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# Part V

# Department of Transportation

## Federal Aviation Administration

**Proposed Advisory Circular No. 120–42B, Extended Operations (ETOPS) and Polar Operations; Notice Proposed Advisory Circular No. 135–42, Extended Operations (ETOPS) and Operations in the North Polar Area; Notice**

## DEPARTMENT OF TRANSPORTATION

### Federal Aviation Administration

**[Docket Number FAA–2002–6717]**

### Proposed Advisory Circular No. 120–42B, Extended Operations (ETOPS) and Polar Operations

**AGENCY:** Federal Aviation Administration, DOT.

**ACTION:** Notice of availability of a proposed advisory circular and request for comments.

**SUMMARY:** This notice announces the availability of and requests comments on a proposed Advisory Circular (AC): AC No. 120–42B, Extended Operations (ETOPS) and Polar Operations. Also in this **Federal Register**, the FAA publishes draft AC No. 135–42, Extended Operations (ETOPS) and Operations in the North Polar Area, for public comment.

**DATES:** Comments must be received on or before October 17, 2007.

**ADDRESSES:** Send all comments on the proposed AC to Docket Number FAA–2002–6717, using any of the following methods:

- *DOT Docket Web site:* Go to *http://dms.dot.gov* and follow the instructions for sending your comments electronically.
- *Government-wide rulemaking Web site:* Go to *http://www.regulations.gov* and follow the instructions for sending your comments electronically.
- *Mail:* Send comments to the Docket Management Facility; U.S. Department of Transportation, 1200 New Jersey Avenue, SE., West Building Ground Floor, Room W12–140, Washington, DC 20590.
- *Fax:* Fax comments to the Docket Management Facility at 202–493–2251.
- *Hand Delivery:* Bring comments to the Docket Management Facility in Room W12–140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

**FOR FURTHER INFORMATION CONTACT:** Jim Ryan, Air Transportation Division (AFS–220), Federal Aviation Administration, 800 Independence Avenue SW., Washington, DC 20591; telephone: (202) 267–7493, e-mail *Jim.Ryan@faa.gov.*

**SUPPLEMENTARY INFORMATION**

**Authority:** 49 U.S.C. 106(g), 40113, 44701, 44702, 44703.

### Comments Invited

Interested parties are invited to submit comments on the proposed AC. Commenters must identify AC No. 120–42B and submit comments to the address specified under **ADDRESSES.** All communications received on or before the closing date for comments will be considered by the FAA before issuing the final AC.

An electronic copy of the proposed AC, which are published in full here, may be obtained by accessing the FAA's web page at—*http://www.faa.gov/regulations_policies/rulemaking/recently_published/.*

The Extended Operations (ETOPS) final rule was published in the **Federal Register** on January 16, 2007. This final rule applies to air carrier (part 121), commuter, and on-demand (part 135) turbine powered multi-engine airplanes used in extended-range operations. All-cargo operations in airplanes with more than two engines were exempted from most of the rule. It established regulations governing the design, operation and maintenance of certain airplanes operated on flights that fly long distances from an adequate airport. This advisory circular provides further guidance for these extended operations to those conducting operations under 14 CFR part 121. It also further clarifies the rule's requirements for Polar operations.

Issued in Washington, DC on August 27, 2007.

**James J. Ballough,**

*Director, Flight Standards Service.*

**Draft Advisory Circular 120–42B, Extended Operations (ETOPS) and Polar Operations**

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### Chapter 1. General

*100. Applicability.* This AC concerns those certificate holders applying for approval to conduct ETOPS under § 121.161, as well as those certificate holders applying for approval to conduct flights where a portion of which traverse either the North or South Polar Areas, as defined in part 121, § 121.7. This AC also provides guidance in resolving operational issues to certificate holders currently conducting such operations.

*101. Cancellations.* The following AC's and policy letters are cancelled:

- AC 120–42A, Extended Range Operation with Two-Engine Airplanes, dated December 30, 1988;
- ETOPS Policy Letter (EPL) 95–1, 138-Minute ETOPS Operational Approval Criteria, dated December 19, 1994;
- EPL 20–1, 207-Minute ETOPS Operational Approval Criteria, dated March 21, 2000; and
- FAA Policy Letter, Guidance for Polar Operations, dated March 5, 2001.

*102. Related Regulations.* 14 CFR part 21, § 21.4; part 25, § 25.1535; part 121, §§ 121.7, 121.97, 121.99, 121.106, 121.135, 121.161, 121.162, 121.191, 121.197, 121.374, 121.410, 121.415, 121.565, 121.624, 121.625, 121.631, 121.633, 121.646, 121.687, 121.689, 121.703, 121.704, and 121.705; and part 121, appendix P (*http://www.gpoaccess.gov/ecfr*).

### Chapter 2. Background on ETOPS

*200. ETOPS Regulatory Requirements.*

a. All two-engine airplanes and three- and four-engine passenger-carrying airplanes operated under part 121 are required to comply with § 121.161. This regulation imposes special requirements

for extended operations (ETOPS) for these airplanes. These operations are defined as:

(1) Two-Engine Airplanes. These are flights whose planned routing contains a point farther than 60 minutes flying time from an adequate airport at an approved one-engine-inoperative cruise speed in still air.

(2) Passenger-Carrying Airplanes with More Than Two Engines. These are flights whose planned routing contains a point farther than 180 minutes flying time from an adequate airport at an approved one-engine-inoperative cruise speed in still air.

b. To conduct ETOPS, the specified airplane-engine combination must be certificated to the airworthiness standards of transport-category airplanes and be approved for ETOPS. (Airplane certification guidance for ETOPS can be found in § 121.162 and § 25.1535, as well as AC 25.1535–1. As with all other operations, a certificate holder requesting any route approval must first show that it is able to satisfactorily conduct operations between each required airport as defined for that route or route segment, and any required en route alternate airport. Certificate holders must show that the facilities and services specified in §§ 121.97 through 121.107 (domestic and flag operations) and §§ 121.113 through 121.127 (supplemental and commercial operations) are available and adequate for the proposed operation. In addition, the certificate holder must be approved for ETOPS under part 121. This AC provides the additional guidance for certificate holder approval for ETOPS.

*201. Evolution of ETOPS.*

a. Section 121.161 has an extensive historical basis, which began as early as 1936. Before obtaining approval for operation in 1936, an applicant operating an airplane with two piston engines was required to show that intermediate fields available for safe takeoffs and landings were located at least at 100-mile intervals along the proposed route. Previously, the rule imposed restrictions only on two-engine airplanes based on the lack of satisfactory engine reliability in the operation. In response to improvements in engine design and reliability, and responding to the needs of industry, the FAA has provided guidance for deviations from the rule that have allowed two-engine operations to expand incrementally beyond the initial 60-minute restriction. Currently, engine reliability has improved to a level where the safety of the operations is not impacted so much by the number of engines, but by other factors that affect operations of all airplanes whose routings take them great distances from adequate airports. Throughout the evolution of the current § 121.161, the following factors have remained constant:

(1) The rule has always applied to all areas of operation, and has not been limited to overwater operations.

(2) Any additional restrictions imposed or, alternatively, any deviations granted to operate in excess of the basic requirements, were based on a finding by the Administrator that adequate safety would be provided in the proposed operation and current levels of safety would be maintained when all factors were considered. This finding was never limited to engine reliability alone.

(3) The airports used in meeting the provisions of the rule must be adequate for the airplane used (that is, available for safe landings and takeoff with the weights authorized).

(4) Adequate levels of safety within the operation are to be maintained. Operations over increasingly remote areas and the possibility of increased diversion lengths have a potentially negative impact on the safety of the diversion, and thus the operation as a whole. Additional regulatory requirements are intended to ensure that this potential increase in risk is mitigated and that adequate levels of safety within operations are retained.

(5) When considering the impact of operating at greater distances from airports, the certificate holder must show that the operation can be conducted at a level of reliability that maintains an acceptable level of risk.

b. In June of 1985, responding to the industry's desire to take advantage of the increased reliability and capabilities of two-engine airplanes, the FAA issued AC 120–42. This AC provided guidance on one means of obtaining deviation authority from § 121.161 to allow two engine airplanes to operate on routes up to 120 minutes from an adequate airport after demonstration of specific levels of in-service experience and systems reliability. The FAA amended this AC in 1988 (AC 120–42A) to permit two-engine airplanes to operate up to 180 minutes from an adequate airport. These ACs introduced the term ''ETOPS'' for those specific extended operations and addressed airplane and engine design aspects, maintenance programs, and operations. Both of these ACs encompassed the following precepts:

(1) Reliance on a two-step approval that included type design of the airplane-engine combination and approval of the certificate holder's operation.

(2) Risk, as measured by diversion length, is mitigated by application of regulations and guidance reflecting current best practices that address the type certification of the ETOPS airplane and its systems as well as the operational environment of such operations.

(3) ETOPS can be managed successfully, and the level of safety can be maintained, by up-to-date regulations and guidance that articulate quantifiable standards of reliability and experience.

c. The original guidance for extended-range operations with two-engine airplanes in AC 120–42 allowed an increase of up to 15 percent to the maximum diversion time of 120 minutes. This provision was eliminated with the release of the guidance in AC 120–42A, providing for operations up to 180 minutes. Recognizing a need for ETOPS diversion authority between 120 and 180 minutes, the FAA reinstated the 138-minute provision by issuing EPL 95 1 in 1994. In March of 2000, at the request of the industry, the FAA issued ETOPS Policy Letter (EPL) 20–1, 207 Minute ETOPS Operation Approval Criteria. This document provided a similar 15 percent increase in the 180-minute maximum diversion time and gave limited relief to ETOPS certificate holders in the specific case of North Pacific Operations.

d. Since the advent of the original § 121.161, extended two-engine airplane operations have been governed by this rule, and the process of evolving and progressive guidance has reflected the successful and ever-increasing experience of the industry. As capable as this body of guidance has been in the past, it became increasingly clear that a need existed to codify all the disparate documents into a single body of rules, and to update the existing rules to reflect all the industry improvements such progress has used as its basis. Consequently § 121.161 was revised to expand two-engine operational authority under successful ETOPS processes and require certain operations of all passenger-carrying part 121 airplanes to adopt ETOPS requirements. This AC reflects current § 121.161 regulatory requirements.

*202. ETOPS Applicability to All Passenger-Carrying Airplanes Flown in Long-Range Operations.*

a. AC 120–42 in 1985, and AC 120–42A in 1988, recognized the increasing reliability of turbojet engines and helped to establish type design and operational practices for safe and reliable long-range operations with two-engine airplanes. As the technology and reliability of two-engine airplanes continued to improve, due in large

measure to the requirements of these documents, such operations became compatible with those long-range operations typically associated with three- and four-engine airplanes. At the same time this technology brought two-engine airplanes to the arena of long-range operations, the infrastructure to support such operations was changing. Political and funding priorities forced the closure or reduction in basic services of a number of airports, military and civilian, in remote areas that historically had been used as diversion airports for routes over oceanic and/or desolate land areas. The increasing use of polar flights, while creating economic benefits, has also brought new challenges to the operation. The risks associated with these areas' remoteness, harsh climate and terrain, and their unique operational issues, needed to be addressed to maintain an equivalent level of safety in the operation.

b. These issues began to significantly impact the viability of all long-range two-engine airplane operations under current regulations, and likewise began to erode the basic safety net that long-range operations in three- and four-engine airplanes had relied on. Because of these pressures and the increasing commonality of all long-range operations, the data began to show that ETOPS requirements and processes are generally applicable to all long-range passenger-carrying operations, including those by three- and four-engine airplanes, and would improve the safety and viability of such operations. All long-range passenger-carrying airplanes, regardless of the number of engines, needed a viable diversion airport in the case of onboard fire, medical emergency, or catastrophic decompression. Ensuring availability of en route alternate airports, adequate fire fighting coverage at these airports, and fuel planning to account for depressurization are sound operational practices for all airplanes, including three- and four-engine airplanes. Likewise, planning for the maximum allowable diversion and worst-case scenarios should account for all airplane time-critical systems.

c. Unlike the ETOPS guidance provided for two-engine airplanes, there has been no regulatory framework governing the long-range operations of three- and four-engine airplanes.

For example, in emergencies such as loss of cabin pressure, current regulations require adequate oxygen supplies but do not require the operator to consider the amount of extra fuel necessary to reach a diversion airport.

(1) An analysis of operational data shows that between 1980 and 2000, 33 of the 73 cruise depressurization events on one manufacturer's airplanes occurred on airplanes with more than two engines.

(2) A study conducted by this manufacturer using a modern four-engine aircraft carrying normal route planning fuel reserves raises issues about the adequacy of the current fuel planning requirements in the event of a diversion.

d. Operational data shows that the diversion rate for all airplane-related and non-airplane-related causes are comparable between two-engine airplanes and airplanes with more than two engines. Consequently, the FAA has found that there is a need for all passenger carrying operations beyond 180 minutes from an adequate airport to adopt many of the ETOPS requirements that have been based on sound safety principles and successfully proven over many years of operations. Accordingly, the FAA revised § 121.161 to include passenger-carrying airplanes with more than two engines in these long-range operations.

*203. ''Extended Operations.''*

a. Since 1985, the acronym, ETOPS, has been defined as ''extended twin-engine operations'' and has been limited to part 121 airplanes with only two engines. Current regulations have extended these applications to all passenger-carrying airplanes operating in both 14 CFR parts 121 and 135, and the acronym has now been redefined to mean ''extended operations.'' This is to acknowledge the similarity of certain long-range passenger-carrying operations of all airplanes operating today, and the common issues that impact such operations.

b. Since 1988, the ETOPS limit for two-engine airplanes has been 180 minutes from an adequate airport at an approved one-engine-inoperative cruise speed under standard conditions in still air (excluding the limited authority in the North Pacific given under EPL 20–1, 207-Minute ETOPS Operational Approval Criteria, dated March 21, 2000). Service experience has shown that although limited, this authority has satisfactorily supported the vast majority of the world's current aviation routes.

c. Those areas not supported within 180-minute diversion authority tend to be routes over remote areas of the world that are uniquely challenging to the operation. These areas include the South Polar Region, a small section in the South Pacific, the southern South Atlantic Ocean between South America and Africa, the southern Indian Ocean and the North Polar area under certain winter weather conditions. The additional operational challenges of these routes are equally demanding of all airplanes, regardless of the number of engines, and include such issues as extremes in terrain and meteorology, as well as limited navigation and communications infrastructure. Support of a necessary diversion and subsequent recovery in such areas demands added training, expertise, and dedication from all certificate holders. The development of ETOPS requirements is intended to address all these issues.

d. Even though for continuity with current two-engine ETOPS the existing acronym ETOPS is retained, the ETOPS acronym has been re-defined. ETOPS has been expanded to include all passenger-carrying airplane operations where a proposed flight plan includes any point that is greater than 180 minutes from an adequate airport (at an approved one-engine-inoperative cruise speed under standard conditions in still air).

*204. Preclude and Protect.*

a. The whole premise of ETOPS has been to preclude a diversion and, if it were to occur, to have programs in place to protect the diversion. Under this concept, propulsion systems are designed and tested to ensure an acceptable level of in-flight shutdowns (IFSD), and other airplane systems are designed and tested to ensure their reliability. Two-engine airplane maintenance practices are enhanced to better maintain and monitor the condition of the engines and systems significant to ETOPS. The design of these enhanced practices has been a major factor in the joint development of the FAA's and industry's aggressive steps to develop a foundation to resolve problems with airplane systems and engines in order to minimize the potential for procedural and human errors, thereby precluding a diversion.

b. However, despite the best design, testing, and maintenance practices, situations occur that may require an airplane to divert. Regardless of whether the diversion is for technical (airplane system- or engine-related) or non-technical reasons, the certificate holder must have a flight operations plan to protect that diversion. For example, such a plan must include ensuring that pilots are knowledgeable about diversion airport alternates and weather conditions (§ 121.631), have the ability to communicate with the certificate holder's dispatch office and air traffic control (§§ 121.99 and 121.122), and have sufficient fuel to divert to the alternate (§ 121.646). Under the ''preclude and protect'' concept, various failure scenarios need to be considered. For example, during the design of the

airplane, time-limited systems such as cargo compartment fire suppression/containment capability are considered. Fuel planning must account for the possibility of decompression or the failure of an engine with considerations for in-flight icing conditions. Best options under these scenarios should be provided to the pilot before and during the flight.

c. This philosophy has been critical to the success of two-engine ETOPS in the past and has been applied to these airplanes in operations beyond 60 minutes from an adequate airport. This application is based on the requirements of § 121.161 and the engine inoperative diversion requirements of § 121.565. In-service data shows that all airplanes, regardless of the number of engines, divert from time to time for various causes. All passenger-carrying operations conducted where there are a limited number of en route airports, where the support infrastructure is marginal, or where there are challenging weather conditions should adopt many of the same elements of the same preclude and protect concept. If certificate holders plan to operate passenger-carrying airplanes with more than two engines in areas where en route airports are farther away than 180 minutes, these operations are also required to meet certain the standards defined under ETOPS to ensure that all efforts are made to preclude a diversion, and if a diversion does occur, that procedures are in place to protect that diversion.

*205. ETOPS Areas of Operation.*

a. ETOPS areas of operation are defined by § 121.7 to be areas beyond a certain distance from adequate airports measured by an airplanes one-engine inoperative cruise speed under standard conditions in still air. Because of the impact such distances might have on the diversion time of an airplane, regulatory guidance has been established for the planning, operational, and equipage requirements for such operations. A certificate holder must apply to the FAA for approval to operate in an ETOPS area using the methodologies in this AC and is granted ETOPS authority for a specific ETOPS area of operations in their operations specifications.

b. Most ETOPS authorities for two-engine ETOPS beyond 180 minutes are limited to a specific geographical region. Historically, ETOPS authorities for two-engine airplanes up to 180 minutes were developed based on a specific need in a particular operating area. Limiting expanded ETOPS authority beyond 180 minutes (for two-engine airplanes) has been extended and serves several purposes.

