

DEPARTMENT OF TRANSPORTATION**Federal Aviation Administration****14 CFR Part 25**

[Docket No. NM448; Special Conditions No. 25-437-SC]

Special Conditions: Gulfstream Model GVI Airplane; Electronic Systems Security Protection From Unauthorized External Access

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions.

SUMMARY: These special conditions are issued for the Gulfstream GVI airplane. This airplane will have novel or unusual design features associated with the architecture and connectivity capabilities of the airplane's computer systems and networks, which may allow access by external computer systems and networks. Connectivity by external systems and networks may result in security vulnerabilities to the airplane's systems. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for these design features. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

DATES: *Effective Date:* July 25, 2011.

FOR FURTHER INFORMATION CONTACT: Will Struck, FAA, Airplane and Flight Crew Interface Branch, ANM-111, Transport Standards Staff, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue, SW., Renton, Washington 98055-4056; telephone (425) 227-2764; facsimile (425) 227-1320.

SUPPLEMENTARY INFORMATION:**Background**

On March 29, 2005, Gulfstream Aerospace Corporation (hereafter referred to as "Gulfstream") applied for an FAA type certificate for its new Gulfstream Model GVI passenger airplane. Gulfstream later applied for, and was granted, an extension of time for the type certificate, which changed the effective application date to September 28, 2006. The Gulfstream Model GVI airplane will be an all-new, two-engine jet transport airplane. The maximum takeoff weight will be 99,600 pounds, with a maximum passenger count of 19 passengers.

Type Certification Basis

Under provisions of Title 14, Code of Federal Regulations (14 CFR) 21.17,

Gulfstream must show that the Gulfstream Model GVI airplane (hereafter referred to as "the GVI") meets the applicable provisions of 14 CFR part 25, as amended by Amendments 25-1 through 25-119, 25-122, and 25-124. If the Administrator finds that the applicable airworthiness regulations (i.e., 14 CFR part 25) do not contain adequate or appropriate safety standards for the GVI because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same novel or unusual design features, the special conditions would also apply to the other model under provisions of § 21.101.

In addition to complying with the applicable airworthiness regulations and special conditions, the GVI must comply with the fuel vent and exhaust emission requirements of 14 CFR part 34 and the noise certification requirements of 14 CFR part 36. The FAA must also issue a finding of regulatory adequacy pursuant to section 611 of Public Law 92-574, the "Noise Control Act of 1972."

The FAA issues special conditions, as defined in 14 CFR 11.19, in accordance with § 11.38, and they become part of the type certification basis under § 21.17(a)(2).

Novel or Unusual Design Features

The Gulfstream Model GVI airplane will incorporate the following novel or unusual design features: Digital systems architecture composed of several connected networks. The proposed architecture and network configuration may be used for, or interfaced with, a diverse set of functions, including:

1. Flight-safety related control, communication, and navigation systems (aircraft control domain),
2. Airline business and administrative support (airline information domain),
3. Passenger information and entertainment systems (passenger entertainment domain), and
4. The capability to allow access to or by external sources.

Discussion

The proposed Model GVI architecture and network configuration may allow increased connectivity to and access by external airplane sources and airline operations and maintenance systems to the aircraft control domain and airline information domain. The aircraft control domain and airline information domain

perform functions required for the safe operation and maintenance of the airplane. Previously these domains had very limited connectivity with external sources.

The architecture and network configuration may allow the exploitation of network security vulnerabilities resulting in intentional or unintentional destruction, disruption, degradation, or exploitation of data, systems, and networks critical to the safety and maintenance of the airplane.

The existing regulations and guidance material did not anticipate these types of airplane system architectures. Furthermore, 14 CFR regulations and current system safety assessment policy and techniques do not address potential security vulnerabilities, which could be exploited by unauthorized access to airplane systems, data buses, and servers. Therefore, these special conditions and a means of compliance are issued to ensure that the security (i.e., confidentiality, integrity, and availability) of airplane systems is not compromised by unauthorized wired or wireless electronic connections.

Discussion of Comments

Notice of proposed special conditions No. 25-11-05-SC for Gulfstream GVI airplanes was published in the **Federal Register** on February 25, 2011 (76 FR 10529). Only one comment was received, which was supportive, so this special condition is adopted as proposed.

Applicability

As discussed above, these special conditions are applicable to the Gulfstream Model GVI airplane. Should Gulfstream apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design features, these special conditions would apply to that model as well.

Conclusion

This action affects only certain novel or unusual design features of the GVI. It is not a rule of general applicability.

List of Subjects in 14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

The Special Condition

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special condition is issued as part of the type

certification basis for Gulfstream GVI airplanes.

