instruct passengers on the location of, and proper donning and use of life preservers following a successful egress from the aircraft in the unlikely event of a forced water landing.

If approved, these exemptions will carry with them the following safety advantages:
1. Improvement of crash survivability due to less complicated use of aircraft restraint devices and elimination of inadvertently intertwining restraint devices and life preserver straps.
2. Elimination of entanglement and entrapment hazards due to unintentional or premature inflation of life vests, which could create impediments to expeditious evacuation in the event of an emergency landing.

Summary:
Petitioner: Maverick Airstar LLC. Certificate# Q2KQ218L,
Sections of 14 CFR 136.9(a), 136.11(a), and 136.11(c)(2)

Maverick Airstar is seeking relief from the requirement that all occupants must wear life preservers on helicopter air tour flights that follow the routes depicted in this exemption request. If granted, relief is also requested from equipping its helicopters with floats that otherwise would not be required.

Maverick Airstar Inc. proposes a higher level of safety than afforded by 14 CFR 136.9 and 136.11 by virtually eliminating the risk of an emergency landing in the water by the self-imposition of the additional restrictions outlined in this exemption request. This plan will be augmented by the implementation of a training program that addresses the glide distance of the type of helicopters being operated and techniques for extending that glide.

In the highly unlikely event of a Maverick Airstar aircraft landing in the water, Maverick Airstar asserts that entrapment is a more likely cause of death than survival in the water following a successful egress. Therefore, Maverick Airstar places emphasis on briefing air tour passengers on egress procedures and, if necessary, proper utilization of life preservers. Maverick Airstar's life preservers are stowed for immediate access in a pouch in front of the passenger or open slots between each passenger's legs. This storage technique eliminates any potential for the life preserver to become entangled with the aircraft's seatbelts or shoulder harnesses, and it decreases the chance of a passenger prematurely inflating the life preserver while still inside the aircraft.

REFERENCES:

136.21 Deviation procedures (from NPRM)

An air tour operator may be issued a deviation by the Administrator from the following sections of this subpart if the Administrator finds that the operation can be conducted with an equivalent level of safety under the terms of the deviation: 136.3, Minimum altitudes; 136.5, Standoff distance; 136.7, Visibility; 136.9, Cloud clearance; 136.13, Life preservers; and 136.15, Helicopter floats:

(b) For 136.13, Life preservers, and 136.15, Helicopter floats, the Administrator will consider the size and nature of the body of water and any other factors, as appropriate when determining whether a deviation will be approved. (Italics added for emphasis)

NTSB Recommendation Number A-99-S7 (cited in NPRM)

Require all occupants of single-engine airplanes and single-engine helicopters operated for hire (air taxi and air tour) to wear life preservers when the aircraft is operating over water, whether float-equipped or not, *unless it is operated at an altitude that allows it to reach a suitable landing area in the case of an engine failure.* **(Italics added for emphasis)**

NOTE:

This exemption request is consistent with the exact intent of the deviation procedure outline in the NPRM. Additionally, this exemption request outlines procedures consistent with the NTSB recommendation cited above that served as a basis of this rule making.

Respectfully,

Brent Armenta

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SAFRAN

HELICOPTER ENGINES

TECHNICAL MEMO

1889999/MW/2020 Arriel 2B1/2D

To:	Maverick Helicopters	**From:**	Mike Whiteman
Attn:	Director of Flight Operations	**Date:**	October 15, 2020
Ref:	In Flight Shut Down Rate (IFSD)	**Pages:**	1
Re:	Mean Time Between Failures (MTBF)	**cc:**	Tom Belew, Aymeric Jondreville Jennifer Baldwin

Subject: Arriel 2B1/2D In Flight Shut Down Rate

Sir:

The Arriel 2B1/2D un-commanded IFSD rate is as follows;