(1) The primary importance is the preclusion of an arbitrary use of diversion authority beyond that necessary to complete the operation safely and efficiently. Because it is accepted that increased diversion times potentially increase the risk of the operation a certificate holder must make every effort to plan ETOPS with a maximum diversion distance of 180 minutes or less, if possible.

(2) It should be a goal of all two-engine airplane flight planning to operate to the shortest diversion time that provides the widest range of options in the event of a diversion while recognizing the economic benefits of a more direct route and the safety benefits of diverting to an airport that is well equipped. Tying increased diversion authority to specific areas of operation accomplishes this goal while sufficiently addressing the operational needs of the industry.

(3) Likewise, this focus on specific needs and areas of operation does not add impetus to any perceived rationale for further degradation in the availability or capabilities of en route alternates in remote areas of the world. Although the industry has no direct authority to affect the actions of sovereign nations, it is reasonable to base operations on the value of en route alternate availability at reasonable diversion distances.

(4) In consideration of the successful history of three- and four-engine airplane operations and the reliability and redundancy of current engines used in this operation, ETOPS for these airplanes does not have similar restrictions and ETOPS authorities are not limited to geographic areas. However, like twin-engine operators, the three- and four-engine operator is required to designate the nearest available ETOPS alternate along the planned route of flight and must remain within a 240 minute diversion time if possible.

c. In its application for ETOPS authority, the certificate holder will typically request a specific ETOPS area of operation based on an analysis of proposed routings and the availability of airports sufficient to support the operational requirements of the ETOPS regulations. Because the operating rules distinguish between ETOPS up to 180 minutes, and ETOPS beyond 180 minutes, the requested level of ETOPS authority in a certificate holder's application will necessarily have to be assessed differently for ETOPS beyond 180 minutes.

(1) Two-Engine Airplanes Up to 180-Minute ETOPS and 207-Minute ETOPS Authority in the North Pacific Area of Operations. The ETOPS area of operation is the area bounded by distance circles representing the approved one-engine-inoperative cruise speed under standard conditions in still air chosen by the applicant. The actual flight plan must comply with the fuel supply requirements in § 121.646(b) and must therefore account for wind. However, the flight planning limitations of § 121.633(a) for airplane systems do not require the operator to account for wind in such calculations for flight planning and for determining the ETOPS area of operations in these cases. This allows the applicant to choose an operating authority in his or her application that is based on the ''ETOPS area of operation'' determination. In other words, the distance from alternates in a certificate holder's route planning exercise will be the same value used to determine the type design criteria for the airplane-engine combination used in the operation, and the ETOPS approval necessary to fly the route under all flight planning conditions.

(2) ETOPS Beyond 180 Minutes (Two-Engine Airplanes and All Passenger-Carrying Airplanes With More Than 2 Engines). As required by § 121.633(b), for ETOPS beyond 180 minutes for all airplanes, the ETOPS operation must account for the effects of wind and temperature on the calculated distances. Consequently the planning for an ETOPS flight beyond 180 minutes is more complex.

(a) The certificate holder should first conduct a route planning exercise for each planned city pairing to determine the diversion authority needed in still air conditions. If the route or segments of the route exceed 180 minutes based on one engine inoperative speed and still air, then a secondary planning exercise (that may be required seasonally) should be conducted that factors in expected winds and temperatures on that route. The distance between adequate alternate airports on the route is converted into time (minutes) computed for all engine cruise speed, as well as engine inoperative speed. The number of minutes cannot exceed the time-limited system certified capability (cargo fire suppression and the other most limiting system) that is identified in the aircraft flight manual less the 15-minute pad. The operator needs to determine how much system capability is required for the planned route and equip its airplane to have sufficient margins. Finally, for the actual flight, the operator's flight

planning must be within the airplane systems capability for the selected ETOPS alternate airports on the planned route based on diversion times that are calculated using known or forecast winds and temperature conditions.

(b) As a minimum, the certificate holder must ensure that the time-limited systems requirements of § 121.633(b) are met at the equal-time points between ETOPS alternates determined by the most limiting en route fuel supply requirements of § 121.646(b), commonly referred to as the ETOPS critical fuel scenario. Certificate holders flying three- and four-engine airplanes, prior to the established installation time and certification time requirements of the regulation for these systems and their airplanes, are exempt from these flight planning limitations.

(c) Once the required fire suppression systems are installed (no later than February 15, 2013) the certificate holder must follow the flight planning limitations of § 121.633(b)(1). As required by § 121.162(d), for airplanes with more than 2 engines manufactured on or after February 17, 2015, the Configuration, Maintenance and Procedures (CMP) document for that model will list the airplane's most limiting ETOPS Significant System time issued in accordance with § 25.3(c). The Certificate holder operating an airplane-engine combination with more than two engines is required to comply with § 121.633(b)(2) if the CMP lists the most limiting ETOPS Significant System time.

d. Credit for the Driftdown. For the purposes of computing distances for ETOPS Area of Operation, credit for driftdown may be taken.

e. Actual Diversion Time. Actual diversion time may exceed the authorized diversion time as long as the flight is conducted within the authorized ETOPS Area of Operation, and complies with the requirements of § 121.633.

*206. ETOPS Alternate Requirements.*

a. One of the distinguishing features of ETOPS operations is the concept of an en route alternate airport being available where an airplane can divert following a single failure or a combination of failures that require a diversion. Most airplanes operate in an environment where there usually is a choice of diversion airports available within a close proximity to the route of flight. However, a certificate holder conducting ETOPS may only have one alternate airport within a range dictated by the endurance of a particular airframe system (for example, the cargo fire suppressant system), and that system or system failure may dictate the approved maximum diversion time for that route. Therefore, it is important that any airport designated as an ETOPS alternate have the capabilities, services, and facilities to safely support the operation. The weather conditions at the time of arrival should provide assurance that adequate visual references will be available upon arrival at decision height (DH) or minimum descent altitude (MDA), and that the surface wind conditions and corresponding runway surface conditions will be acceptable to permit the approach and landing to be safely completed with an engine and/or systems inoperative.

b. At dispatch, an en route alternate must meet ETOPS alternate weather requirements in § 121.625 and as specified in Chapter 3, paragraph 303c(5) of this AC and in the certificate holder's operations specifications (OpSpecs). Because of the natural variability of weather conditions with time, as well as the need to determine the suitability of a particular en route alternate before departure, such requirements are higher than the weather minimums required to initiate an instrument approach. This is necessary prior to the time that the instrument approach would be conducted, to provide for some deterioration in weather conditions after planning. This increases the probability that the flight will land safely after a diversion to an alternate airport. The airport of departure (takeoff) and the destination airport (unless used concurrently as an ETOPS alternate) are not required to meet the weather minima for ETOPS alternates, as these airports are subject to other regulations (e.g., §§ 121.617, 121.621, and 121.623).

c. While en route, the forecast weather for designated ETOPS alternates must remain at or above operating minima. This provides ETOPS flights with the ability to resolve all diversion decisions successfully throughout the flight. The suitability of an en route alternate airport for an airplane that encounters an in-flight situation that necessitates a diversion during ETOPS operations is based on a determination that the airport still is suitable for the circumstances, and the weather and field conditions at that airport permit an instrument approach to be initiated and a landing completed.

*207. ETOPS In-Service Experience Requirements.*

a. When AC 120–42 was first released in 1985, two-engine ETOPS was a new concept and ETOPS approvals were sought on airframe-engine combinations that were already in service. Hence, it was logical to establish criteria for approvals based on in-service experience. At that same time, the FAA recognized the possibility that other approval methods could be developed without in-service experience, and accordingly, provided statements that recognized those options. The original two-engine ETOPS requirements for engine reliability were based on a world fleet in-service experience of 250,000 hours. For 120-minute ETOPS, the FAA additionally required the certificate holder to have 12 consecutive months of operational in-service experience with the airplane-engine combination (AEC). For 180-minute ETOPS, the FAA required the certificate holder to have previously gained 12 consecutive months of operational in-service experience with the specified AEC conducting 120-minute ETOPS. These basic, two-engine in-service requirements have been retained and are discussed in Appendix 3. Achieving these levels of experience, combined with the required levels of engine reliability, is an acceptable means of attaining ETOPS approval for operators of two-engine airplanes.

b. At the time AC 120–42A was drafted, the FAA recognized that a reduction of two-engine in-service experience requirements or substitution of in-service experience on another airplane would be possible. Any reduction was to be based on an evaluation of the certificate holder's ability and competence to achieve the necessary reliability for the particular AEC in ETOPS. For example, a reduction in in-service experience would be considered for a certificate holder who could show extensive in-service experience with a related engine on another airplane that had achieved acceptable reliability. The FAA also allowed certificate holders unable to initially fly ETOPS routes at the lesser thresholds to make use of ETOPS simulation or demonstration programs in their application for 180-minute ETOPS. Eventually specific guidance material (AC 120–42A, appendix 7, Accelerated ETOPS Operational Approval) was developed by the FAA permitting ETOPS without accumulating in-service experience in the airplane-engine combination. Most subsequent ETOPS approvals have been granted under these guidelines and this method is retained in Appendix 3.

*208. Operational Reliability and Systems Suitability Requirements.*

a. The safety of long-range operations such as ETOPS depends on the reliability of all airplane systems including the propulsion systems. Time-limited systems such as cargo compartment fire suppression/containment capability must be

considered (§ 121.633). The certificate holder must also have an established program that monitors the reliability of systems significant to ETOPS (§ 121.374).

b. In order to achieve and maintain the required engine reliability standards, the certificate holder operating a two-engine airplane in ETOPS should assess the proposed maintenance and reliability program's ability to maintain a satisfactory level of airplane systems reliability for the particular airplane-engine combination. All certificate holders must design the flight operations and, if applicable, the maintenance programs for ETOPS with an objective to preclude diversions and, if a diversion does occur, to protect that diversion. Required ETOPS maintenance practices also must minimize the potential for procedural and human errors that could be detrimental to the safety of the operation. Fuel planning must account for the possibility of a depressurization and/or failure of an engine with considerations for in-flight icing conditions (§ 121.646).

c. The type design requirements for ETOPS certification consider the probability of occurrence of conditions that would reduce the capability of the airplane or the ability of the flight crewmember to cope with an adverse operating condition. System failures or malfunctions occurring during extended range operations could affect flight crewmember workload and procedures. Although the demands on the flight crewmember may increase, a manufacturer applying for ETOPS type design approval must consider crew workload, operational implications, and the crew's and passengers' physiological needs during continued operation with failure effects for the longest diversion time for which it seeks approval. The manufacturer must also conduct flight tests to validate the adequacy of the airplane's flying qualities and performance, and the flightcrew's ability to safely conduct an ETOPS diversion with expected system failures and malfunctions. An ETOPS operator should carefully consider the possible adverse effects that changes in airplane equipment or operating procedures may have on the original evaluations conducted when the airplane was approved for ETOPS before implementing such changes.

d. Following a determination that the airframe systems and propulsion systems are ETOPS type design approved as per part 25, an in-depth review of the applicant's required ETOPS programs will be accomplished to show the ability to achieve and maintain an acceptable level of systems reliability, and to safely conduct these operations.

**Chapter 3. Requirements for ETOPS Authorization**

*300. ETOPS Requirements.* The FAA may approve ETOPS for various areas of operation in accordance with the requirements and limitations specified in part 121, Appendix P. ETOPS must be authorized in the certificate holder's operations specifications and conducted in compliance with those sections of part 121 applicable to ETOPS.

a. As of February 15, 2008, certificate holders operating passenger-carrying airplanes with more than two engines, having the authority to operate on specific ETOPS routes should not need to re-apply for their specific route authority. However, the certificate holder is required to comply with all the applicable ETOPS flight operational regulations described in this AC, and must have their ETOPS programs and processes approved by their CHDO with the concurrence of the Director, Flight Standards Service.

b. The certificate holder's ETOPS requirements must be specified in their maintenance and operations programs. Maintenance requirements necessary to support ETOPS are explained in paragraphs 301 and 302. Flight operations requirements necessary to support ETOPS are described in paragraphs 303 and 304.

c. The requirements for the various levels of ETOPS authorities are listed in tabular form in Appendix 2.

*301. Maintenance Requirements for Two-Engine ETOPS Authorization.* The certificate holder conducting ETOPS with two-engine airplanes must comply with the ETOPS maintenance requirements as specified in § 121.374. These requirements are discussed in paragraphs a through o as follows:

a. Continuous Airworthiness Maintenance Program (CAMP). The basic maintenance program for the airplane being considered for ETOPS is a CAMP that may currently be approved for a non-ETOPS certificate holder for a particular make and model airplane-engine combination. The basic CAMP must be a maintenance and inspection program that contains the instructions for continued airworthiness (ICA) based on the manufacturer's maintenance program, or those contained in a certificate holder's maintenance manual approved in its operations specifications. The certificate holder and its certificate holding district office (CHDO) must review the CAMP to ensure it provides an adequate basis for development of a ETOPS maintenance program. The certificate holder's ETOPS CAMP must include specific ETOPS requirements, which will be incorporated as supplemental requirements to the basic CAMP. These supplemental requirements include the enhanced maintenance and training processes that will ensure ETOPS airplanes achieve and maintain the level of performance and reliability necessary for ETOPS operations. These supplemental requirements, referred to in the industry as ETOPS processes or ETOPS process elements, currently should be in place for existing ETOPS operations. Prospective ETOPS certificate holders must supplement their basic CAMP with those program elements defined in paragraphs b through o below.

b. ETOPS Maintenance Document. The certificate holder must develop a document for use by personnel involved in ETOPS. This document need not be inclusive but should, at least, reference the maintenance program and other pertinent requirements clearly indicating where all facets of the ETOPS maintenance program are located in the certificate holder's document system. All ETOPS requirements, including supportive programs, procedures, duties, and responsibilities, must be identified. The ETOPS document(s) must reflect the actual policies and procedures the certificate holder expects their ETOPS maintenance personnel to adhere to. The document(s) should be user friendly, and be accessible to all affected personnel. The initial document must be submitted to the CHDO and be approved before being adopted.

c. ETOPS Predeparture Service Check (PDSC).

(1) The certificate holder must develop an ETOPS PDSC to verify that the airplane and certain significant items are airworthy and ETOPS capable. Each certificate holder's PDSC may vary in form and content. One certificate holder may have a one page PDSC while other certificate holders, using the same airplane-engine combination, may have six or more pages of items in their PDSCs. The prerequisites for an acceptable PDSC are content and suitability for the specific certificate holder's needs.

(2) All certificate holders must address ETOPS significant system airworthiness in their ETOPS maintenance program, including the PDSC. For example, proper servicing of fluids, such as engine, APU, generator systems, and hydraulic systems is a vital ingredient to successful ETOPS operations. Current ETOPS operations have had incidents resulting from

improper fluid servicing that have resulted in IFSDs and diversions. Certificate holders should consider this area very seriously when developing their maintenance checks, including the PDSC.

(3) Some certificate holders may elect to include tasks in the PDSC that are driven by their reliability programs and are not related to ETOPS significant systems. However, the certificate holder clearly must identify the ETOPS related tasks on their PDSC, because non-ETOPS qualified maintenance personnel may accomplish the non-ETOPS tasks. An ETOPS-qualified maintenance individual must complete all ETOPS-related tasks and an ETOPS-qualified maintenance individual, with an airframe and powerplant rating, must certify the entire check. When outside the United States, if an individual with an airframe and powerplant rating is not available, then a trained individual employed by an FAA certificated repair station, contracted by the certificate holder must certify the entire check. This PDSC must be certified complete immediately before each scheduled ETOPS flight. The term ''immediately'' has historically meant to be no more than 2 to 4 hours before the flight. However, the FAA may grant some relief from this time period under certain conditions. The certificate holder should explain any rational for such deviations in its ETOPS maintenance document, which is approved by its CHDO.

(4) A PDSC may not be required before all ETOPS flights. The FAA may grant relief following irregular operations because of non-mechanical issues, such as weather or medical emergency diversions, or when operating ETOPS into specific areas of operation. For example, if an airplane scheduled for an ETOPS flight receives a PDSC before departure and subsequently must divert or turn back for reasons other than mechanical, the certificate holder must identify in its ETOPS maintenance document what procedures its flight operations and maintenance personnel would follow to preclude performing another PDSC. If a mechanical discrepancy develops as a result of the diversion or turn back, the certificate holder may have to perform another PDSC. For example, when an overweight landing inspection reveals a discrepancy that requires maintenance intervention, another PDSC is required.

(5) In areas where prevailing weather conditions are stable and generally do not approach extremes in temperature, wind, ceiling, and visibility, such as in the Caribbean/Western Atlantic (75-minute ETOPS) and Micronesia routes (90-minute ETOPS), the service check may not be required for the return leg of an ETOPS flight. This check is not precluded by any other maintenance check.

d. Dual Maintenance.

(1) ETOPS dual maintenance, otherwise referred to as identical maintenance, multiple maintenance, and simultaneous maintenance, requires special consideration by the certificate holder. This is to recognize and preclude common cause human failure modes. Proper verification processes or operational tests, prior to ETOPS, are required when dual maintenance on significant systems occurs.