1. The applicant must ensure electronic system security protection for the aircraft control domain and airline information domain from access by unauthorized sources external to the airplane, including those possibly caused by maintenance activity.

2. The applicant must ensure that electronic system security threats from external sources are identified and assessed, and that effective electronic system security protection strategies are implemented to protect the airplane from all adverse impacts on safety, functionality, and continued airworthiness.

Issued in Renton, Washington, on June 13, 2011.

Ali Bahrami,

*Manager, Transport Airplane Directorate,
Aircraft Certification Service.*

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. NM444; Special Conditions No. 25-435-SC]

Special Conditions: Gulfstream Model GVI Airplane; Operation Without Normal Electric Power

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions.

SUMMARY: The Gulfstream GVI airplane will have numerous electrically operated systems whose function is needed for continued safe flight and landing of the airplane. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for these design features. These proposed special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

DATES: *Effective Date:* July 25, 2011.

FOR FURTHER INFORMATION CONTACT: Nazih Khaouly, FAA, Airplane and Flight Crew Interface Branch, ANM-111, Transport Standards Staff, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue, SW., Renton, Washington 98057-3356; telephone (425) 227-2432; facsimile (425) 227-1320.

SUPPLEMENTARY INFORMATION:

Background

On March 29, 2005, Gulfstream Aerospace Corporation (hereafter referred to as "Gulfstream") applied for an FAA type certificate for its new Gulfstream Model GVI passenger airplane. Gulfstream later applied for, and was granted, an extension of time for the type certificate, which changed the effective application date to September 28, 2006. The Gulfstream Model GVI airplane will be an all-new, two-engine jet transport airplane. The maximum takeoff weight will be 99,600 pounds, with a maximum passenger count of 19 passengers.

Type Certification Basis

Under provisions of Title 14, Code of Federal Regulations (14 CFR) 21.17, Gulfstream must show that the Gulfstream Model GVI airplane (hereafter referred to as "the GVI") meets the applicable provisions of 14 CFR part 25, as amended by Amendments 25-1 through 25-119, 25-122, and 25-124. If the Administrator finds that the applicable airworthiness regulations (i.e., 14 CFR part 25) do not contain adequate or appropriate safety standards for the GVI because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same novel or unusual design features, the special conditions would also apply to the other model under provisions of § 21.101.

In addition to complying with the applicable airworthiness regulations and special conditions, the GVI must comply with the fuel vent and exhaust emission requirements of 14 CFR part 34 and the noise certification requirements of 14 CFR part 36. The FAA must also issue a finding of regulatory adequacy pursuant to section 611 of Public Law 92-574, the "Noise Control Act of 1972."

The FAA issues special conditions, as defined in 14 CFR 11.19, in accordance with § 11.38, and they become part of the type certification basis under § 21.17(a)(2).

Novel or Unusual Design Features

The GVI incorporates an electronic flight control system that requires a continuous source of electrical power in order to keep the system operable. Due to rapid improvements in airplane technology, the applicable airworthiness regulations do not contain adequate or

appropriate safety standards for these design features.

Discussion

The GVI incorporates an electronic flight control system that requires a continuous source of electrical power in order to keep the system operable. The criticality of this system is such that their failure will either reduce the capability of the airplane or the ability of the crew to cope with adverse operating conditions, or prevent continued safe flight and landing of the airplane. The airworthiness standards of part 25 do not contain adequate or appropriate standards for protection of these systems from the adverse effects of operation without normal electrical power.

The current rule, § 25.1351(d), Amendment 25-72, requires safe operation under visual flight rules (VFR) conditions for at least five minutes after loss of all normal electrical power. This rule was structured around traditional airplane designs that used mechanical control cables and linkages for flight control. These manual controls allowed the crew to maintain aerodynamic control of the airplane for an indefinite period of time after loss of all electrical power. Under these conditions, the mechanical flight control system provided the crew with the ability to fly the airplane while attempting to identify the cause of the electrical failure, start the engine(s) if necessary, and reestablish some of the electrical power generation capability, if possible.

To maintain the same level of safety associated with traditional designs, the GVI must be designed for operation with the normal sources of engine and auxiliary power unit (APU) generated electrical power inoperative. Service experience has shown that loss of all electrical power from the airplane's engine and APU driven generators is not extremely improbable. Thus, Gulfstream must demonstrate that the airplane is capable of recovering adequate primary electrical power generation for safe flight and landing.

For compliance purposes, a test demonstration of the loss of normal engine generator must be established such that:

1. The failure condition should be assumed to occur during night instrument meteorological conditions (IMC) at the most critical phase of the flight relative to the electrical power system design and distribution of equipment loads on the system.

2. After the unrestorable loss of normal engine generator power, the airplane engine restart capability must