- During the engine design, we predict (in the safety analysis done for the engine certification) the engine un-commanded IFSD rate, is assessed for 2B1/2D at 3.10-6 failure / engine flight hours (this means 3 failure for 1 million of hours, that's to say a Mean Time Between Failure of more than 300 000 hours),

- The in service experience is followed through airworthiness following (IFSD annual rate assessed for EASA, and for CAT POL (rate of sudden major loss of power (loss higher than 30% of power)

The Arriel 2 engine fleet data with the removal information for the Arriel 2 single engine variants are calculated over a 12 month period and are based on the amount of hours flown during that 12 months period divided by the reported engine removals. This information is updated every six months and includes the Mean time between removals (MTBR), the Mean Time Between Unscheduled Removals (MTBUR) and MTBF.

- The individual Arriel 2B1 fleet flight data for the last calculated 12 month period (January 2019 to December 2019) are a total accumulated flight time/engine removals based on a total flight hours of 330,000 hours

    - MTBR: 1,587 hours
    - MTBUR: 6,471 hours
    - MTBF: 13,750 hours

- The individual Arriel 2D fleet flight data for the last calculated 12 month period (January 2019 to December 2019) are a total accumulated flight time/engine removals based on a total flight hours of 365,000 hours

    - MTBR: 3,687 hours
    - MTBUR: 6,759 hours
    - MTBF: 12,167 hours

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SAFRAN

HELICOPTER ENGINES

TECHNICAL MEMO

1889999/MW/2020 Arriel 2B1/2D

The Arriel 2 single engine fleet flight data for the last 12 month period (January 2019 to December 2019) are a total accumulated flight time/engine removals for all the Arriel 2 single engine aircraft based on a total flight hours of 795,000 hours

- MTBR: 2,131 hours
- MTBUR: 6,625 hours
- MTBF: 13,250 hours

These numbers include all Arriel 2 engines (Arriel 2B, 2B1, 2B1A, 2D) combined. The information provided is to show the Arriel 2B1/2D information relative to the global fleet has a MTBF of two times the engine TBO availability.

Please contact your Field Representative or me directly, should you require any further information.

Mike Whiteman

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5.10 GLIDE DISTANCE IN AUTOROTATION

The distance flown in autorotation is :
0.54 NM (1000 m)/1000 ft at IAS = 65 kt and NR ≅ 410 rpm