(2) Dual maintenance on the ''same'' ETOPS Significant System can be described as actions performed on the same element of identical, but separate ETOPS Significant Systems during the same routine or non-routine visit. Examples of maintenance on the ''same'' ETOPS Significant System are: maintenance of both Satellite Communication (SATCOM) systems during a turnaround flight; removal of either both engine oil filters, or both chip detectors; and replacement of both chip detectors.

(3) Dual maintenance on ''substantially similar'' ETOPS Significant Systems specifically addresses maintenance actions on engine-driven components on both engines. An example of dual maintenance on ''substantially similar'' ETOPS Significant Systems could include: replacement of the no. 1 Integrated Drive Generator (IDG) and the no. 2 Engine Driven Pump (EDP).

(4) The certificate holder must establish procedures that minimize identical maintenance actions from being scheduled or applied to multiple similar elements in any ETOPS Significant System during the same routine or non-routine maintenance visit. In order to manage this requirement the certificate holder must develop a list of fleet-specific ETOPS Significant Systems and include them in their ETOPS maintenance document(s).

(5) The FAA recognizes that sometimes ETOPS dual maintenance actions cannot be avoided or precluded because of unforeseen circumstances that occur during ETOPS operations. In the line maintenance arena, one example would be when an ETOPS airplane has inbound discrepancies on both engines' oil systems, or there is a generator replacement on one engine, and an oil system discrepancy on the other engine. Another example is if both of the SATCOM systems require maintenance at the same time during a turnaround flight. Additionally, staggering maintenance on ETOPS Significant Systems in the heavy maintenance arena is not always possible or feasible. However, to minimize human factor common cause risk, the certificate holder should attempt to minimize dual maintenance on ETOPS Significant Systems wherever/whenever possible.

(6) In any event, when dual maintenance is performed on a ETOPS Significant System, the certificate holder must have written procedures in its ETOPS maintenance document that addresses this situation. At a minimum, the certificate holder must ensure:

(a) Separate ETOPS-qualified maintenance persons perform the tasks, or

(b) The maintenance action on each of the elements in the ETOPS Significant System is performed by the same technician under the direct supervision of a second ETOPS qualified individual, and

(c) It verifies the effectiveness of the corrective actions to those ETOPS Significant Systems before the airplane enters the ETOPS area of operation. This verification action must be performed using ground verification methods, and in some instances, in-flight verification methods described in the next section of this AC. On an exception basis, the same ETOPS-qualified technician, under the supervision of an ETOPS-qualified Centralized Maintenance Control person, may perform the dual maintenance and the ground verification methods only if in-flight verification action is performed.

(7) The FAA acknowledges that the servicing of fluids and gases is not considered maintenance; however, these tasks, when done improperly have adversely affected ETOPS operations. The certificate holder should recognize the hazard associated with improper servicing and do all possible to mitigate the associated risk. Specifically, servicing tasks such as engine, APU, and generator system oil servicing are tasks that require high levels of attention. The FAA encourages the certificate holder to ensure that its programs have separate individuals perform such servicing. However, the FAA recognizes that many certificate holder's route and organizational structures may not lend themselves to these procedures. The certificate holder's program should include detailed servicing instructions, or make readily available servicing instructions, and provide related OJT, regardless of whether one individual or multiple individuals perform the tasks.

e. Verification Program.

(1) The certificate holder must develop a verification program for resolution of airplane discrepancies (corrective actions) on ETOPS significant systems. This program must include corrective action confirmation in specific areas such as engine shutdown, significant system failure, adverse trends, or any prescribed event that could effect an ETOPS operation. The program must ensure corrective action is taken and confirmed successful before the airplane enters an ETOPS area of operation. The certificate holder must verify the effectiveness of the corrective actions following the maintenance action and prior to an ETOPS flight or prior to passing the ETOPS entry point. The ground verification method is accomplished by following the Instructions for Continued Airworthiness (ICA) contained in the airplane maintenance manuals (AMM) or the certificate holder's maintenance manuals. These ICAs include built-in test equipment (BITE) and functional/operational checks that often include leak checks after ground runs.

(2) Normally ground verification is acceptable to ensure corrective action. Under certain conditions ground verification beyond that recommended in the ICA or in-flight verification may be required. An example of a condition that would require an in-flight verification is the replacement of an APU component that could affect the APU's ability to start at the ETOPS cruise altitude after cold soak. In-flight verification may be conducted on revenue flights, provided the action is completed before the ETOPS entry point. Ground maintenance personnel must coordinate with flight operations personnel whenever an in-flight verification is required. Each certificate holder must identify its ETOPS significant systems, ground verification requirements, and in-flight verification requirements in its ETOPS maintenance document.

(3) The certificate holder must establish a means to ensure any required verification action is accomplished. The certificate holder must include a clear description of who initiates verification actions and who is responsible for completing the actions in its ETOPS maintenance document.

f. Task Identification.

(1) The certificate holder must identify all tasks that must be accomplished or certified as complete by ETOPS qualified personnel. The intent is to have ETOPS trained maintenance personnel accomplish these identified tasks because they are related to ETOPS. ETOPS specific tasks should be:

(a) Identified on the certificate holder's work forms and related instructions, or

(b) Parceled together and identified as an ETOPS package.

(2) If a certificate holder does not identify ETOPS-related task in their current maintenance program, then all task must be accomplished by ETOPS-qualified personnel.

(3) In the event that maintenance is performed on an ETOPS airplane by personnel who are not ETOPS trained, then the actions must be verified per the certificate holder's ETOPS verification program.

g. Centralized Maintenance Control Procedures. An ETOPS certificate holder, regardless of the size of its ETOPS fleet, must have a centralized entity responsible for oversight of the ETOPS maintenance operation. The certificate holder must develop and clearly define in its ETOPS maintenance document specific procedures, duties, and responsibilities for involvement of their centralized maintenance control personnel in the ETOPS operation. These established procedures and centralized control processes would preclude an airplane from being dispatched for ETOPS flights after an engine IFSD, ETOPS significant system failure, or discovery of significant adverse trends in system performance without appropriate corrective action having been taken.

h. ETOPS Parts Control. The certificate holder must develop a parts control program to ensure the proper parts and configurations are maintained for ETOPS. The program must include procedures to verify that the parts installed on ETOPS airplanes during parts borrowing or pooling arrangements, as well as those parts used after repair or overhaul, maintain the required ETOPS configuration.

i. Reliability Program.

(1) The certificate holder must develop an ETOPS reliability program or enhance its existing reliability program to incorporate the ETOPS supplemental requirements. This program must be designed with early identification and prevention of ETOPS-related problems as the primary goal. The program must be event-oriented, and incorporate reporting procedures for critical events detrimental to ETOPS flights. For those certificate holders that do not have an FAA-approved reliability program, their continuing analysis and surveillance system (CASS) must be enhanced to achieve ETOPS reliability goals. The certificate holder should submit a monthly ETOPS reliability report to its CHDO.

(2) In keeping with the reporting requirements in § 121.703, the certificate holder must report the following items within 96 hours to its CHDO:

(a) IFSDs, except planned IFSDs performed for flight training.

(b) Diversions and turnbacks for failures, malfunctions, or defects associated with any airplane or engine system.

(c) Uncommanded power or thrust changes or surges.

(d) Inability to control the engine or obtain desired power or thrust.

(e) Inadvertent fuel loss or unavailability, or uncorrectable fuel imbalance in flight.

(f) Failures, malfunctions or defects associated with ETOPS Significant Systems.

(g) Any event that would jeopardize the safe flight and landing of the airplane on an ETOPS flight.

(3) The reporting of any of the above items must include the information specified in § 121.703(e).

(4) The certificate holder must conduct an investigation into the cause of the occurrence of any event listed in § 121.703 and § 121.374(h)(1) in conjunction with manufacturers and submit its findings to its CHDO. If the CHDO determines additional corrective action is necessary, the certificate holder must further investigate and implement appropriate corrective action acceptable to the CHDO.

j. Propulsion System Monitoring.

(1) The certificate holder must monitor its fleet average IFSD rate for the specified airplane-engine combination. It should establish firm criteria regarding the actions it will take when it detects adverse trends in propulsion system conditions. If the IFSD rate, computed on a 12-month rolling average, exceeds the values in the following table, the certificate holder, in conjunction with its CHDO, must investigate common cause effects or systemic errors and submit the findings to its CHDO within 30 days.

IN FLIGHT SHUT DOWN RATES

| Number of engines | Engine hours ETOPS | ETOPS authorization |
|---|---|---|
| 2 | .05/1000 | Up to and including 120 minutes. |
| 2 | .03/1000 | Beyond 120 minutes up to and including 180 minutes and 207 minutes in North Pacific. |
| 2 | .02/1000 | Greater than 180 minutes (Except for 207 minutes in North Pacific. |

(2) With respect to maintenance, the purpose of monitoring IFSD rates is to provide FAA and operators with a tool for measuring the health of a fleet of ETOPS-approved airplanes in service. Causes of IFSDs or other engine and propulsion system problems may be associated with type design problems and/or maintenance and operational procedures applied to the airplane. It is very important that the certificate holder identify the root cause of events so that an indication of corrective action is available, such as a fundamental design problem that requires an effective hardware (or software) final fix. Repetitive inspections may be satisfactory as interim solutions, but longer-term design solutions, such as terminating actions, may be required if possible. Design problems can affect the whole fleet. The FAA will not revoke an existing ETOPS operational approval solely because of a high IFSD rate. A certificate holder who experiences a type design related event need not be operationally penalized for a problem that is design-related and may not be of their own making. However, maintenance or operational problems may be wholly, or partially, the responsibility of the certificate holder. If a certificate holder has an unacceptable IFSD rate risk attributed to common cause or a systemic problem in operational practices or the maintenance program, then action carefully tailored to that certificate holder may be required, and may include a reduction of the certificate holder's diversion limit.

(3) The certificate holder must investigate an IFSD rate higher than the 12-month rolling average standard that occurs for a mature fleet after the commencement of ETOPS (Refer to the IFSD Rates table above.). The certificate holder also must investigate any indication of a high IFSD rate; however, it must consider that in the case of the smaller fleet, the high IFSD rate may be because of the limited number of engine operating hours used as the denominator for the rate calculation. This can cause an IFSD jump well above the standard rate because of a single IFSD event. The underlying causes for such a jump in the rate will have to be considered by the Administrator's representative. On occasion, a particular event may also warrant implementation of corrective action even though the overall IFSD rate is not being exceeded.

(4) The 30-day reporting criteria of paragraph 301j (1) is intended to ensure that the certificate holder provides the FAA timely notification of the status of an event investigation. The certificate holder may or may not have root cause or terminating action at the end of the 30-day period, and further discussions with the FAA may be required after this period.

(5) The certificate holder may designate a sub-fleet engine/airframe combination for the purposes of the IFSD monitoring/rate program. The operator may include the IFSD statistics of all engines that are ETOPS configured and are maintained in accordance with the operators ETOPS program even if used on non-ETOPS airplanes.

k. Engine Condition Monitoring. The certificate holder must develop a program for its ETOPS engines that describes the parameters to be monitored, method of data collection, and corrective action processes. The program should reflect the manufacturer's instructions and industry practices, or the certificate holder should establish a program that demonstrates an equivalent level of monitoring and data analysis. The goal of this monitoring program is to detect deterioration at an early stage, and to allow for corrective action before safe operation is affected. Engine limit margins should be maintained so that prolonged engine inoperative diversions may be conducted without exceeding approved engine limits (for example, rotor speeds and exhaust gas temperature) at all approved power levels and expected environmental conditions. Engine margins preserved through this program should account for the effects of additional engine loading demands (for example anti-ice and electrical), which may be required during IFSD flight phase associated with the diversion. If oil analysis monitoring, such as the Spectrographic Oil Analysis Program (SOAP), is meaningful and recommended by the manufacturer, the certificate holder should include it in their program.

l. Oil Consumption Monitoring. The certificate holder must develop an engine oil consumption monitoring program to ascertain that there is enough oil to complete the scheduled ETOPS flight. The certificate holder's consumption limit must not exceed the manufacturer's recommendations, and it must trend oil consumption. The certificate holders trending program may be done manually or by electronic means. The program must consider the amount of oil added at the departing ETOPS station with reference to the running average consumption, as well as monitor for sudden increases in consumption. The monitoring must be continuous including non-ETOPS flights and the oil added at the ETOPS departure station. For example, after servicing, the oil consumption may be determined by maintenance personnel as part of the pre-departure check. The amount of oil added also could be reported to a centralized maintenance control for calculation before the ETOPS flight. If the APU is required for ETOPS, it must be included in the oil consumption monitoring program. Any corrective actions taken regarding oil consumption must be verified before ETOPS departure.

m. APU In-Flight Start Program.

(1) If the airplane type certificate requires an APU but does not normally require the APU to operate during the ETOPS portion of the flight, the certificate holder must develop an in flight start and run reliability program to ensure that the APU will continue to provide the performance and reliability established by the manufacturer. This monitoring program must include periodic sampling of each airplane's APU in-flight starting capabilities. Specifically, the certificate holder must ensure that each airplane's APU periodically is sampled rather than repeatedly sampling the same APUs. The certificate holder may adjust sampling intervals according to system performance and fleet maturity. The certificate holder and its CHDO should periodically review the certificate holder's APU in-flight start program data to ensure that the in-flight start reliability is maintained. Should the rolling 12-month APU in-flight start rate drop below 95 percent, the certificate holder should initiate an investigation into any common cause effects or systemic errors in procedures.

(2) The certificate holder should include the criteria below in their APU in-flight start program. The certificate holder should make APU in-flight starts subject to the following conditions:

(a) In-flight APU starts do not need to be performed on ETOPS flights; however, the APU must be in the ETOPS configuration in accordance with the appropriate CMP document, if applicable, for credit to be allowed.

(b) If in-flight APU start is performed on an ETOPS flight, the start may be attempted on the return leg.

(c) The start attempt should be initiated before top of descent, or at such time that will ensure a 2-hour cold soak at altitude before the start attempt.

(d) Within route or track constraints, the objective would be met by attempting a start near the highest altitude assigned the route or track, and the final attempt near the lower altitude limits of the route or track, as defined by ATC. These altitudes must be representative of the ETOPS routes flown.

(e) If the APU fails to start on the first attempt, subsequent start attempts may be made within the limits of the airframe and APU manufacturer design specifications stated in the applicable Aircraft Flight Manual (AFM) and AMM.

(3) The certificate holder must report any operationally required APU in-flight start failures occurring during actual ETOPS operations to its CHDO within 96 hours. The certificate holder also must report any occurrences of an ETOPS configured APU in-flight unsuccessful start attempt occurring during routine sampling (which exceed the airframe and APU manufacturer design specifications) to its CHDO. The final report should include corrective actions taken as well as the status of corrective action programs and fleet upgrades.

n. Configuration Maintenance and Procedures (CMP).

(1) The CMP Standard specifies any additional configuration, maintenance or operational requirement that is uniquely applicable to ETOPS. The requirements in the CMP are established by the FAA at the time of initial ETOPS type design approval of the airplane-engine combination. The CMP document typically is published and maintained by the airplane manufacturer and includes identified CMP requirements. Airplane manufacturers may continue to release CMP revisions beyond the basic revision level required for ETOPS. The CMP revision levels required for specific airplane-engine combinations are typically listed in the front of the CMP or may be controlled through issuance of customized CMP documents. The certificate holder must implement the basic configuration, maintenance, and operating procedures standard, identified in the CMP, before beginning ETOPS operations. If a CMP document exists for an ETOPS certificate holder's airplane, the certificate holder must ensure that all of the following apply:

(a) Configuration features are installed in the airplanes and engines;

(b) Maintenance procedures are incorporated into the maintenance program;

(c) Demonstrated capabilities are incorporated into the flight operations manual and the minimum equipment list, as required; and

(d) Operators must coordinate any deviation from the manufacturer's CMP requirements with the CHDO or ACO, as required by the CMP document.

(2) Each certificate holder must develop a system to ensure all CMP requirements remain incorporated in its airplanes, programs, and manuals throughout the operational life of each airplane, for as long as they operate in ETOPS.

(3) The FAA will mandate any subsequent CMP changes necessary for continued safe ETOPS operations through the airworthiness directive (AD) process. The certificate holder should review and consider voluntarily incorporating any revised CMP standard that enhances airplane reliability and/or performance.

(4) The certificate holder should provide its CHDO a matrix detailing the CMP standard for its proposed ETOPS fleet. The matrix should specifically include each CMP item number, revision level, item description, and reference documentation describing the incorporation method, date, and place.

o. Procedural Changes. Refer to Chapter 5, paragraph 502 for ETOPS maintenance and training program changes.

*302. ETOPS Maintenance Training Requirements.*

a. The certificate holder is responsible for ensuring that all maintenance personnel who perform maintenance on its ETOPS airplanes, including repair stations, vendors, and contract maintenance, have received adequate technical training for the specific airplane-engine combination it intends to operate in ETOPS. The certificate holder should review the existing airplane-engine combination maintenance training program with its CHDO to ensure that it adequately provides the necessary training.

b. Additionally, the certificate holder must develop ETOPS specific training that focuses on the special nature of ETOPS and take measures to insure that this training is given to all personnel involved in ETOPS. ETOPS specific training is in addition to the certificate holder's accepted maintenance training program used to qualify individuals for specific airplanes and engines and may be included in the accepted maintenance training curricula. It thus, becomes the certificate holder's ETOPS training program. The goal of this training is to ensure that all personnel involved in ETOPS properly accomplish ETOPS maintenance requirements. The certificate holder is responsible with acceptance from the CHDO to determine which personnel are involved in ETOPS, and ensure that each person's level of ETOPS training is commensurate with their level of involvement with ETOPS airplanes. For example, a mechanic who is performing pre-departure service checks may be required to have a higher level of ETOPS training and certification than a mechanic performing routine tasks on non ETOPS significant systems during a heavy maintenance check. A technician working ETOPS significant systems in an HMV (Heavy Maintenance Visit) environment must be appropriately trained for ETOPS, but need not be ETOPS certificated. Recurrent training in all maintenance areas should be established and used to inform personnel involved in ETOPS about new equipment, requirements, operator programs, etc. Experience has shown recurrent training is a valuable instrument in ''lessons learned'' for ETOPS operations.

c. In the line maintenance environment, ETOPS-qualified maintenance personnel are those who have successfully completed the certificate holder's ETOPS training program, and who have satisfactorily performed extended range tasks under the direct supervision of an FAA-certificated maintenance person. The person giving the direct supervision must have had previous experience with maintaining the particular make and model airplane being used by the certificate holder. For new airplanes, it is understood the certificate holder may not have an FAA certified maintenance person available who has previous experience with the newly introduced make and model airplane. In this instance, the training received from the manufacturer's maintenance training program, or a comparable program would be acceptable.

