

## PART 25—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES

### The Proposed Special Conditions

Accordingly, the Federal Aviation Administration (FAA) proposes the following revisions to Special Conditions 25–ANM–84 as part of the type certification basis for Boeing Model 777 series airplanes. The existing special conditions are printed in their entirety for clarity. Your comments are invited on the proposed revisions: Sections (e)(6), (e)(7), and the word substitutions in sections (g)(2) and (h)(1).

In addition to the airworthiness requirements of 14 CFR part 25, the Model 777 airplane must comply with the following requirements in order to be eligible for Extended Range Operation with Two-Engine Airplanes (ETOPS) without the requisite operating experience specified in Advisory Circular (AC) 120–42A:

(a) *Introduction.* An approved ETOPS Type Design Assessment Plan covering the engine and each applicable airplane system must be established. The specific methods that will be used to substantiate compliance with the requirements of these special conditions must be defined in the plan. Specific systems that will undergo the complete analysis, testing, and development program tracking defined in paragraph (c) of these special conditions must be identified. Other airplane systems that may contribute to the overall safety of an ETOPS operation, but that do not warrant the rigorous type design requirements and relevant experience assessments defined in paragraph (c) of these special conditions, must be identified and agreed to by the FAA. Compliance must be shown for these other systems with all provisions of these special conditions, except paragraph (c). In showing compliance with these special conditions, tests and analyses conducted to substantiate compliance with the basic airworthiness standards of part 25 may be referenced, if applicable.

(b) *Engine Assessment.*

(1) The ETOPS eligibility of the engine must be determined specifically for the airplane installation for which early ETOPS type design approval is requested.

(2) Procedures for an engine condition monitoring program must be defined and validated at the time of ETOPS type design approval. The engine condition monitoring program must be able to predict when an engine is no longer capable of providing, within certified engine operating limits, the maximum

thrust required for a single engine diversion.

(c) *ETOPS Type Design Assessment.*

(1) *Design Requirements Assessment.* 14 CFR part 25, including applicable amendments, defines most of the requirements necessary to design an airplane that is suitable for ETOPS operation, as long as the ETOPS mission is considered in applying these requirements for all anticipated dispatch configurations. In addition to these requirements, the propulsion system must be designed to preclude failures or malfunctions that could result in an engine inflight shutdown. The applicant must identify and list methods of compliance for each of the applicable ETOPS requirements, including those specific part 25 requirements for which methods of compliance relative to the ETOPS mission are different from those traditionally used for two-engine airplanes. Paragraph (c)(3) of these special conditions lists certain design feature categories that may be affected by a consideration of the ETOPS mission in the design of these systems. The effects of the applicable ETOPS requirements on the design of any of those design feature categories listed in paragraph (c)(3) must be specifically addressed by this assessment.

(2) *Relevant Experience Assessment.* For each system covered by the ETOPS Type Design Assessment, there must be an assessment of the relevant design, manufacturing, and operational problems experienced on previous airplanes built by the applicant. The assessment must include the applicable relevant service experience of vendor supplied systems or, to the extent possible, the service experience of components on aircraft built by other manufacturers. Specific corrective actions taken to preclude similar problems from occurring on the new airplane must be identified.

(3) *Design Features.*

(i) The applicant must define any design features implemented to comply with the design requirements listed in paragraph (c)(1). Consideration of the following design feature categories must be specifically addressed:

(A) Airplane capabilities and capacities of the ETOPS mission;

(B) Fuel system integrity, including consideration of uncontained main engine rotor burst and fuel availability as affected by cross-feed capability and electrical power to pumps and other components;

(C) Fuel quantity indication to the flightcrew, including alerts that consider the fuel required to complete the mission, abnormal fuel management

or transfer between tanks, and possible fuel leaks between the tanks and the main engines;

(D) Communication systems for the ETOPS environment;

(E) Navigation systems for the ETOPS environment;

(F) Minimum single engine cruise altitude capability; and

(G) Failure tolerant designs of cockpit indicating systems or avionics systems to prevent unnecessary airplane diversions.

(ii) The applicant must define the specific design features used to address problems identified in the relevant service experience assessment of paragraph (c)(2).

(4) *Test Features.* The applicant must define specific new tests, or enhanced tests, that will be used to assure engine and airplane system design integrity. These test features may be derived from the requirements assessment of paragraph (c)(1) and the relevant service experience assessment of paragraph (c)(2).

(5) *Analysis Features.* The applicant must define specific new analyses, or enhanced analyses, that will be used to assure engine and airplane system design integrity. These analysis features may be derived from the requirements assessment of paragraph (c)(1) and the relevant service experience assessment of paragraph (c)(2).

(6) *Manufacturing, Maintenance, or Operational (Other) Features.* The applicant must define specific new, or enhanced, manufacturing processes or procedures, and maintenance or operational procedures that are being implemented to assure engine and airplane system integrity. These “other” features may be derived from the requirements assessment of paragraph (c)(1) of this section and the relevant service experience assessment of paragraph (c)(2).

(d) *Additional ETOPS Analysis Requirements.*

(1) *Performance and Failure Analyses.* Engine and airplane performance and failure analyses required for certification must be expanded to consider ETOPS mission requirements, including exposure times associated with a 180-minute single-engine diversion and a subsequent 15-minute hold in the terminal airspace at the diversion airport. Consideration must be given to crew workload and operational implications of continued operation with failure effects for an extended period of time. The rationale and all assumptions used in the analyses must be documented, justified, and validated, including maintenance interval and maintainability assumptions.