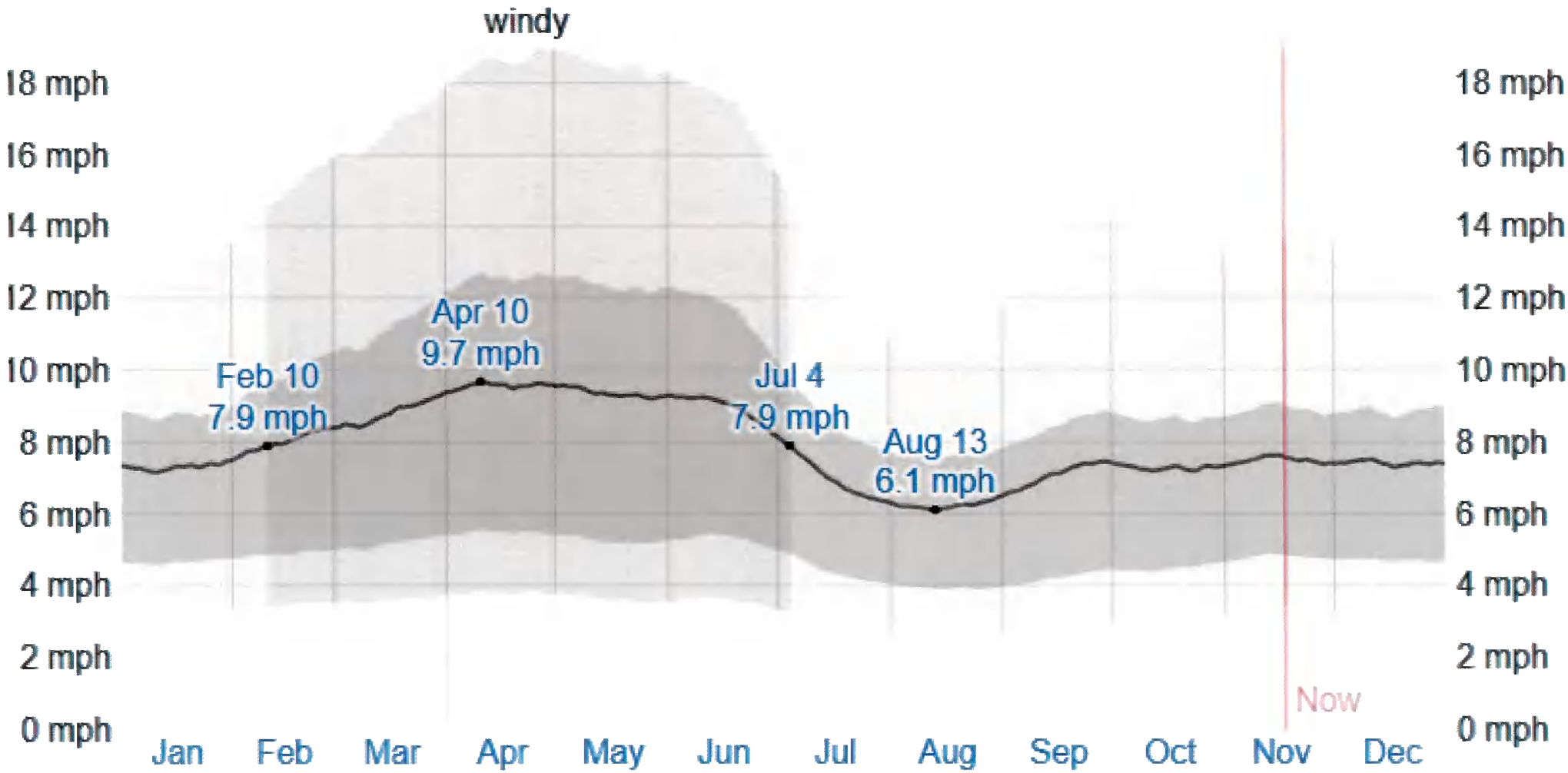
5.11 NOISE LEVEL

Noise characteristics at maximum gross weight defined by chapter 8 of the ICAO annex 16 and JAR part 36 subpart D are as follows :

Flight phase	Noise Level measured (EPNdB)	ICAO / JAR 36 Noise Limits (EPNdB)
Takeoff	85.5	93.8
Flyover at 0.9 Vh (with Vh = 126 kt, at Hp = 0, OAT = 25°C)	84.3	92.8
Approach	90.5	94.8