*303. ETOPS Flight Operations Requirements*

a. Airplane Performance Data. The certificate holder may not dispatch an

airplane on an ETOPS flight unless it makes performance data available to its flight crewmembers and dispatchers. This performance data will contain the following information:

(1) Detailed one-engine-inoperative performance data including fuel flow for standard and nonstandard atmospheric conditions, which should be demonstrated as a function of airspeed and power setting, where appropriate. This data will cover:

(a) Driftdown (includes net performance);

(b) Cruise altitude coverage including 10,000 feet;

(c) Holding; and

(d) Altitude capability (includes net performance).

(2) Detailed all-engine-operating performance data, including nominal fuel flow data, for standard and nonstandard atmospheric conditions, which should be demonstrated as a function of airspeed and power setting, where appropriate. This data will cover:

(a) Cruise altitude coverage including 10,000 feet; and

(b) Holding.

(3) Details of any other conditions relevant to ETOPS that can cause significant deterioration of performance, such as ice accumulation on the unprotected surfaces of the airplane, RAM Air Turbine (RAT) deployment, and thrust reverser deployment.

b. En Route Airport Information.

(1) In accordance with § 121.97, the certificate holder must maintain current status information on the operational capabilities of the airports designated for use as ETOPS alternates. ''Public protection'' has been a historic requirement for all domestic and flag operations. For ETOPS greater than 180 minutes and for operations traversing the North and South Polar Areas, this requirement has been expanded to include the listing of facilities at each airport, or in the immediate area, sufficient to protect the passengers and crew from the elements and to see to their welfare. Such a requirement can be interpreted to encompass the time from landing until satisfactory recovery of passengers and crew based on the certificate holder's passenger recovery plan required by § 121.135 and discussed in Chapter 4, paragraph 403c(5) of this AC.

(2) The certificate holder's program should provide flight crewmembers with current weather and information on a set of adequate airports in the ETOPS portion of the flight that are within the maximum diversion capability of the airplane on the planned route of flight as an aid to the flight crew in contingency planning. Any appropriate facility information and other data concerning these airports should be provided to flight crewmembers in a clear, concise, user-friendly format for use when planning a diversion.

(3) Section 121.135 requires that any certificate holder conducting passenger flag operations must include in their Flight Operations Manuals or equivalent documentation available to the flight crews:

(a) For ETOPS greater than 180 minutes, a specific passenger recovery plan for each ETOPS Alternate Airport used in those operations; and

(b) For operations in the North Polar Area and South Polar Area, a specific passenger recovery plan for designated diversion airports.

c. Dispatch.

(1) Alternates. A certificate holder may not dispatch an airplane in ETOPS unless the required takeoff, destination and alternate airports, including ETOPS alternate airports are listed in the cockpit documentation (e.g., computerized flight plan) and are identified and listed in the dispatch release. Because ETOPS alternates serve a purpose different from that of a destination alternate, and may be used in the event of a diversion with an engine failure or loss of a primary airplane system, a certificate holder should not list an airport on the dispatch/flight release as an ETOPS alternate unless that airport's services and facilities are adequate for such a diversion. A certificate holder of a two-engine airplane should exercise ETOPS beyond 180 minutes authority only if there are no ETOPS alternates that are within a 180-minute diversion distance from the planned route of flight. In addition, those adequate airports closest to the planned route of flight should be those first considered as ETOPS alternates.

(2) Flight Planning Limitation. The certificate holder's ETOPS flight planning program must ensure that the planned route of flight remains within the authorized ETOPS area of operation in accordance with § 121.633 as follows:

(a) For ETOPS up to and including 180 minutes and 207 minutes in the North Pacific Area of Operation, the time required to fly the distance to the planned ETOPS alternate, at the approved one-engine-inoperative cruise speed in still air and standard conditions, may not exceed the time specified for the airplane's most time limited ETOPS significant system (including cargo fire suppression) minus 15 minutes.

(b) For ETOPS beyond 180 minutes, the time required to fly the distance to the planned ETOPS alternate, at the all-engines-operating cruise speed at the normal all-engine-cruise altitude, correcting for wind and temperature, may not exceed the certified capability for the airplane's most limiting fire suppression system minus 15 minutes. Three- and four-engine turbine engine-powered airplanes not meeting these requirements as of the effective date of § 121.633 may continue ETOPS operations until February 15, 2013.

(c) Further, for ETOPS beyond 180 minutes, the time required to fly the distance to the planned ETOPS alternate, at the approved one-engine-inoperative cruise speed at the normal one engine inoperative level off altitude, correcting for wind and temperature, may not exceed the certified capability for the airplane's most time limited ETOPS significant system (except for the most limiting fire suppression system) minus 15 minutes.

**Note:** Certificate holders flying three- and four-engine airplanes prior to the established installation time and certification time requirements of the regulation for these systems and their airplanes are exempt from these flight planning limitations. Once such required fire suppression systems are installed (no later than February 15, 2013) and once the ETOPS significant system time limits are established and placed in the CMP as required by 121.162(d) (no later than February 17, 2015), the operator must follow the flight planning limitations in 121.633(b)(1) and 121.633(b)(2).

(3) Landing Distance. For the runway expected to be used, the landing distance available, as specified by the airport authority, must be sufficient based on airplane flight manual landing performance data to meet the landing distance limitations specified in § 121.197. The altitude of the airport, wind conditions, runway surface conditions, and airplane handling characteristics should be taken into account.

(4) Airport Rescue and Fire-Fighting Service (RFFS).

(a) The following minimum International Civil Aviation Organization (ICAO) rescue and fire-fighting service (RFFS) categories must be available at each airport listed as an ETOPS Alternate Airport in a dispatch or flight release:

1. ETOPS Up to 180 Minutes. ETOPS alternates with ICAO Category 4.

2. ETOPS Greater than 180 Minutes. ETOPS alternates with Category 4. In addition, the airplane must remain within the ETOPS authorized diversion time from an Adequate Airport that has RFFS equivalent to that specified by ICAO Category 7, or higher. The availability of Adequate Category 7

RFFS airports must be considered for the entire ETOPS segment of the planned route.

(b) If the necessary equipment and personnel are not immediately available at the airport, additional fire fighting support may be brought in from a nearby town or other location. The certificate holder must ensure that the nearby facility is capable of responding to a request for firefighting assistance within a reasonable time. A 30-minute response time is deemed adequate if the initial notification to respond can be initiated while the diverting airplane is en route. A 30-minute response time does not imply that the firefighting equipment has to be at the airport within 30 minutes of the initial notification under all conditions. It does mean that such equipment must be available on arrival of the diverting airplane and remain on station as long as the services are needed.

(5) ETOPS Alternate Minima. A particular airport may be considered to be an ETOPS alternate for flight planning and dispatch purposes, if the latest available forecast weather conditions from the earliest time of landing to the latest time of landing at that airport, equals or exceeds the criteria detailed in the following table. Because OpSpecs alternate weather minima standards apply to all alternates, the following criteria is recommended for a typical certificate holder's OpSpecs. An individual certificate holder's OpSpecs must reflect current requirements (§ 121.625). Although no consideration for the use of GPS/RNAV approaches is presented here, operators may request to receive this authorization through the FAA. This authorization would be reflected in the operator's OpSpecs. Appropriate ETOPS alternate minima for such operations will be determined by the Director, Flight Standards Service. The airport of departure (takeoff) and the destination airport (unless used concurrently as an ETOPS alternate) are not required to meet the weather minima for ETOPS alternates as these airports are subject to other regulations (e.g., §§ 121.617, 121.621, and 121.623).

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**ETOPS Alternate Minimum**

| Approach Facility Configuration[1] | Alternate Airport IFR Weather Minimum Ceiling[2] | Alternate Airport IFR Weather Minimum Visibility[3] |
|---|---|---|
| For airports with at least one operational navigational facility providing a straight-in non-precision approach procedure, or Category I precision approach, or, when applicable, a circling maneuver from an instrument approach procedure. | Add 400 ft to the MDA or DH, as applicable. | Add 1 sm or 1600m to the landing minimum. |
| For airports with at least two operational navigational facilities, each providing a straight-in approach procedure to different suitable runways. | Add 200 ft to the higher DH or MDA of the two approaches used. | Add ½ sm or 800m[4] to the higher authorized landing minimum of the two approaches used. |
| One useable authorized Category II ILS IAP. | 300 feet | 3/4 sm (1200 m) or RVR 4000 (1200 m) |
| One useable authorized category III ILS Instrument Approach Procedure (IAP). | 200 feet | 1/2 sm (800 m)[4] or RVR 1800 feet (550 m) |

[1] When determining the usability of an IAP, wind plus gust must be forecast to be within operating limits, including reduced visibility limits, and should be within the manufacturer's maximum demonstrated crosswind value.

[2] Conditional forecast elements need not be considered, except that a PROB40 or TEMPO condition below the lowest applicable operating minima must be taken into account.

[3] When dispatching under the provisions of the MEL, those MEL limitations affecting instrument approach minima must be considered in determining ETOPS alternate minima.

[4] For operations outside United States, because of variations in the international metric weather forecasting standards, 700m may be used in lieu of 800m.

(6) Fuel Supply. The certificate holder must comply with the ETOPS en-route fuel supply as specified in § 121.646(b) as follows:

(a) No person may dispatch or release for flight or takeoff a turbine engine-powered airplane in ETOPS unless,

considering wind and other weather conditions expected, it has the fuel required by normal Flag requirements and enough fuel to satisfy paragraphs 1 through 4 below:

1. The greater amount of fuel sufficient to fly to an ETOPS alternate under the following three scenarios:

• Assuming a rapid decompression at the most critical point followed by descent to a safe altitude in compliance with the oxygen supply requirements of § 121.333, or

• At the approved one-engine-inoperative cruise speed assuming a rapid decompression and a simultaneous engine failure at the most critical point followed by descent to a safe altitude in compliance with the oxygen supply requirements of § 121.333, or

• At the approved one-engine-inoperative cruise speed assuming an engine failure at the most critical point followed by descent to the one-engine-inoperative cruise altitude.

2. Upon reaching the alternate, hold at 1,500 ft above field elevation for 15 minutes and then conduct an instrument approach and land.

3. Add a 5 percent wind speed factor (that is, an increment to headwind or a decrement to tailwind) on to the actual forecast wind used to calculate fuel in paragraph 1 above to account for any potential errors in wind forecasting. If a certificate holder is not using the actual forecast wind based on a wind model acceptable to the FAA, the airplane must carry 5 percent of the fuel required for paragraph 1 above, as reserve fuel to allow for errors in wind data. A wind aloft forecast distributed worldwide by the World Area Forecast System (WAFS) is an example of a wind model acceptable to the FAA.

4. After completing the calculation in paragraph 3, compensate in paragraph 1 above with additional fuel for the greater of the following scenarios:

• The effect of airframe icing during 10 percent of the time during which icing is forecast (including ice accumulation on unprotected surfaces, and the fuel used by engine and wing anti-ice during this period). Unless a reliable icing forecast is available, icing may be presumed to occur when the total air temperature at the approved one-engine cruise speed is less than +10 degrees Celsius, or if the outside air temperature is between 0 degrees Celsius and −20 degrees Celsius with a relative humidity of 55 percent or greater.

• Fuel for engine anti-ice, and if appropriate wing anti-ice, for the entire time during which icing is forecast.

(b) Unless the certificate holder has a program established to monitor airplane in-service deterioration in cruise fuel burn performance, and includes in fuel supply calculations fuel sufficient to compensate for any such deterioration, increase the final calculated fuel supply by 5 percent to account for deterioration in cruise fuel burn performance.

(c) If the APU is a required power source, then its fuel consumption must be accounted for during the appropriate phases of flight.

(d) In computing the ETOPS alternate fuel supply, advantage may be taken of driftdown computed at the approved one-engine-inoperative cruise speed. Accounting of wing anti-ice as in paragraph (6)(a)4 above may apply to some models of airplane based on their characteristics and the manufacturer's recommended procedures.

(7) Communications. The FAA has determined that the best way to assure clear and timely communication in general, is via voice communication. Likewise the FAA has determined that there is a significant safety benefit associated with an ETOPS flight having the ability to communicate via a satellite based voice system, especially for those situations that occur while on long, remote ETOPS routes. The need for safety is best served through information and technical assistance that is clearly and rapidly transmitted to the flight crew in a way that requires the least amount of distraction to piloting duties. Other than the area north of 82 degrees latitude, satellite communications provides the best means to provide that capability because it is not limited by distance. The FAA recognizes the limitations of satellite communications (SATCOM) in the North Polar Area above this latitude, and in such an area an alternate communication system such as HF voice or data link is to be used. The relatively short period of time that the flight is above latitude 82 degrees North in relation to the total planned flight time is a small fraction of the total flight. The ability to use SATCOM for all other portions of the flight, which for some routes could be longer than 15 hours duration, is advantageous to the flight. For flights above 82 degrees North latitude, the operator must also ensure that communications requirements can be met by the most reliable means available, taking into account the potential communication disruption due to solar flare activity. The same philosophy and commensurate requirements apply for ETOPS in the South Polar Area.

(a) Section 121.99(a) includes a requirement for communications facilities that enable rapid and reliable communications on routes and altitudes that may be used. For all ETOPS each certificate holder conducting flag or supplemental operations in ETOPS must provide voice communications over routes where voice communications facilities are available. Where voice communication facilities are not available, and voice communication is not possible or is of poor quality, communications using alternative systems must be substituted.

(b) In addition to the communication requirement above, flag and supplemental certificate holders operating ETOPS beyond 180 minutes from an alternate must have a second communications system that is capable of providing immediate satellite-based voice communications of landline telephone fidelity such as SATCOM. This system must be capable of providing clear voice communications between the flight crewmember and air traffic control, and the flight crewmember and operations (dispatch). Where clear satellite-based voice communications are not available, alternative communications systems must be substituted. If an operator has provided a satellite communication system for the crew to satisfy § 121.99(a), it is not necessary that the second communication system required for ETOPS beyond 180 minutes be satellite based.

(c) In determining whether such communications requirements discussed in paragraphs (a) and (b) above are available, the certificate holder must consider potential routes and altitudes needed for possible diversions to ETOPS alternates as well as the original planned routing.

(8) Dispatch/Flight Release.

(a) The following items must be listed in the dispatch or flight release for all ETOPS in accordance with § 121.687:

1. ETOPS alternates, and

2. The authorized ETOPS diversion time under which the flight is dispatched or released.

(b) The pilot in command (PIC) must have access to the weather and status of services and facilities at all adequate airports with weather greater than approach minimums other than the designated ETOPS alternates along the planned route that could be used for diversion before accepting the flight release.

(c) If a flight is dispatched on a route that is greater than 180 minutes from an ETOPS alternate, the certificate holder must inform the flight crew and give them the reason for the routes selection.

(9) Dispatch on a ''Flight-by-Flight Exception'' Basis. For two-engine

airplane ETOPS approvals under the provisions of 207-minute ETOPS in the North Pacific Area of Operation, and 240-minute ETOPS in the North Polar Area, in the area north of the NOPAC area, and the Pacific Ocean area north of the equator, regulations limit the operator's use of this authority in these areas to an ''exception'' basis. This exception may only be used when an ETOPS alternate is not available within 180 minutes and is based on certain criteria.

(a) For 207-Minute ETOPS, exception criteria includes political or military concerns, volcanic activity, temporary airport conditions, and airport weather below dispatch requirements, or other weather related events.

(b) For 240-Minute ETOPS in the North Polar Area and in the Area North of NOPAC, exception criteria includes extreme conditions particular to these areas such as volcanic activity, extreme cold weather at en-route airports airport, weather below dispatch requirements, temporary airport conditions and other weather related events. The certificate holder must establish the criteria to be used to decide what extreme weather precludes using an airport.

(c) For 240-Minute ETOPS in the Pacific Ocean Area north of the Equator, exception criteria includes political or military concern, volcanic activity, airport weather below dispatch requirements, temporary airport conditions and other weather related events.

**Note:** Certificate holders are required to maintain a record of their use of that authority for tracking purposes. When an operator is granted such authority, they may exercise this authority based on the conditions above without limit. There is currently no requirement for any specific format for reporting 207- and 240-minute track usage.

d. En Route.

(1) Pilot-in-Command Authority. No part of this AC is to be interpreted as reducing the PIC's joint responsibility for determining that the flight can be safely conducted as planned before release. None of the guidance in this AC may be interpreted in any way to prejudice or limit the final authority and responsibility of the PIC for the safe operation of the airplane.

(2) Potential Diversion Airports after Departure.

