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[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. FAA-2011-1172: Special Conditions No. 25-453-SC]

Special Conditions: Gulfstream Aerospace LP (GALP) Model G280 airplane, Operation Without Normal Electrical Power

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions.

SUMMARY: These special conditions are issued for the Gulfstream Aerospace LP (GALP) Model G280 airplane. This airplane will have a novel or unusual design feature associated with operation without normal electrical power. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. 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.

EFFECTIVE DATE: The effective date of these special conditions is December 20, 2011.

FOR FURTHER INFORMATION CONTACT: Nazih Khaouly, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington 98057-3356; telephone (425) 227-2432; facsimile (425) 227-1149.

SUPPLEMENTARY INFORMATION:

Background

On March 30, 2006, GALP applied for a type certificate for their new Model G280 airplane. The Model G280 will have a novel or unusual design feature associated with operation without normal electrical power.

Type Certification Basis

Under the provisions of Title 14, Code of Federal Regulations (14 CFR) 21.17, GALP must show that the Model G280 airplane meets the applicable provisions of part 25 as amended by Amendments 25-1 through 25-117.

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 Model G280 airplane 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 feature, the special conditions would also apply to the other model.

In addition to the applicable airworthiness regulations and special conditions, the Model G280 airplane must comply with the fuel-vent and exhaust-emission requirements of part 34 and the noise-certification requirements of part 36; and the FAA must issue a finding of regulatory adequacy under § 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 Model G280 airplane will incorporate the following novel or unusual design features:

The Model G280 airplane is equipped with electrical and electronic systems that control critical functions and systems. Examples of these include the electronic displays, rudder, brakes, spoilers, flaps, and electronic engine controls. The Model G280 electrical-power generation and distribution architecture is equipped with an auxiliary power unit (APU) and is not equipped with a Ram Air Turbine (RAT) generator. The loss of all electrical power to certain functions and systems impacts the airplane's ability to land safely. Therefore, these special conditions are issued to retain the level of safety intended by the current § 25.1351(d).

Discussion

The Model G280 airplane requires a continuous source of electrical power for continued safe flight and landing. The current regulation in § 25.1351(d), "Operation without normal electrical power," states that the airplane must be operated safely in visual-flight-rules conditions, for a period of not less than five minutes, with the normal electrical power (electrical power sources excluding the battery) inoperative. This rule was structured around a traditional design utilizing mechanical controls for flight systems while the crew took time to sort out the electrical failure, start engine(s) if necessary, and re-establish some of the electrical-power-generation capability.

To maintain the same level of safety associated with traditional designs, the Model G280 airplane electrical-system design must not be time-limited in its operation. It should be noted that service experience has shown that the loss of all electrical power, which is generated by the airplane's engine generators or APU is not extremely improbable. Thus, it must be demonstrated that the airplane can continue through safe flight and landing (including steering and braking on ground for airplanes using steer/brake-by-wire) with the use of its emergency electrical-power systems. These emergency electrical-power systems must be able to power loads that are required for continued safe flight and landing.

Discussion of Comments

Notice of proposed special conditions no. 25-11-17-SC for the GALP Model G280 airplanes was published in the Federal Register on October 27, 2011 (76 FR 66660). No comments were received, and the special conditions are adopted as proposed.

Applicability

As discussed above, these special conditions are applicable to the GALP Model G280 airplane. Should GALP apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design feature, the special conditions would apply to that model as well.

Under standard practice, the effective date of final special conditions would be 30 days after the date of publication in the Federal Register; however, as the certification date for the GALP Model G280 airplane is imminent, the FAA finds good cause to make these special conditions effective upon issuance.

Conclusion

This action affects only certain novel or unusual design features on the GALP Model G280 airplane. It is not a rule of general applicability and it affects only the applicant who applied to the FAA for approval of these features on the airplane.

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 Conditions

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type-certification basis for GALP Model G280 airplanes. The special conditions are issued in lieu of 14 CFR 25.1351(d) and are required to ensure that the airplane has sufficient electrical power for continued safe flight and landing.

1. The applicant must show by test or a combination of test and analysis that the airplane is capable of continued safe flight and landing with all normal electrical power sources inoperative, as prescribed by paragraphs (1)(a) and (1)(b) below.

For purposes of this special condition, normal sources of electrical-power generation do not include any alternate power sources such as a battery, ram-air turbine (RAT), or independent power systems such as the flight-control permanent-magnet generating system. In showing capability for continued safe flight and landing, consideration must be given to systems capability, effects on crew workload and operating conditions, and the

physiological needs of the flightcrew and passengers for the longest diversion time for which approval is sought.

- a. Common-cause failures, cascading failures, and zonal physical threats must be considered in showing compliance with this requirement.
- b. The ability to restore operation of portions of the electrical-power generation and distribution system may be considered if it can be shown that unrecoverable loss of those portions of the system is extremely improbable. An alternative source of electrical power must be provided for the time required to restore the minimum electrical-power-generation capability required for safe flight and landing.

Unrecoverable loss of all engines may be excluded when showing that unrecoverable loss of critical portions of the electrical system is extremely improbable. Unrecoverable loss of all engines is covered in special condition 2, below, and thus may be excluded when showing compliance with this requirement.

2. Regardless of any electrical-generation and distribution-system recovery capability shown under special condition 1, above, sufficient electrical-system capability must be provided to:
 - a. Allow time to descend, with all engines inoperative, at the speed that provides the best glide slope, from the maximum operating altitude to the altitude at which the soonest possible engine restart could be accomplished, and
 - b. Subsequently allow multiple start attempts of the engines and APU. This capability must be provided in addition to the electrical capability required by existing part 25 requirements related to operation with all engines inoperative.
3. The airplane emergency electrical-power system must be designed to supply:

- a. Electrical power required for immediate safety, which must continue to operate without the need for crew action following the loss of the normal electrical power, for a duration sufficient to allow reconfiguration to provide a non-time-limited source of electrical power.
 - b. Electrical power required for continued safe flight and landing for the maximum diversion time.
4. If APU-generated electrical power is used in satisfying the requirements of these special conditions, and if reaching a suitable runway upon which to land is beyond the capacity of the battery systems, then the APU must be able to be started under any foreseeable flight condition prior to the depletion of the battery or the restoration of normal electrical power, whichever ever occurs first. Flight tests must demonstrate this capability at the most critical condition.
- a. It must be shown that the APU will provide adequate electrical power for continued safe flight and landing.
 - b. The Airplane Flight Manual (AFM) must incorporate non-normal procedures that direct the pilot to take appropriate actions to activate the APU after loss of normal engine-driven generated electrical power.

As a part of showing compliance with these special conditions, the tests by which loss of all normal electrical power is demonstrated must also take into account the following:

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 worst possible electrical-power distribution and equipment-loads-demand condition.

2. After the un-restorable loss of normal engine generator power, the airplane-engine-restart capability must be provided and operations continued in IMC.
3. It should be demonstrated that the aircraft is capable of continued safe flight and landing. The length of time must be computed based on the maximum diversion-time capability for which the airplane is being certified. Consideration for airspeed reductions resulting from the associated failure or failures must be made.
4. The airplane must provide adequate indication of loss of normal electrical power to direct the pilot to the non-normal procedures, and the AFM must incorporate non-normal procedures that will direct the pilot to take appropriate actions.

Issued in Renton, Washington, on December 20, 2011.

K. C. Yanamura
Acting Manager, Transport Airplane Directorate
Aircraft Certification Service

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