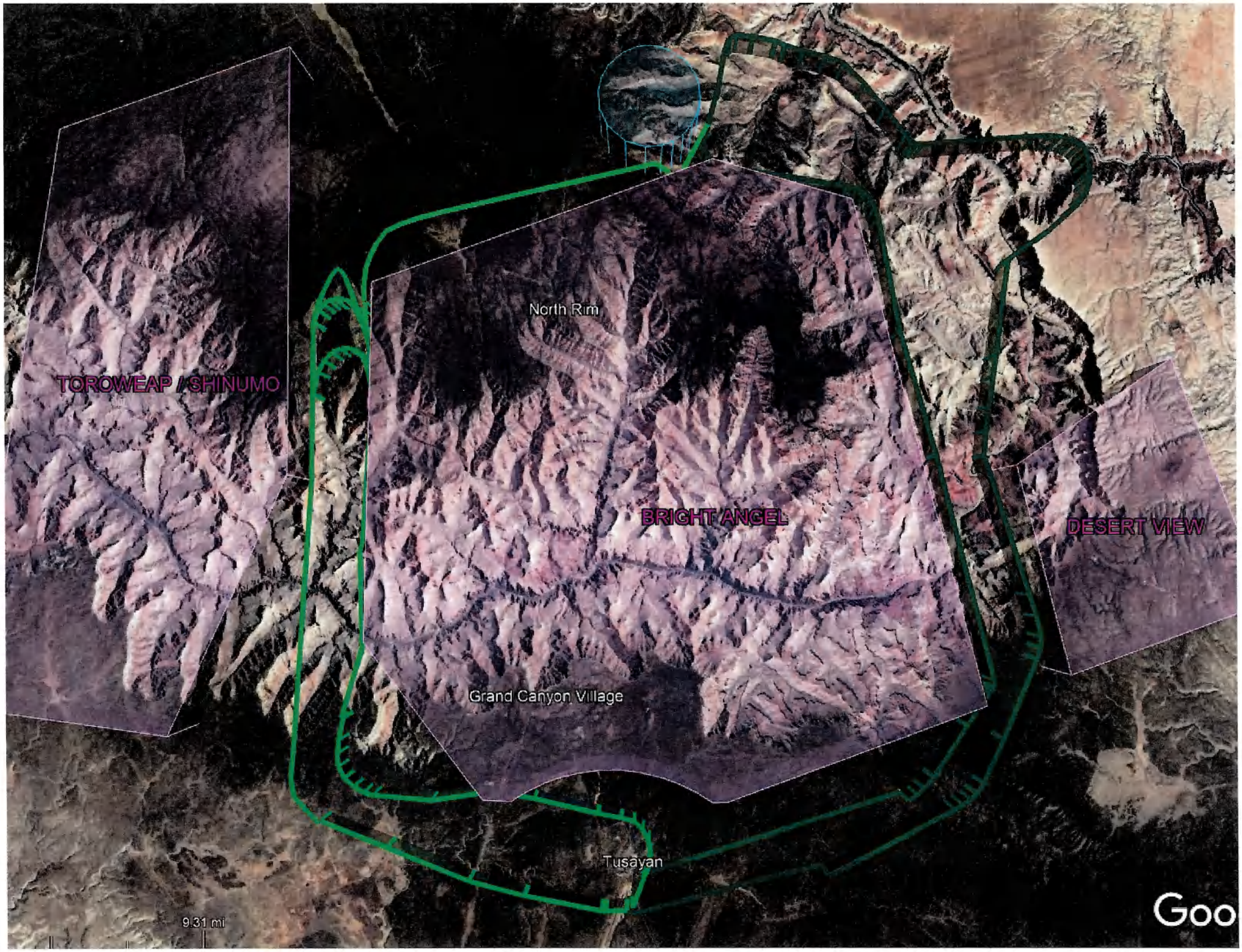
Average Wind Speed at Grand Canyon National Park Airport

Link Download Compare History: 2021 2020 2019 2018 2017 2016 2015 2014 2013



The average of mean hourly wind speeds (dark gray line), with 25th to 75th and 10th to 90th percentile bands.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind Speed (mph)	7.3	8.0	8.9	9.6	9.4	8.9	7.0	6.2	7.1	7.3	7.5	7.4


TOROWEAP / SHINUMO
North Rim
BRIGHT ANGEL
DESERT VIEW
Grand Canyon Village
Tusayan
9.31 mi
Goo

Green 1. 60 Mi Canyon. 420ft. 5300 AGL 2.5 seconds
2768 ft
Google E

Newills Rapids
Papago Creek
Green 1, 350ft wide. 2 sec. 5300ft agl
Colorado River

Cape Solitude
Green 1. Temple Butte. 560ft wide. 5300ft AGL. 4 seconds

Colorado River
Crystal Creek
Crystal Rapids
Slate Creek
Green 2. Crystal Rapids 320ft Wide. 5300ft AGL 2 seconds
Colorado River
1884 ft