(a) After departure, designated ETOPS alternates must continue to meet the requirements of original dispatch, except that the weather must remain at, or above, operating minima (§ 121 .631(c)). The pilot and dispatcher should monitor the airports within the ETOPS area of operation that could be used for diversion for deterioration in the weather and limitations in the availability of facilities and services that would render an airport unsuitable for landing in the event of a diversion. During the course of the flight, the flight crewmembers should be informed of significant changes in conditions at the designated ETOPS alternates, particularly those conditions that would render an airport unsuitable for landing and improvement in airport weather to conditions above operating minima.

(b) In most ETOPS operations, the ETOPS entry point is a significant distance from the point of dispatch. To ensure the capability and availability of an en route alternate to support any en route contingencies, before an ETOPS flight proceeds beyond the ETOPS entry point, the certificate holder must evaluate the weather from the earliest to latest time of arrival at the designated ETOPS alternates, as well as the landing distances, airport services, and facilities. If any conditions, such as weather below landing minima, are identified that would preclude a safe approach and landing, the PIC should be notified and an additional ETOPS alternate selected where a safe approach and landing can be made. A revised flight plan should include information on the newly designated ETOPS alternates within the authorized area of operation. Information on the weather and capabilities (that is, emergency response, approach aids, navigation facilities, and airport infrastructure) of potential ETOPS alternates in the authorized area of operations should be available to the PIC. The maximum diversion time, determined by the newly selected ETOPS alternate, must not exceed the authorized ETOPS maximum diversion time listed in the certificate holder's OpSpec for that airplane and operating area that could have been applied at original dispatch.

(c) An operator is not required to turn back once the flight has gone beyond the ETOPS entry point if an unexpected worsening of the weather at the designated ETOPS alternate airport drops the airport below operating landing minima (or any other event occurs that makes the runway at that airport unusable). The FAA requires that the pilot-in-command, in coordination with the dispatcher if appropriate, will exercise judgment in evaluating the situation and make a decision as to the safest course of action. This may be a turn back, re-routing to another ETOPS alternate airport, or continuing on the planned route. Should the operator become aware of a potential weather problem prior to the airplane entering the ETOPS stage of the flight, the rule allows the operator to designate a different alternate airport at the ETOPS entry point in order to continue the flight.

(3) Engine Failure.

(a) Section 121.565 requires the PIC of a two-engine airplane with one engine inoperative to land at the nearest suitable airport where, in the PIC's judgment after considering all relevant factors, a safe landing can be made. This determination is especially critical for ETOPS where the availability of suitable airports may be limited and the diversion decision is therefore more critical. The following is a list of some, but not all, factors that may be relevant in determining whether or not an airport is suitable, and are consistent with the ETOPS principle of protecting the diversion once it occurs:

- Airplane configuration, weight, systems status, and fuel remaining
- Wind and weather conditions en route at the diversion altitude
- Minimum altitudes en route to the diversion airport
- Fuel burn to the diversion airport
- Airport's nearby terrain, weather, and wind
- Availability and surface condition of runway
- Approach navigation aids and lighting available
- Rescue and fire fighting services (RFFS) at the diversion airport
- Facilities for passenger and crewmember disembarkation, and accommodations
- PIC's familiarity with the airport
- Information about the airport provided to the PIC by the certificate holder.

(b) When operating a two-engine airplane with one engine inoperative, none of the following factors should be considered sufficient justification to fly beyond the nearest suitable airport:

- The fuel supply is sufficient to fly beyond the nearest suitable airport;
- Passenger accommodation other than passenger safety;
- Availability of maintenance and/or repair resources.

(c) If no more than one engine is shut down on an airplane that has three or more engines, § 121.565 permits the PIC to fly beyond the nearest suitable airport in point of time if the PIC determines that doing so is as safe as landing at the nearest suitable airport. In making a decision to fly beyond the nearest suitable airport, the PIC should consider all relevant factors and, in addition, consider the possible difficulties that may occur if the flight is continued beyond the nearest suitable airport. When an airplane with more than two engines bypasses a suitable alternate,

the PIC must carefully weigh the risk associated with the next possible failure, which could complicate or compound the current engine inoperative condition. The next possible failure could be a system failure or another engine failure, which in either case, would affect crew workload and their possible success in completing the associated abnormal approach and landing procedures. It is even possible that a contingency outside of the realm of a system failure, such as a passenger illness, could compound the crew's workload normally associated with the current failure condition.

(4) System Failure/Partial Failure.

(a) During ETOPS, the limited availability of diversion airports and extended diversion distances require that the impact of a system failure or partial failure be carefully evaluated. This should include a careful assessment of remaining systems and overall operational capability. Time permitting, full use should be made of the information available through the certificate holder's dispatch facility and a determination made by the PIC as to the plan for the safe continuation of the flight, that is whether it is safer to divert and land or to continue as planned under the circumstances.

(b) If, as a result of reevaluating airplane systems, a change in flight plan is required, the PIC should be provided revised flight plan information and an update of conditions, including weather conditions at designated ETOPS alternates. Dispatch should advise the flight crewmembers of additional airports on the planned route of flight that could be used for diversion. In no case may the maximum approved diversion authority of the operation be exceeded.

(5) Other Diversion Scenarios. During ETOPS an airplane may divert for reasons other than engine or systems failure such as medical emergencies, onboard fire, or decompression. When considering the nature of the emergency and the possible consequences to the airplane, passengers and crew will dictate the best course of action suitable to the specific en route contingency. The flight crew must decide on the best course of action based on all available information. The ETOPS Alternate Airports required by § 121.624 and designated for a particular flight provide one option to the PIC. However, these ETOPS alternates may not be the only airports available for the diversion and nothing in this guidance in any way limits the authority of the pilot-in-command.

e. ETOPS Procedures Documentation.

(1) The certificate holder should develop unique ETOPS flight crew procedures for each of the flight operations requirements discussed in this section. These procedures should be contained in the applicable pilot flight manual. The pilot flight manual should also contain procedural information necessary to interface with ETOPS maintenance requirements such as;

- Fuel crossfeed valve operational check (if applicable)
- Special ETOPS MEL requirements
- APU in-flight start procedures (if applicable)
- Engine Condition Monitoring (ECM) data recording procedures
- In-flight verification of ETOPS significant systems

(2) The initial pilot flight manual ETOPS section and each revision must be submitted to the CHDO and approved before being adopted.

*304. Flight Operations Training Requirements.*

a. ETOPS Unique Requirements. The certificate holder's approved training program for ETOPS should include training that describes the unique aspects of ETOPS. That training should include, but not be limited to:

(1) Diversion Decision Making. The certificate holder's training program should prepare flight crewmembers to evaluate probable propulsion and airframe systems malfunctions and failures. The goal of this training should be to establish flight crewmember competency in dealing with the most probable operating contingencies.

(2) Specific ETOPS Requirements. The certificate holder's ETOPS training program should provide and integrate training for flight crewmembers and dispatchers (if applicable), as listed below. The FAA will periodically evaluate a cross-section of these items.

(a) Flight planning, including contingency data, that is engine failure, decompression, and diversion equal time point.

(b) Flight progress monitoring and fuel tracking.

(c) Operational restrictions associated with dispatch under the minimum equipment list (MEL).

(d) Non-normal procedures including:

1. Abnormal and emergency procedures.

2. Systems failures and remaining airplane capability as it relates to the decision to divert or to continue.

3. Diversion.

4. Crewmember incapacitation.

5. A simulated approach and missed approach with only an alternate power source available, if the loss of two main alternating current electrical power sources with no APU electrical source available results in significant degradation of instrumentation to either pilot.

(e) Use of emergency equipment associated with ETOPS operations, including cold weather gear and SATCOM.

(f) Procedures to be followed in the event that there is a change in conditions at an ETOPS alternate listed on the dispatch/flight release that would preclude a safe approach and landing.

(g) Procedures to be followed in the event that there is a change in conditions at other potential en route diversion airports that would preclude a safe approach and landing.

(h) Understanding and effective use of approved additional or modified equipment required for ETOPS.

(i) Fuel quantity comparison: The certificate holder's training program should identify fuel management procedures to be followed during the en route portion of the flight. These procedures should provide for an independent crosscheck of fuel quantity indicators, for example, fuel used, subtracted from the total fuel load, compared to the indicated fuel remaining.

(j) Fuel management: Accounting for discrepancies between planned fuel remaining and actual fuel remaining for example estimated time of arrival ahead of or behind plan, gross weight, and/or altitude differences.

(k) Flight crew procedures unique to ETOPS as listed above in the paragraph 303(e).

(3) Passenger Recovery Plan. The certificate holder must provide training to the flight crewmembers and dispatchers relative to their perspective roles in the certificate holder's passenger recovery plan (§ 121.415).

b. Check Airman Used in ETOPS. The certificate holder must designate check airmen specifically for ETOPS. The objective of the ETOPS check airman program should be to ensure standardized flight crewmember practices and procedures and also to emphasize the special nature of ETOPS. Only airmen with a demonstrated understanding of the unique requirements of ETOPS should be designated as a check airman.

c. Review of Training Programs and Operating Manuals.

(1) The purpose of the review is to verify the adequacy of information provided to training programs and operating manuals. The FAA will use the information resulting from these reviews as the basis for modification or updating flight crewmember training

programs, operating manuals, and checklists, as necessary.

(2) The FAA will also continually review in-service experience of systems significant to ETOPS. The review includes system reliability levels and individual event circumstances, including crewmember actions taken in response to equipment failures or loss of capabilities.

**Chapter 4. Applications to Conduct ETOPS**

*400. ETOPS Qualifications.* The unique nature of ETOPS necessitates an evaluation of these operations to ensure that the certificate holder's proposed programs are effective. The FAA will review the certificate holder's documentation and training programs to validate that they are appropriate for ETOPS. To receive approval to conduct ETOPS the certificate holder must satisfy the following conditions:

a. Airplane. The specified airplane-engine combination listed in the certificate holder's application must have been certificated to the airworthiness standards of transport category airplanes and must be approved for ETOPS. Guidance for airplane ETOPS type design can be found in AC 25.1535–1 and § 121.162.

(1) Two-Engine. Airplane-engine combinations already approved for ETOPS under previous FAA guidance can continue to be used in ETOPS operations under part 121. No re-certification under § 25.1535 is required. Two-engine airplanes with existing type certificates on February 15, 2007, may be approved for up to 180-minutes ETOPS without meeting requirements for fuel system pressure and flow, low fuel alerting, and engine oil tank design contained in § 25.1535.

(2) More than Two Engines. Airplanes with more than two engines that are to be used in ETOPS and are manufactured prior to February 17, 2015, may operate in ETOPS without type design approval under the revised § 25.1535. Airplanes with more than two engines manufactured on or after February 17, 2015, must meet the requirements of ETOPS type design.

b. Flight Operations and Maintenance Requirements. The certificate holder must show compliance with the flight operations requirements discussed in paragraph 303 and the maintenance requirements discussed in paragraph 301.

c. Training Requirements. The certificate holder must show that it has trained its personnel to achieve competency in ETOPS and should show compliance with the flight operations and maintenance training requirements discussed in paragraphs 302 and 304.

d. Before the FAA grants ETOPS operational approval to an applicant for two-engine ETOPS, the certificate holder must be able to demonstrate the ability to achieve and maintain the level of propulsion system reliability that is required for the ETOPS-approved airplane-engine combination to be used (Appendix P to Part 121, section I. Paragraph (a)). The certificate holder must also demonstrate that it can operate the particular airframe and other airplane systems at levels of reliability appropriate for the intended operation. This can be achieved directly by a successful in-service operational history or by successfully validating all the required ETOPS processes according to the Accelerated ETOPS Application Method in Appendix 3 of this AC.

e. An applicant for an initial operating certificate who is applying for ETOPS authority at entry into service under the Accelerated ETOPS Application method must comply with the same requirements for certificate holders outlined in this AC. It should be understood that validation of an applicant with no previous operational experience should be more robust than would be necessary for a certificate holder with operational experience. As is the case for all Accelerated ETOPS approvals, the Director, Flight Standards Service must be satisfied that the applicant can operate to the standards expected of an experienced ETOPS operator from the first day of service.

*401. Application for ETOPS Authorization.*

a. Any certificate holder wishing to obtain an ETOPS authorization must submit an application with all supporting data to their local CHDO office. This application will be for a specific airplane-engine combination and should address all the regulatory requirements for ETOPS. The certificate holder may follow the guidance found in this AC to complete the application. The application should be submitted at least 60 days prior (6 months for the Accelerated ETOPS method of application) to the proposed start of extended range operation with the specific airplane-engine combination.

b. Two-Engine Airplanes.

(1) Up to 180-Minute ETOPS. An applicant requesting ETOPS up to 180 minutes for two-engine operations may select one of the following two application methods best suited to their proposed operation (See Appendix 3):

(a) In-service experience method, or

(b) Accelerated ETOPS method.

(2) ETOPS beyond 180 Minutes, Up to and Including 240 Minutes. The FAA grants approval for ETOPS beyond 180 minutes only to certificate holders with existing 180-minute ETOPS operating authority for the airplane-engine combination to be operated in the application. There is no minimum in-service time requirement for the 180-minute ETOPS operator requesting ETOPS approval beyond 180 minutes. The determination by the Director, Flight Standards Service to grant ETOPS approval is the same as for all ETOPS authorities.

(3) ETOPS beyond 240 Minutes. This authority is only granted to operators of two-engine airplanes between specific city pairs. The certificate holder must have been operating at 180 minute or greater ETOPS authority for at least 24 consecutive months, of which at least 12 consecutive months must be at 240-minute ETOPS authority with the airplane-engine combination in the application.

c. Passenger-Carrying Airplanes with More than Two Engines. There are no minimum in-service experience criteria for certificate holders requesting ETOPS beyond 180 minutes for operations with more than two engines. Those applicants will request approval under the accelerated ETOPS method.

*402. ETOPS Authorities.*

a. ETOPS with Two-Engine Airplanes. An applicant for two-engine ETOPS may seek approval for extended operations by seeking one of the following ETOPS approvals best suited to their proposed operations (see Appendix 2):

(1) 75-Minute ETOPS in the Caribbean/Western Atlantic Area or in other areas.

(2) 90-Minute ETOPS in Micronesia.

(3) 120-Minute ETOPS.

(4) 138-Minute ETOPS. Such approvals are granted to current 180-minute ETOPS operators, or as an extension of authority to operators with only 120-minute ETOPS approval.

(5) 180-Minute ETOPS.

(6) 207-Minute ETOPS in the North Pacific Area of Operation.

(7) 240-Minute ETOPS. Approvals are granted at this level based on the particular geographic area applied for with criteria delineated for particular applications.

(8) Beyond 240-Minute ETOPS. Approvals are granted at this level based on particular city pairs.

b. ETOPS with Passenger-Carrying Airplanes having More than Two Engines. Certificate holders applying for ETOPS with passenger-carrying airplanes that have more than two engines will receive ETOPS authority based on the FAA approved maximum time limited airplane system restriction

of the airplane-engine combination listed in their application and the maximum authority requested.

*403. ETOPS Authorization Requirements.*

a. All certificate holders of airplanes with two engines, and all certificate holders of passenger-carrying airplanes with more than two engines, operating on ETOPS routes must comply with all the operational and process requirements specified in the ETOPS regulations in part 121 and as discussed in this AC.

b. Those certificate holders operating airplanes with more than two engines who choose to follow the recommendations in this AC as a means of compliance with the operating rules, and who, on February 15, 2008, have the authority to operate on specific non-ETOPS routes that under the new definition are classified as ETOPS routes, are not required to re-apply for their specific route authority. However, from February 15, 2008, the certificate holder is required to comply with all the ETOPS flight operational requirements that are described in this AC and must have their ETOPS program and all ETOPS processes approved by their CHDO with concurrence of the Director, Flight Standards Service. The CHDO will amend the certificate holder's OpSpecs when the Director, Flight Standards Service grants a certificate holder approval to conduct operations under § 121.161.

c. All ETOPS certificate holders applying for approvals under this section must provide sufficient information with their application to the Manager, Air Transportation Division, AFS 200, through its CHDO and regional FAA office on the following areas of concern in ETOPS:

(1) ETOPS Area of Operations/ Airplane Performance. The altitudes and airspeeds used in establishing the ETOPS area of operations for each airplane-engine combination must be shown to permit compliance with the terrain and obstruction clearance requirements of §§ 121.191 and 121.193, as applicable. A speed other than the approved single engine speed may be used as the basis for compliance to §§ 121.191 and 121.193, provided fuel consumption is shown not to exceed the critical fuel scenario associated with the applicable ETOPS equal-time point (§ 121.646), and the time limited system requirements of § 121.633 are not exceeded.

(2) Weather Information System. A certificate holder should substantiate that the weather information system that it uses can be relied on to forecast terminal and en route weather with a reasonable degree of accuracy and reliability in the proposed areas of operation. Such factors as staffing, dispatcher, training, sources of weather reports and forecasts, and when possible, a record of forecast reliability, should be evaluated.

(3) Minimum Equipment List. The certificate holder is required to submit its MEL, designed in accordance with the master minimum equipment list (MMEL), appropriate to the requested level of ETOPS. A certificate holder's MEL may be more restrictive than the MMEL, considering the kind of ETOPS proposed and the equipment and service problems unique to the certificate holder. System redundancy levels appropriate to ETOPS should be reflected in the MMEL. Systems considered to have a fundamental influence on flight safety may include, but are not limited to the following:

- Electrical, including battery
- Hydraulic
- Pneumatic
- Flight instrumentation
- Fuel
- Flight control
- Ice protection
- Engine start and ignition
- Propulsion system instruments
- Navigation and communications
- Auxiliary power units
- Air conditioning and pressurization
- Cargo fire suppression
- Emergency equipment
- Any other equipment necessary for ETOPS.

