

airplanes that are currently operating at a stable level of reliability in ETOPS service. It would not be appropriate to make this comparison with a non-ETOPS approved fleet. The FAA does not require the operators of non-ETOPS fleets to maintain a level of reliability consistent with the ETOPS standard for two-engine airplanes.

We speculate that the ARAC may have intended that the added phrase “or any non-ETOPS derivative models of those aircraft or engines” would address a manufacturer that initially would have no previously approved ETOPS airplanes in service from which to base a type and frequency comparison. The proposed rule would not specifically require that the comparison be with currently certified ETOPS airplanes by that manufacturer. If an applicant does not currently have an existing ETOPS approved airplane in service from which to base a type and frequency comparison, the proposed rule would allow the manufacturer to use available data for ETOPS approved airplanes of other manufacturers. It is not necessary that the applicant use a single existing airplane model in the comparison that would be required by proposed paragraph II(b)(9). We have not included this phrase in proposed paragraph II(b)(9).

In finding compliance with the proposed type and frequency requirement, we would be looking at the significance of the problems that occur during the type certification testing and whether or not they would require a design change prior to type certification of the airplane. Manufacturers continually make improvements to enhance their designs based on in-service experience. These design improvements may eliminate nuisance problems that are not, in themselves, safety related. In addition, certain failures that occur in service are expected during the life of the product at a known low rate of occurrence and are not indicative of a significant design shortcoming. We could find compliance with the proposed reliability demonstration acceptance criteria even though we might expect that these types of failures or problems occurring during airplane flight testing could also occur on a mature ETOPS fleet.

In contrast, the types of failures or problems that would give the FAA concern about compliance with the proposed reliability demonstration acceptance criteria would fall into two categories:

(1) A major failure that would require a significant redesign before the airplane could receive a basic part 25 type certificate. In other words, a problem

that makes the airplane unsafe without a significant redesign and testing.

(2) Random ETOPS significant failures occurring during the test program at a frequency greater than would be expected on a mature ETOPS fleet. ETOPS significant failures would be those that result in the events listed in proposed § 21.4(a)(5).

II(c) Combined Service Experience and Early ETOPS Method

This proposed paragraph would allow an applicant to combine certain elements of the early ETOPS process proposed in section II(b) with a reduced amount of service experience from what would be required by paragraph II(a)(1) to obtain ETOPS approval.

Explanation

The early ETOPS process proposed in section II(b) of Appendix L would define requirements for obtaining ETOPS type design approval without the service experience that would be required by section II(a). Proposed subsection II(c) would define requirements for obtaining ETOPS approval with a combination of service experience and elements of the early ETOPS process.

The FAA has accepted, in principle, the concept of trading a limited amount of service experience for the airplane demonstration test requirements contained in the 777 early ETOPS special conditions. The FAA did this based on a concept already contained in Advisory Circular 120–42A, which allows a reduction in the normal amount of service experience if “adequate compensating factors exist which give a reasonable equivalent database.” The FAA considers that elements of the early ETOPS process may be used to provide “adequate compensating factors.” Since the 777 early ETOPS process provides a method for obtaining ETOPS approval without any service experience, a minimum amount of actual service experience would provide an adequate evaluation if the applicant complies with the other elements of the early ETOPS process.

Proposed section II(c) would codify this concept into the ETOPS rule. The proposed rule would allow two methods of reduced service experience in place of the complete early ETOPS process contained in section II(b). Paragraph II(c)(1) would specifically require only 15,000 engine hours of service experience if the applicant complies with the following elements of sections II(a) and (b):

- (a)(5) Airplane flight test requirements,
- (b)(1) Relevant experience assessment,
- (b)(2) Propulsion system design,

- (b)(3) Maintenance and operational procedures,
- (b)(4) Propulsion system validation test,
- (b)(5) New technology demonstration testing,
- (b)(6) APU validation test,
- (b)(8) Problem tracking and resolution system, and
- (b)(9) Reliability demonstration acceptance criteria.

In addition to the airplane flight test requirement from the service experience method, paragraph II(a)(5), these are all of the elements of the early ETOPS process except for the airplane demonstration test in proposed paragraph II(b)(7). We have added three paragraphs to the original ARAC proposal. The first is the airplane flight test requirement from the service experience method, paragraph II(a)(5). Without some required airplane flight-testing, the ARAC proposal would not result in an equivalent demonstration of a capability to safely operate in an ETOPS environment. Paragraph II(a)(5) would require an applicant for ETOPS approval based on service experience to conduct a flight test to validate the adequacy of the airplane’s flying qualities, performance and the flight crew’s ability to deal with engine inoperative and non-normal worst case system failure conditions expected to occur in service. The FAA considers that an applicant who does not complete the airplane demonstration flight test requirement in accordance with proposed paragraph II(b)(7) as part of a combined ETOPS approval method must as a minimum complete the flight testing that would be required if the applicant were using service experience only.

The second is proposed paragraph (b)(5), new technology testing. We have added the new technology testing requirement here and in section III because we could find no valid reason to exclude it when every other requirement of proposed early ETOPS section is included except for the airplane demonstration test requirement. Since ARAC overlooked the new technology testing requirement in their original proposal as discussed above for proposed paragraph II(b)(5), we assume that it would have been included in proposed paragraph II(c)(a) had they not overlooked it.

The third paragraph we have added is the reliability demonstration acceptance criteria in proposed paragraph II(b)(9). In section II(a) for a service experience based approval, in-flight shutdown rate provides the FAA with a reliability objective to assess a design’s suitability.