(4) Public Protection. The provisions for public protection have historically been embedded in § 121.97(ii). Current requirements are found in § 121.97(b)(1)(ii). The definition of ''public protection'' has been expanded for certificate holders operating ETOPS beyond 180 minutes, and for operations in the North Polar Area and South Polar Area to include facilities at each airport, or in the immediate area, sufficient to protect the passengers and crew from the elements and to see to their welfare. Due to the nature of these operations and the climatic issues involved during the majority of the year, certificate holders undertaking these operations must ascertain that facilities at an airport, or in the immediate area, are sufficiently robust to protect the passengers and crew from the elements, and to see to their welfare during the time required to transport them towards their destination under the passenger recovery plan discussed in paragraph (5) below.

(5) Passenger Recovery Plan.

(a) A specific passenger recovery plan is required for each ETOPS Alternate Airport used by a certificate holder in ETOPS greater than 180 minutes (OpSpec paragraph B042 (4), ER–OPS En Route Alternate Airports). For operations in the North Polar Area and the South Polar Area a specific passenger recovery plan is required for each designated diversion airport taken from those listed in an operator's operations specifications for this operation (North and South Polar Areas, OpSpec paragraph B055, North Polar Operations [Sic], Polar Operations). For further guidance on passenger recovery plans for these polar diversion airports see paragraph 603(2).

(b) The certificate holder's formal passenger recovery plan should provide a means to validate acceptable levels of infrastructure to provide for an orderly process for the care and well being of the passengers and crewmembers. This infrastructure should include facilities that provide for the physiological needs of the passengers and crewmembers such as continuing safety, food, and shelter. Any list of considerations for the passengers and crewmembers need not be exhaustive. However, in certain cases involving operations in demanding environments, plans may need to be detailed enough to provide for medical care, communications, methods for securing alternative expedited travel, extraction, and other continued travel provisions for the crewmembers and passengers. If the certificate holder proposes to use the airplane capabilities and services as a means to satisfy all or part of the requirements for such a plan, the time-limited capability of appropriate systems should be evaluated and taken into account.

(c) It is generally accepted that any plan that is designed to fully recover the passengers within 48 hours may be viewed as meeting the overall requirement to provide for the care and safety of the passengers and crewmembers. The greatest concern relative to passenger recovery plans is when diversions occur to an airport that is geographically located within an area not normally served by the certificate holder and, more specifically, when the diversion occurs to an en route alternate airport located in a harsh operating environment. A certificate holder with a route system extending over remote areas of the world has a responsibility under the regulations (§ 121.135), to develop a passenger recovery plan in anticipation of the possibility of a diversion to an approved en route alternate airport lying within those remote regions. In these instances, the certificate holder operating on those routes should devise a plan of substance that will outline how it will recover the

passengers, crewmembers, and airplane in the event of such a diversion. This plan should be of sufficient detail to demonstrate that the recovery operation can be readily effected, and that the basic needs of the diverted passengers and crewmembers can be provided for in the interim. The plan should address all of the concerns previously listed with specific emphasis on any issues unique to that particular environment. In some environments provisions for shade from the direct sunlight and cooling may be a concern; while in other environments such as polar and sub polar areas, plans should provide for immediate provisions for shelter from the elements, heating, and clothing. After these immediate concerns are addressed, the plan should address provisions for initiating extraction procedures immediately. In all cases a particular alternate airport environment should drive the requirements of the passenger recovery plan and the prioritization of concerns needing to be addressed.

(6) Navigation. The applicant must show the availability of navigation facilities adequate for the operation, taking into account the navigation equipment installed on the airplane, the navigation accuracy required for the planned route and altitude of flight, and the routes and altitudes to the airports designated as ETOPS alternates. Navigation facilities required to ensure a safe approach and landing must be available.

**Note:** Non-terrestrial approaches, e.g., GPS/RNAV, may be utilized if approved in a certificate holder's operating specifications at airports where terrestrial navigation aids, such as NDB or VOR, are not available or operational.

(7) Communications. The certificate holder must show the availability of communications services and facilities for communication with ATC and the dispatch office. Certificate holders operating ETOPS routes must use the most reliable voice-based communications technology available for communications between the flight crew and air traffic services, and the flight crew and the certificate holder per § 121.99. For ETOPS routes further than 180 minutes from adequate airports, a second communication system is required and must be able to provide immediate satellite-based voice communications of landline-telephone fidelity. Rapid and reliable ATC communications are determined by the facilities operated by ATC units in the areas of operations.

*404. Validation Flight(s).*

Prior to granting ETOPS approval to a certificate holder for operation of a specific airplane-engine combination in an authorized area of operation, the FAA will require actual validation flights on proposed routes that the certificate holder intends to operate within the ETOPS area of operations, designated in the operator's approval request. This is to ensure that the ETOPS flight operations and maintenance programs described in Chapter 3 are capable of supporting those operations. Depending on the certificate holder's level of experience in conducting ETOPS and the routes intended to be used in operations, the FAA will determine the number of validation flights required, the manner in which validation flights may be conducted (revenue with passengers, non-revenue, or cargo only), and any other items requiring validation. If approval is granted to fly the validation flight in revenue service, the operator should be granted appropriate, though temporary or restricted, OpSpecs covering the necessary flight(s). At the successful conclusion of the validation, the CHDO should coordinate with the Director, Flight Standards, amendment and issuance of unrestricted OpSpecs. Certificate holders operating passenger-carrying airplanes with more than two engines who, on the effective date of this AC, have the authority to operate on specific non-ETOPS routes that under the new definition are classified as ETOPS routes, may not be required to conduct an actual validation flight. If the certificate holder can adequately validate that the necessary additional ETOPS processes and procedures are in place, and that they can function appropriately, may be validated by another means satisfactory to the CHDO with concurrence of Director, Flight Standards Service.

*405. Required Demonstration on a Validation Flight.*

a. The certificate holder should demonstrate, by means of an FAA-witnessed validation flight or flights using the specified airplane-engine combination in its application, that it has the competence and capability to safely conduct and adequately support the intended operation. The CHDO, with the concurrence of the Director, Flight Standards Service, will determine the conditions for each certificate holder's validation flights. This determination will be made on a case-by-case basis following a review of the certificate holder's experience and the proposed operation. This process may require the certificate holder to conduct an actual diversion during the validation flights.

b. The following emergency conditions should be demonstrated during the ETOPS validation flights, unless successful demonstration of these conditions has been approved and subsequently witnessed by the FAA in an acceptable simulation prior to the validation flight:

(1) Total loss of thrust of one engine and total loss of engine-generated electrical power, or

(2) Any other condition considered more critical in terms of airworthiness, crewmember workload, or performance risk.

c. This simulator demonstration does not alter the certificate holder's requirement to demonstrate the competence and the capability to adequately support the intended operation during the ETOPS validation flight.

## Chapter 5. FAA ETOPS Approval

*500. Final ETOPS Operating Authority.*

Following completion of the ETOPS application requirements and before the issuance of operations specifications, the certificate holder's application with supporting data, together with the CHDO's recommendations, should be forwarded through the certificate holder's regional FAA office, to AFS–200 (Washington Headquarters) for review and concurrence. The CHDO's recommendations should include any specific recommendations made by the principal maintenance inspector (PMI), principal avionics inspector (PAI), and principal operations inspector (POI), as appropriate. Following review and concurrence by AFS–200, the validation flights should be conducted in accordance with any additional guidance or recommendations specified in the review and concurrence process. Following the successful completion of the validation flights, the Director, Flight Standards Service, will authorize the CHDO to issue the certificate holder OpSpecs for ETOPS operations.

*501. ETOPS OpSpecs.*

Those OpSpecs for ETOPS provide authorizations and limitations covering at least the following:

a. Approved airplane-engine combinations,

b. Current approved CMP standard required for ETOPS, if appropriate,

c. Authorized geographic area(s) of operation,

d. ETOPS area of operation,

e. Airports authorized for use, including alternates and associated instrument approaches and operating minima,

f. Approved maintenance and reliability program for ETOPS including those items specified in the type design

approved CMP standard, if appropriate, and

g. Identification of the airplanes authorized for ETOPS by make, model, serial, and registration number.

*502. Changes to Approved ETOPS Operations, Maintenance and Training Procedures.*

Following final ETOPS approval, if a certificate holder determines a need to make substantial changes to its ETOPS operations, maintenance and training procedures, it should submit such changes in a timely manner to the CHDO for review and acceptance before incorporation. The certificate holder and its CHDO should negotiate what constitutes a substantial change to allow flexibility and take into consideration a certificate holder's ETOPS experience. What is considered substantial for a new entrant ETOPS certificate holder may be considerably different than for a certificate holder with many years of ETOPS experience.

*503. Processes After Receiving ETOPS Authority.*

a. The FAA continuously monitors the world fleet average IFSD rate for two-engine ETOPS authorized airplane-engine combinations to ensure that the levels of reliability achieved in ETOPS remain at the required levels. If an acceptable level of reliability in fleet average IFSD is not maintained, or if significant deficiencies or adverse trends are detected in type design (i.e., basic design of the airplane-engine) or in the operation, the FAA may require the airframe and engine manufacturers to develop a plan acceptable to the FAA to address the deficiencies.

b. As with all other operations, the CHDO will monitor all aspects of the ETOPS operations it has authorized to the certificate holder to ensure that the levels of reliability achieved in ETOPS operations remain at acceptable levels, and that the operation continues to be conducted safely.

c. In the event that an acceptable level of reliability is not maintained, if significant adverse trends exist, or critical deficiencies are detected in the type design or in the conduct of ETOPS operations, the CHDO will:

(1) Alert the appropriate airplane certification office and the airplane evaluation group, when problems associated with airplane design or operations are identified; and

(2) Initiate a special evaluation, impose operational restrictions (if necessary), and ensure that the certificate holder adopts corrective actions to resolve the problems in a timely manner.

**Chapter 6. Polar Operations**

*600. Background.*

a. In February 2001, in response to several U.S. carriers' plans to conduct north polar operations, the FAA developed a ''Polar Policy Letter.'' This policy letter documented the requirement for airlines to develop necessary plans in preparation for north polar flights and identified the necessary equipment and airplane configuration requirements for all airplanes regardless of the number of engines. The FAA's intent in issuing the policy letter was to ''establish a process that can be applied uniformly to all applicants for polar route authority.'' This policy was applied to all operators, and although not ETOPS per se, it required ETOPS-like planning, equipage and operational requirements in these areas.

b. During the development of the expanded ETOPS regulations the ARAC recommended that the guidance contained in the Polar Policy letter be incorporated in the ETOPS regulations. It also recommended that these requirements be expanded to the South Polar Region. Although no U.S. certificate holders were operating in the South Polar Area at the time, it was felt that due to similar extremes in remoteness, weather, and terrain, this area should be included in anticipation of future industry growth.

c. The FAA agreed with the recommendations of the ARAC and has determined that operating in the polar areas presents operational issues similar to typical ETOPS flights, and as such, the risks associated with this operation can be mitigated by applying planning, operational, and equipage requirements similar to ETOPS and specific procedures applicable to the risks associated with this type of flying.

*601. Definition.*

The North Polar Area is defined as the entire area north of latitude 78 degrees North, and the South Polar Area is defined as the entire area south of latitude 60 degrees South.

*602. Applicability.*

Any certificate holder operating an airplane whose route contains any point within the North Polar area or South Polar area as defined in paragraph 601 above, must comply with the requirements of part 121, appendix P, section III. The certificate holder must first determine during the route planning stage if the operation will be ETOPS as defined in § 121.161 and as further discussed in Chapter 2, paragraph 201 of this AC. If the operation is ETOPS the polar requirements of part 121, appendix P and the guidance in this chapter are in addition to any of the applicable ETOPS requirements discussed in Chapter 3, paragraphs 300–304 of this AC.

*603. Polar Requirements.*

a. The certificate holder applying for authority to fly in the Polar Areas must develop plans in preparation for all polar flights in the North and South Polar Areas. This section documents the added requirements and identifies equipment and airplane configuration requirements in addition to the requirements discussed in Chapter 3, paragraphs 300–304.

b. The certificate holder's plan for conducting operations within these areas must include the following elements:

(1) Requirements for Designating Alternates. Certificate holders should designate a set of alternate airports regardless of their distance from the planned route, such that one or more can reasonably be expected to be available in a variety of weather conditions to support a necessary diversion. The flight must have sufficient fuel as required by § 121.646, if applicable, and should be able to make a safe landing and the airplane maneuvered off of the runway at the selected diversion airport. In the event of a disabled airplane following landing, the capability to move the disabled airplane should exist at that airport, so as not to block the operation of any recovery airplane. In addition, those airports designated for use should be capable of protecting the safety of all personnel by being able to:

(a) Offload the passengers and crewmember in a safe manner during adverse weather conditions;

(b) Provide for the physiological needs of the passengers and crewmembers for the duration of the stay at the diversion airport until safe evacuation; and

(c) Safely extract passengers and crewmembers as soon as possible (execution and completion of the passenger recovery is expected as soon as possible within 48 hours following diversion).

(2) Passenger Recovery Plan. Except for supplemental all-cargo operations, each certificate holder conducting operations in the polar areas must have a passenger recovery plan at designated diversion airports as discussed in paragraph (1) above and in Chapter 4, paragraph 403c(5). The passenger recovery plan in these Polar Regions should also include special consideration for the possibility of extreme cold weather, limited passenger facilities, and the need to initiate passenger recovery without delay.

(3) Fuel Freeze Strategy and Monitoring. The certificate holder must have a fuel-freeze strategy and procedures for monitoring fuel freezing. The certificate holder may wish to develop a fuel freeze strategy and monitoring program (e.g., alternate fuel freeze point temperature determination based on actual measurements of uploaded fuel), in lieu of using the standard minimum fuel freeze temperatures for specific types of fuel used. In such cases, the certificate holder's fuel freeze analysis and monitoring program for the airplane fuel load is subject to FAA approval. The certificate holder should have procedures established that require coordination between maintenance, dispatch, and assigned flight crewmembers to convey the determined fuel freeze temperature of the fuel load on board the airplane.

(4) Communication Capability. The certificate holder must have effective voice communications and/or data link capability for all portions of the flight route. The requirements of § 121.99 apply to all ETOPS operations in these areas. For all other operations, company communications may be accomplished using HF voice, HF data link, satellite communication (SATCOM) voice or SATCOM data link. Because of the limitations of VHF and satellite-based voice communications, ATC communications will probably require high frequency (HF) voice over portions of these routes. The FAA recognizes that SATCOM may not be available for short periods during flight over the Poles. Communication capability with HF radios also may be affected during periods of solar flare activity. The certificate holder should consider predicted solar flare activity and its effect on communications for each flight that is dispatched for operations into these areas.

(5) MEL Considerations. The certificate holder must amend its MEL to reflect the items that must be operational for these operations. For ETOPS flights, all MEL restrictions for the applicable ETOPS operations apply. Before receiving FAA authority to conduct these operations, all certificate holders should review its MEL for consideration of the dispatch availability of the following systems/equipment:

(a) Fuel quantity indicating system (FQIS), including the fuel tank temperature indicating system;

(b) APU (when the APU is necessary for an airplane to comply with ETOPS requirements), including electrical and pneumatic supply to its designed capability,

(c) Autothrottle system;

(d) Communication systems relied on by the flight crewmember to satisfy the requirement for communication capability; and

(e) Except for all-cargo operations, an expanded medical kit to include automated external defibrillators (AED).

(6) Training. The certificate holder should address the following training requirements in its approved training programs:

(a) QFE/QNH and meter/feet conversions (required for flight crewmember and dispatcher training);

(b) Training requirements for fuel freeze, to include maintenance, dispatch, and flight crewmember training (special curriculum segments);

(c) General route-specific training on weather patterns;

(d) Relevant airplane system limitations (for example fuel temperature limits);

(e) Role of maintenance role in providing airplane systems capability information to dispatch and flight crewmember to aid the PIC in diversion decision making;

(f) Crewmember training in the use of the cold weather anti-exposure suit,

(g) For dispatch and crewmember considerations during solar flare activity, the certificate holder must be aware of the content of AC 120–52, Radiation Exposure of Certificate Holder Crewmembers, and provide crewmember training as stated in AC 120–61, Crewmember Training on In-Flight Radiation Exposure; and

(h) Training for flight crewmembers and dispatcher roles in the certificate holder's passenger recovery plan.

(7) Crew Exposure to Radiation during Solar Flare Activity. The certificate holder must provide a plan for mitigating crew exposure to the effects of solar flare activity at the altitudes and latitudes expected in such operations.

(8) Special Equipment for Polar Operations. A minimum of two cold weather anti-exposure suits must be on board each airplane, so that outside coordination at a diversion airport with extreme climatic conditions can be accomplished safely. A short term MEL relief for this item may be granted provided the certificate holder has arranged ground support provisions for providing such protective clothing at alternate airports. The FAA may also relieve the certificate holder from this requirement during those periods of the year when the seasonal temperature makes the equipment unnecessary.

*604. Validation before Approval.*

a. Prior to receiving an authorization to conduct polar operations a certificate holder must conduct an FAA observed validation flight. As part of polar area validation, the certificate holder must exercise its passenger recovery plan. Adequate and timely notification must be made to the FAA before the validation flight so that any necessary coordination between the FAA inspector and personnel at the selected diversion airport can be completed. The inspector will witness the effectiveness and adequacy of the following areas of operation:

(1) Communications,

(2) Coordination,

(3) Facilities,

(4) Accuracy of Notices to Airman and weather information, and

(5) Operability of ground equipment during the simulated diversion.

b. The exercise of the certificate holder's passenger recovery plan may be completed before the validation flight. The FAA will not consider a request by a certificate holder to conduct the validation flight in a passenger revenue status if the certificate holder's passenger recovery plan has not been previously and satisfactorily demonstrated to the FAA. If the certificate holder elects to demonstrate its passenger recovery plan as part of and during its validation flight, the flight may not be conducted in a passenger revenue status. However, the carriage of cargo revenue is permissible in this case and is encouraged for airplane weight and balance purposes.

*605. FAA Polar Area Approval.*

Certificate holders must obtain FAA approval to conduct these operations and to operate in any area of magnetic unreliability. The FAA will grant such authority based on a specific airplane-engine combination. Any certificate holder wishing to obtain Polar authorization must submit an application with all supporting data to their local CHDO office. This application must address all the regulatory requirements for Polar operations and may follow the guidance as found in this AC. The application should be submitted at least 60 days prior to the proposed start of polar operations with the specific airplane-engine combination. FAA approval is granted by an amendment to the certificate holder's OpSpecs.

## Appendix 1. Definitions

The following definitions are applicable to ETOPS. They include definitions from Title 14 of the Code of Federal Regulations (14 CFR) parts 1 and 121, as well as terms that are used within the context of this AC with respect to ETOPS:

1. Adequate Airport. An airport that an airplane operator may list with approval from the FAA because that airport meets the landing limitations of part 121, § 121.197 and

is either, an airport that meets the requirements of 14 CFR part 139, subpart D, excluding those that apply to aircraft rescue and firefighting service, or a military airport that is active and operational. Airports without specific part 139 approval (*i.e.*, outside FAA jurisdiction), may be considered adequate provided that they are determined to meet the equivalent standards and intent of part 139 subpart D.

2. Configuration, Maintenance, and Procedures (CMP) Document. A document approved by the FAA that contains minimum configuration, operating, and maintenance requirements, hardware life-limits, and Master Minimum Equipment List (MMEL) constraints necessary for an airplane-engine combination to meet ETOPS type design approval requirements.

3. Dual Maintenance. Dual maintenance means maintenance on the ''same'' ETOPS significant system. Dual maintenance is maintenance action performed on the same element of identical, but separate ETOPS Significant Systems during a scheduled or unscheduled maintenance visit. Dual maintenance on ''substantially similar'' ETOPS significant systems means maintenance actions performed on engine-driven components on both engines during the same maintenance visit.

4. Equal-Time Point (ETP). A point on the route of flight where the flight time, considering wind, to each of two selected airports is equal.

5. ER. An abbreviation used in the MMEL and in the minimum equipment list (MEL) of some certificate holders to indicate ETOPS. As used in this AC, any ETOPS MMEL/MEL restrictions applicable to ETOPS.

6. ETOPS Alternate Airport. An adequate airport listed in the certificate holder's operations specifications (OpSpecs) that is designated in a dispatch or flight release for use in the event of a diversion during ETOPS. This definition applies to flight planning and does not in any way limit the authority of the pilot in command during flight.

7. ETOPS Area of Operation. For turbine-engine-powered airplanes with two engines an area beyond 60 minutes from an adequate airport, or with more than two engines in passenger-carrying operations, an area beyond 180 minutes from an adequate airport, and within the authorized ETOPS maximum diversion time approved for the operation being conducted. An ETOPS area of operation is calculated at an approved one-engine inoperative cruise speed under standard conditions in still air.

8. ETOPS Entry Point. The first point on the route of an ETOPS flight; determined using a one-engine-inoperative cruise speed under standard conditions in still air that is more than 60 minutes from an adequate airport for airplanes with two engines, and more than 180 minutes from an adequate airport for passenger-carrying airplanes with more than two engines.

9. ETOPS Significant System. An airplane system, including the propulsion system, the failure or malfunctioning of which could adversely affect the safety of an ETOPS flight, or the continued safe flight and landing of an airplane during an ETOPS diversion. Each ETOPS significant system is either an ETOPS group 1 significant system or an ETOPS group 2 significant system.

a. An ETOPS group 1 Significant System:

(1) Has fail-safe characteristics directly linked to the degree of redundancy provided by the number of engines on the airplane;

(2) Is a system, the failure or malfunction of which could result in an in-flight shutdown (IFSD), loss of thrust control, or other power loss;

(3) Contributes significantly to the safety of an ETOPS diversion by providing additional redundancy for any system power source lost as a result of an inoperative engine; and

(4) Is essential for prolonged operation of an airplane at engine inoperative altitudes.

b. An ETOPS group 2 significant system is an ETOPS significant system that is not an ETOPS group 1 significant system.

10. ETOPS-Qualified Personnel. A person performing maintenance for the certificate holder, who has satisfactorily completed the certificate holder's ETOPS training program.

11. Extended Operations (ETOPS). An airplane flight operation during which a portion of the flight is conducted beyond 60 minutes from an adequate airport for turbine-engine-powered airplanes with two engines, and beyond 180 minutes for turbine-engine-powered passenger-carrying airplanes with more than two engines. This distance is determined using an approved one-engine-inoperative cruise speed under standard atmospheric conditions in still air.

12. Flight-by-Flight Exception. The application of a greater ETOPS maximum diversion authority under specific, limited circumstances, as defined in this AC, when a flight cannot be planned on the preferred route within an authorized lesser diversion time.

13. In-Flight Shutdown (IFSD). For ETOPS only, when an engine ceases to function (when the airplane is airborne) and is shut down, whether self induced, flight crew initiated or caused by an external influence. The FAA considers IFSD for all causes, such as flameout, internal failure, flight crew initiated shutdown, foreign object ingestion, icing, inability to obtain or control desired thrust or power, and cycling of the start control; however briefly, even if the engine operates normally for the remainder of the flight. This definition excludes the airborne cessation of the functioning of an engine when immediately followed by an automatic engine relight and when an engine does not achieve desired thrust or power but is not shut down.

14. Maximum Diversion Time. For the purposes of ETOPS in § 121.161 and related ETOPS regulations, maximum diversion time (for example 120 minutes, 180 minutes, 240 minutes, and, beyond 240 minutes) is the longest diversion time authorized for a flight under the operator's ETOPS authority. It is calculated under standard conditions in still air at a one-engine-inoperative cruise speed.

15. One-Engine-Inoperative Cruise Speed. For the purposes of those sections of part 121 applicable to ETOPS, the one-engine-inoperative cruise speed is a speed within the certified operating limits of the airplane that is specified by the certificate holder and approved by the FAA for calculating required fuel reserves needed to account for an inoperative engine, or determining whether an ETOPS alternate is within the maximum diversion time authorized for an ETOPS flight.

**Note:** The following areas (16–18) are defined for the purposes of those sections of part 121 applicable to ETOPS:

16. North Pacific (NOPAC). The North Pacific Air Traffic Service (ATS) routes and adjacent airspace between Anchorage and Tokyo Flight Information Regions (FIR).

17. North Pacific Area of Operations. Pacific Ocean areas north of 40° North latitudes including NOPAC ATS routes, and published Pacific Organized Track System (PACOTS) tracks between Japan and North America. (For the purposes of this definition, ''North America'' includes the countries of Canada, the United States, and Mexico.)

18. Polar Areas.

a. North Polar Area. The entire area north of 78° North latitude.

b. South Polar Area. The entire area south of 60° South latitude.

19. Process. A series of steps or activities that are accomplished in a consistent manner to ensure a desired result is attained on an ongoing basis.

20. Proven Process. A process is considered to be proven when the following elements are developed and implemented:

a. Definition and documentation of process elements.

b. Definition of process related roles and responsibilities.

c. Procedures for validation of process or process elements to include:

- Indications of process stability/reliability.
- Parameters to validate process and monitor (measure) success.
- Duration of necessary evaluation to validate process.

d. Procedure for follow-up in-service monitoring to assure the process remains reliable and stable.

# APPENDIX 2. ETOPS APPROVALS

As described in Section 401 of this AC, Appendix P to § Part 121 permits certificate holders to seek various levels of ETOPS approvals. This Appendix summarizes the details for each approval level, and is intended to provide further guidance to the requirements in Appendix P to Part 121.

## 1. Airplanes with Two Engines

| Approval Level | Area of Applicability | Requirements | How to apply | Comments |
|---|---|---|---|---|
| **75 min** | Caribbean / Western Atlantic Area. | **1.** The airplane-engine combination need not be type design approved for ETOPS.<br>**2.** The FAA reviews the airframe-engine combination to ensure the absence of factors that could prevent safe operations.<br>**3.** The airframe-engine combination must have sufficient favorable experience to demonstrate to the Administrator a level of reliability appropriate for 75-minute ETOPS.<br>**4.** Even though there is no requirement for the type design approval of the airplane, the certificate holder must ensure the airplane has systems that are capable of complying with the requirements of § 121.633 for time-limited system planning.<br>**5.** The certificate holder must comply with the maintenance program requirements of § 121.374, except that a pre-departure service check before departure of the return flight is not required. Guidance is provided in Chapter 3, paragraphs 301 and 302 of this AC.<br>**6.** The certificate holder must comply with the flight operational requirement in part 121, as described in Chapter 3, paragraphs 303 and 304 of this AC.<br>**7.** The certificate holder need not comply with 120 minute ETOPS provisions of the MMEL.<br>**8.** The certificate holder must operate in accordance with the ETOPS authority as contained in its operations specifications. | Request made to the FAA for route authority. The application will show the need for such an authority. Minimal or no in-service experience with the airplane-engine combination is required (see Appendix 3). | This area is considered a "benign" area of operations due to (1) numerous airports, (2) a high level of reliability and availability are required of communications, navigation, and ATC services and facilities, and (3) prevailing weather conditions that are stable and generally do not approach extremes in temperature, wind, ceiling, and visibility. |
| **75 min** | Other areas besides Caribbean / Western | **1.** The airplane-engine combination need not be type design approved for ETOPS.<br>**2.** The FAA reviews the airframe-engine combination to ensure the absence of factors that could prevent safe operations. | Request made to the FAA for route authority. The application will | Areas not considered benign such as North Atlantic |

| Approval Level | Area of Applicability | Requirements | How to apply | Comments |
|---|---|---|---|---|
| | Atlantic Area operations. | **3.** The airframe-engine combination must have sufficient favorable experience to demonstrate to the Administrator a level of reliability appropriate for 75-minute ETOPS.<br>**4.** Even though there is no specific requirement for type design approval of the airplane, the certificate holder must ensure the airplane has systems that are capable of complying with the requirements of § 121.633 for time-limited system planning.<br>**5.** The certificate holder must comply with the maintenance program requirements of § 121.374. Guidance is provided in Chapter 3, paragraphs 301 and 302 of this AC.<br>**6.** The certificate holder must comply with the flight operational requirements in part 121, as described in Chapter 3, paragraphs 303 and 304 of this AC.<br>**7.** The certificate holder must comply with 120-min ETOPS provisions in the MMEL.<br>**8.** The certificate holder must operate in accordance with the ETOPS authority as contained in its operations specifications. | show the need for such an authority. | (NAT/NMPS) area. Minimal or no in-service experience with the airplane-engine combination is required (see Appendix 3). |
| **90 min** | Micronesia | **1.** The airplane-engine combination must be type design approved for 120 min ETOPS or greater.<br>**2.** The certificate holder must comply with the maintenance program requirements of § 121.374, except that a pre-departure service check before departure of the return flight is not required. Guidance is provided in Chapter 3, paragraph 301 and 302 of this AC.<br>**3.** The certificate holder must comply with the flight operational requirement in part 121, as described in chapter 3, paragraphs 303 and 304 of this AC.<br>**4.** The certificate holder must comply with 120-min ETOPS provisions in the MMEL.<br>**5.** The certificate holder must operate in accordance with the ETOPS authority as contained in its operations specifications. | Request made to the FAA for route authority. The application will show the need for such an authority. | Minimal or no in-service experience with the airplane-engine combination is required (see Appendix 3). |
| **120 min** | Unlimited (no area restriction) | **1.** The airplane-engine combination must be ETOPS type design approved for 120-minute or greater.<br>**2.** The certificate holder must comply with all part 121 flight operations and maintenance requirements pertaining to ETOPS as discussed in | Chapter 4, paragraph 401(b) of this AC provides the two | |

| Approval Level | Area of Applicability | Requirements | How to apply | Comments |
|---|---|---|---|---|
| | | Chapter 3 of this AC.<br>**3.** The certificate holder must comply with 120-min ETOPS provisions in the MMEL.<br>**4.** The certificate holder must operate in accordance with the ETOPS authority as contained in its operations specifications. | methods for gaining approval. | |
| **138 min (for certificate holders who are currently approved for 120-min ETOPS)** | Unlimited (no area restriction) | **1.** The airplane-engine combination must be ETOPS type design approved for 120-minute or greater. If approved only up to 120 min, the FAA must ensure the airplane time-limited systems support operations up to 138 min in accordance with § 121.633.<br>**2.** Comply with all part 121 flight operations and maintenance requirements pertaining to ETOPS as discussed in Chapter 3 of this AC. The certificate holder must conduct training for maintenance, dispatch and flight crew. Training should include any unique aspects of 138 min operations e.g., any additional requirement imposed by the FAA including MEL requirements.<br>**3.** Must comply with the "beyond 120-minute ETOPS provisions in the MMEL. If a 180-minute ETOPS MMEL does not exist for the airplane, the certificate holder must apply to the FAA for any additional items that may be applicable for 138-min operations.<br>**4.** 138-min ETOPS authority is used when the route cannot be efficiently operated under 120-min ETOPS.<br>**5.** The certificate holder must operate in accordance with the ETOPS authority as contained in its operations specifications. | Certificate holder with 120-min ETOPS authority may apply to the FAA. The application will show the need for such an authority. A modified MEL to support operations should be submitted with the application to AFS-200 through the certificates CHDO. | This is an extension of previous 120-minute authority. Approval is granted for operations up to 138 minutes on a flight-by-flight exception basis. |
| **138 min (for certificate holders who are currently approved for 180-min ETOPS)** | Unlimited (no area restriction) | **1.** Airplane-engine combination must be ETOPS type design approved for 180 minutes or greater.<br>**2.** Comply with all part 121 flight operations and maintenance requirements pertaining to ETOPS as discussed in Chapter 3 of this AC.<br>**3.** Must comply with the 180 minute ETOPS provisions in the MMEL.<br>**4.** The certificate holder must operate in accordance with the ETOPS authority as contained in its operations specifications.<br>**5.** The certificate holder must conduct training for maintenance, dispatch and flight crew regarding the differences between 138-minute and 180-minute diversion authority. | Certificate holder with 180-min ETOPS authority may apply to the FAA. The application will show the need for such an authority. | Since this authority is less than the certificate holder's maximum ETOPS authority, it may be exercised on an unlimited basis. |

| Approval Level | Area of Applicability | Requirements | How to apply | Comments |
|---|---|---|---|---|
| **180 min** | Unlimited (no area restriction) | **1.** Airplane-engine combination must be ETOPS type design approved for 180-minute or greater.<br>**2.** Comply with all part 121 flight operations and maintenance requirements pertaining to ETOPS as discussed in Chapter 3 of this AC.<br>**3.** Must comply with the 180-minute ETOPS provisions in the MMEL.<br>**4.** The certificate holder must operate in accordance with the ETOPS authority as contained in its operations specifications. | Chapter 4, paragraph 401(b) of this AC provides the methods for gaining approval to operate under 180 min | |
| **207 min** | In North Pacific Area of Operations (Pacific Ocean areas north of 40N latitudes including NOPAC ATS routes and published PACOTS tracks between Japan and North America). The subcontinent of North America includes Canada, Mexico and the United States. | **1.** Airplane-engine combination must be ETOPS type design approved for 180-minute or more. The certificate holder must comply with § 121.633(a), however, the approved time for the airplane's most limiting ETOPS significant system and most limiting cargo-fire suppression time must be at least 222 minutes.<br>**2.** Certificate holder must have existing 180-minute ETOPS operating authority for the airplane-engine combination to be operated.<br>**3.** The certificate holder must have previous ETOPS experience satisfactory to the Administrator.<br>**4.** The certificate holder must make every effort to plan ETOPS within 180 minutes or less, if possible.<br>**5.** The certificate holder must inform the flight crew each time an airplane is proposed for dispatch for greater than 180 minutes and tell them why the route was selected.<br>**6.** In addition to the equipment specified in the certificate holder's minimum equipment list for 180-minute ETOPS, the following systems must be operational for dispatch:<br>**(A)** The fuel quantity indicating system,<br>**(B)** The APU (including electrical and pneumatic supply and operating to the APU's designed capability) when the APU is necessary for an airplane to comply with ETOPS requirements,<br>**(C)** The auto throttle system,<br>**(D)** The communication system required by § 121.99(d) or § 121.122(c), as applicable, and<br>**(E)** One-engine-inoperative auto-land capability, if flight planning is predicated on its use. | Those certificate holders that have 180-minute ETOPS authority in this area can apply to the FAA for approval as an extension to their 180-minute authority. | This is an extension of 180-minute ETOPS authority for the specific case of operations in the North Pacific Area of Operations. |

| Approval Level | Area of Applicability | Requirements | How to apply | Comments |
|---|---|---|---|---|
| | | **7.** Comply with all part 121 flight operations and maintenance requirements pertaining to ETOPS as discussed in Chapter 3 of this AC.<br>**8.** The nearest available ETOPS alternate within 207 minutes diversion time must be specified in the dispatch or flight release.<br>**9.** In conducting such a flight the certificate holder must consider Air Traffic Service's preferred track.<br>**10.** This exception may be used only on a flight-by-flight basis when an ETOPS alternate is not available within 180 minutes for reasons such as political or military concerns; volcanic activity; temporary airport conditions; and airport weather below dispatch requirements or other weather related events.<br>**11.** The certificate holder must operate in accordance with the ETOPS authority as contained in its operations specifications.<br>**12.** The certificate holder must track how many times 207-minute authority is used. | | |
| **240 min** | North Polar Area, in the area north of the NOPAC, and in the Pacific Ocean north of the equator | **1.** Airplane-engine combination must be ETOPS type design approved for greater than 180-minutes. The certificate holder must ensure the airplane has systems that are capable of complying with the requirements of § 121.633(b) for time-limited system planning.<br>**2.** Certificate holder must have existing 180-minute ETOPS operating authority for the airplane-engine combination to be operated.<br>**3.** The certificate holder must have previous ETOPS experience satisfactory to the Administrator.<br>**4.** The certificate holder must make every effort to plan ETOPS with 180 minutes or less, if possible.<br>**5.** The certificate holder must inform the flight crew each time an airplane is proposed for dispatch for greater than 180 minutes and tell them why the route was selected.<br>**6.** In addition to the equipment specified in the certificate holder's minimum equipment list for 180-minute ETOPS, the following systems must be operational for dispatch:<br>**(A)** The fuel quantity indicating system,<br>**(B)** The APU (including electrical and pneumatic supply and operating to the APU's designed capability) when the APU is necessary for an airplane to comply with ETOPS requirements, | Those certificate holders that have 180-minute ETOPS authority in this area can apply to the FAA for approval as an extension to their 180-minute authority. | This is an extension of 180-minute ETOPS in this area and is to be used on a flight by flight exception basis when an ETOPS alternate is not available within 180 minutes. |

| Approval Level | Area of Applicability | Requirements | How to apply | Comments |
|---|---|---|---|---|
| | | **(C)** The auto throttle system,<br>**(D)** The communication system required by § 121.99(d) or § 121.122(c), as applicable, and<br>**(E)** One-engine-inoperative auto-land capability, if flight planning is predicated on its use.<br>**7.** Comply with all part 121 flight operations and maintenance requirements pertaining to ETOPS as provided in Chapter 3 of this AC.<br>**8.** The nearest available ETOPS alternate within 240 minutes diversion time must be specified in the dispatch or flight release.<br>**9.** In conducting such a flight the certificate holder must consider Air Traffic Service's preferred track.<br>**10.** The criteria used by the certificate holder to decide that extreme weather precludes using an airport must be established by the certificate holder, accepted by the FAA, and published in the certificate holder's manual for the use of dispatchers and pilots.<br>**11.** The certificate holder must operate in accordance with the ETOPS authority as contained in its operations specifications.<br>**12.** This exception may be used in the North Polar Area and in the area north of NOPAC only in extreme conditions particular to these areas such as volcanic activity, extreme cold weather at en route airports, airport weather below dispatch requirements, temporary airport conditions, and other weather related events. This exception may be used in the Pacific Ocean area north of the equator only for reasons, such as political or military concern, volcanic activity, airport weather below dispatch requirements, temporary airport conditions and other weather related events. | | |

| Approval Level | Area of Applicability | Requirements | How to apply | Comments |
|---|---|---|---|---|
| **240 min** | Areas south of the equator:<br><br>**1.** Pacific Ocean areas between the US West coast and Australia, New Zealand and Polynesia,<br>**2.** South Atlantic Oceanic areas,<br>**3.** Indian Ocean areas<br>**4.** Oceanic areas between Australia and South America | **1.** Airplane-engine combination must be ETOPS type design approved for greater than 180-minute. The certificate holder must ensure the airplane has systems that are capable of complying with the requirements of § 121.633 (b) for time-limited system planning.<br>**2.** Certificate holder must have existing 180-minute ETOPS operating authority for the airplane-engine combination to be operated.<br>**3.** The certificate holder must have previous ETOPS experience satisfactory to the Administrator.<br>**4.** In addition to the equipment specified in the certificate holder's minimum equipment list for 180-minute ETOPS, the following systems must be operational for dispatch:<br>**(A)** The fuel quantity indicating system,<br>**(B)** The APU (including electrical and pneumatic supply and operating to the APU's designed capability) when the APU is necessary for an airplane to comply with ETOPS requirements,<br>**(C)** The auto throttle system,<br>**(D)** The communication system required by § 121.99(d) or § 121.122(c), as applicable, and<br>**(E)** One-engine-inoperative auto-land capability, if flight planning is predicated on its use.<br>**5.** Comply with all part 121 flight operations and maintenance requirements pertaining to ETOPS as provided in Chapter 3 of this AC.<br>**6.** The nearest available ETOPS alternate within 240 minutes diversion time must be specified in the dispatch or flight release.<br>**7.** The certificate holder must operate in accordance with the ETOPS authority as contained in its operations specifications. | Request made to the FAA for route authority. The application will show the need for such an authority. | This is an unlimited authority |
| **Beyond 240 min** | Specific city pairs in the following areas as designated in the operators application: | **1.** Airplane-engine combination must be ETOPS type design approved for greater than 180-minute. The certificate holder must ensure the airplane has systems that are capable of complying with the requirements of § 121.633 (b) for time-limited system planning.<br>**2.** The certificate holder must have existing 180-minute ETOPS operating authority for the airplane-engine combination to be operated.<br>**3.** The certificate holder must have previous ETOPS experience satisfactory to the Administrator.<br>**4.** The operator must have been operating at 180-minute or greater ETOPS | Request made to the FAA for route authority. The application will show the need for such an authority. | There is no time limit to this authority. |

| Approval Level | Area of Applicability | Requirements | How to apply | Comments |
|---|---|---|---|---|
| | **1.** Pacific Ocean areas between the US West coast and Australia, New Zealand and Polynesia, **2.** South Atlantic Oceanic areas, **3.** Indian Ocean areas **4.** Oceanic areas between Australia and South America **5.** South Polar Area | authority for at least 24 consecutive months, of which at least 12 consecutive months must have been under 240-minute ETOPS authority with the airplane-engine combination to be used.<br>**5.** In addition to the equipment specified in the certificate holder's minimum equipment list for 180-minute ETOPS, the following systems must be operational for dispatch:<br>**(A)** The fuel quantity indicating system,<br>**(B)** The APU (including electrical and pneumatic supply and operating to the APU's designed capability) when the APU is necessary for an airplane to comply with ETOPS requirements,<br>**(C)** The auto throttle system,<br>**(D)** The communication system required by § 121.99(d) or § 121.122(c), as applicable, and<br>**(E)** One-engine-inoperative auto-land capability, if flight planning is predicated on its use.<br>**6.** The certificate holder must comply with all part 121 flight operations and maintenance pertaining to ETOPS as provided in Chapter 3 of this AC.<br>**7.** The certificate holder must operate in accordance with the ETOPS authority as contained in its operations specifications. | | |

## 2. Passenger-carrying Airplanes with more than Two Engines.

| Approval Level | Area of Applicability | Requirements | How to apply | Comments |
|---|---|---|---|---|
| **Beyond 180 min** | Unlimited area of the world | **1.** The airplane-engine combination must be type-design-approved for ETOPS, except as provided in § 121.162(see comments).<br><br>**2.** The certificate holder must ensure the airplane has systems that are capable of complying with the requirements of §121.633 for time-limited system planning.<br>**3.** The operator must designate the nearest available ETOPS alternate or alternates within 240 minutes diversion time (at one engine inoperative cruise speed under standard conditions in still air). If an ETOPS alternate is not available within 240 minutes, the operator must designate the nearest available ETOPS alternate or alternates along the planned route of flight.<br><br>**4.** The minimum equipment list (MEL) limitations for the authorized ETOPS diversion time apply.<br><br>**(i)** The Fuel Quantity Indicating System must be operational.<br><br>**(ii)** The communications systems required by §121.99(d) or §121.122(c) must be operational, except for three and four-engine airplanes operating 180 minutes or less from an alternate in the North Polar and South Polar areas.<br><br>**5.** The certificate holder must operate in accordance with the ETOPS authority as contained in its operations specifications. | Request made to the FAA for route authority. The application will show the need for such an authority.<br><br>Certificate holders who have authority to operate on specific routes that under this AC are newly defined as ETOPS routes do not have to re-apply for specific route authority. The certificate holder will be required to comply with all the ETOPS operational requirements in this AC. | 121.162 allows for an eight-year 'production cut-in for ETOPS type design requirements for these airplanes. The certificate holder should review their aircraft for applicability. Those airplanes not required to have an ETOPS type design do not have any CMP or Parts control compliance requirements. |

3. All airplanes planned on routings any portion of which enter the North Polar or South Polar areas.

| Level *1.* Approval | Area of Applicability | Requirements | How to Apply | Comments |
|---|---|---|---|---|
| | North Polar area – the entire area north of 78N latitude<br><br>and,<br><br>South Polar area – the entire area south of 60S latitude | In addition to any applicable requirements of Sections 1. and 2. of this Appendix, the certificate holder's operations specifications must contain the following:<br>**(1)** The designation of alternate airports that may be used for enroute diversions and the requirements the airports must meet at the time of diversion.<br>**(2)** Except for supplemental, all-cargo operations, a recovery plan for passengers at diversion alternates.<br><br>**(3)** A fuel-freeze strategy and procedures for monitoring fuel freezing.<br><br>**(4)** A plan to ensure communication capability for these operations.<br><br>**(5)** An MEL for these operations.<br><br>**(6)** A training plan for operations in these areas.<br><br>**(7)** A plan for mitigating crew exposure to radiation during solar flare activity.<br><br>**(8)** A plan for providing at least two cold weather anti-exposure suits in the aircraft, to protect crewmembers during outside activity at a diversion airport with extreme climatic conditions. The FAA may relieve the certificate holder from this requirement if the season of the year makes the equipment unnecessary. | Certificate holders must submit an application with all supporting data to their local CHDO office. This application must address all the regulatory requirements for Polar operations and the guidance in this AC. The application should be submitted at least 60 days prior to the proposed start of polar operations with the specific airplane-engine combination. | Except for intrastate operations within the State of Alaska.<br><br>These requirements are in addition to any applicable ETOPS requirements listed in chapters 3 and 4 of this AC.<br><br>The validation requirements of this approval include an exercise of the certificate holder's passenger recovery plan as per 605.. |

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## Appendix 3. ETOPS Approval Methods

The two different approval methods available for a certificate holder's use are described in this appendix.

1. IN-SERVICE EXPERIENCE METHOD (TWO-ENGINE ETOPS FOR UP TO 180–MINUTE ETOPS).

a. General.

(1) An in-service experience program is one way of gaining ETOPS operational approval. As a prerequisite to obtaining any operational approval, the certificate holder should show that an acceptable level of propulsion system reliability has been achieved in service by the world fleet for that particular airplane-engine combination. The candidate certificate holder also should obtain sufficient maintenance and operation familiarity with the particular airplane-engine combination. Each certificate holder requesting approval to conduct ETOPS by the in-service method should have operational experience appropriate to the operation proposed.

(2) This appendix contains guidelines for requisite in-service experience. These guidelines may be reduced or increased following review and concurrence on a case by case basis by the Director, Flight Standards Service. Any reduction or increase in in-service experience guidelines will be based on an evaluation of the certificate holder's ability and competence to achieve the necessary reliability for the particular airplane-engine combination in ETOPS. For example, a reduction in in-service experience may be considered for a certificate holder who can show extensive in-service experience with a related engine on another airplane that has achieved acceptable reliability. In contrast, an increase in in-service experience may be considered for those cases where heavy maintenance has yet to occur and/or abnormally low number of takeoffs has occurred.

b. Specific Approvals.

(1) 75- and 90-Minute Operation. Consideration may be given to the approval of 75-minute and 90-minute ETOPS for certificate holders with minimal or no in-service experience with the airplane-engine combination. This determination considers such factors as the proposed area of operations, the certificate holder's demonstrated ability to successfully introduce airplanes into operations, and the quality of the proposed maintenance and operations programs.

(2) 120-Minute Operation. Each certificate holder requesting approval to conduct ETOPS with a maximum diversion time (in still air) of 120 minutes should have 12 consecutive months of operational in-service experience with the specified airplane-engine combination. In-service experience guidelines may be increased or decreased by the Director, Flight Standards Service.

(3) 180-Minute Operation.

(a) Each certificate holder requesting approval to conduct ETOPS with a maximum diversion time (in still air) of 180 minutes should have previously gained 12 consecutive months of operational in service experience with the specified airplane-engine combination in conducting 120-minute ETOPS. In-service experience guidelines may be reduced or increased by the Director, Flight Standards Service. Likewise, the substitution of in-service experience, which is equivalent to the actual conduct of 120-minute ETOPS operations, also will be established by the Director, Flight Standards Service, on a case by-case basis.

(b) Before approval, the certificate holder's capability to conduct operations and implement effective ETOPS programs in accordance with the criteria detailed in this AC will be examined. Only certificate holders who have demonstrated capability to successfully conduct a 120-minute program will be considered for approval beyond 120 minutes. Approval will be given on a case-by-case basis for an increase to their area of operation beyond 120 minutes. The dispatch limitation will be a maximum diversion time of 180 minutes to an ETOPS alternate at an approved one-engine-inoperative speed (under standard conditions in still air).

c. Requesting Approval. A certificate holder requesting approval under Title 14 of the Code of Federal Regulations (14 CFR) part 121, § 121.161 for ETOPS under this method should submit the request with the required supporting data to its CHDO at least 60 days before the proposed start of ETOPS operation with the specific airplane-engine combination. In considering an application from a certificate holder to conduct ETOPS, the CHDO should assess the certificate holder's overall safety record, past performance, flight crewmember training, and maintenance programs. The data provided with the request should substantiate the certificate holder's ability and competence to safely conduct and support these operations and should include the means used to satisfy the considerations outlined in this paragraph.

2. ACCELERATED ETOPS METHOD (UP TO 180-MINUTE ETOPS FOR TWO-ENGINE AIRPLANES AND FOR ALL ETOPS FOR PASSENGER-CARRYING AIRPLANES WITH MORE THAN TWO ENGINES). This section describes the means by which a certificate holder may initiate ETOPS operations when the certificate holder establishes the processes necessary for successful and reliable ETOPS operations and proves to the FAA that such processes can be successfully applied throughout the applicant's ETOPS operations. This may be achieved by thorough documentation and analysis of processes and process validation, or demonstration on another airplane/validation (as described under process validation in this appendix, below) or a combination of these processes.

a. ETOPS Processes. The airplane-engine combination for which the certificate holder is seeking accelerated ETOPS operational approval must be ETOPS type design-approved (except for two-engine ETOPS at 75- and 90-minute authorizations and for passenger-carrying airplanes with more than two engines manufactured prior to March 17, 2015) and determined to be operating at a satisfactory level of reliability before commencing ETOPS. The certificate holder seeking accelerated ETOPS operational approval must demonstrate to the FAA that it has an ETOPS program in place that consists of all the following applicable ETOPS process elements:

(1) The process elements defined as the ETOPS maintenance and operations requirements of Chapter 3, paragraphs 301–304.

(2) Documentation of the following elements as appropriate:

(a) Technology new to the certificate holder and significant difference in primary and secondary power (engines, electrical, hydraulic, and pneumatic) systems between the airplanes currently operated and the two-engine airplane for which the certificate holder is seeking ETOPS operational approval.

(b) The plan to train flight and maintenance personnel to the differences identified in the maintenance subparagraph above.

(c) The plan to use proven manufacturer-validated training and maintenance and operations manual procedures relevant to ETOPS for the two-engine airplane for which the certificate holder is seeking accelerated ETOPS operational approval.

(d) Changes to any previously proven validated training, maintenance or operations manual procedures used in previous non-ETOPS operations or in previous ETOPS with a different airplane-engine combination and/or geographic area of operations. Depending on the nature and extent of any changes, the certificate holder may be required to provide a plan for validating such changes.

(e) The validation plan for any additional certificate holder unique training and procedures relevant to ETOPS.

(f) Details of any ETOPS program support from the airframe manufacturer, engine manufacturer, other certificate holders or any other outside person.

(g) The control procedures when maintenance or flight dispatch support is provided by an outside person as described above.

b. Process Validation Methodology.

(1) Paragraph (a) identifies those process elements that should be proven before ETOPS authority is granted by the FAA under the accelerated ETOPS approval program. For a process to be considered proven the process should first be defined. Typically, this will include a flow chart showing the various elements of the process. Roles and responsibilities of the personnel who will be managing this process should be defined including any training requirement. The certificate holder should demonstrate that the process is in place and functions as intended. The certificate holder may accomplish this by thorough documentation and analysis, or by demonstrating on an airplane, that the process works and consistently provides the intended results. The certificate holder should define the necessary evaluation duration to validate the process and also show that a feedback loop exists to illustrate need for revision of the process, if required, based on in-service experience.

(2) Normally the choice to use or not to use demonstration on an airplane as a means of validating individual processes should be

determined by the certificate holder. Process validation may be done with the airframe-engine combination that will be used in ETOPS. It can also be done with a different airplane type from that for which ETOPS approval is being sought, including an airplane with more than two engines, if it can be shown that the particular airplane-engine combination in the certificate holder's ETOPS program is not necessary to validate a process. With sufficient preparation and dedication of resources, such validation may not be necessary to assure processes that produce acceptable results. However, if the plan proposed by the certificate holder to prove processes is determined by the FAA to be inadequate or the plan does not produce acceptable results, validation of the processes with an airplane will be required.

(3) If a certificate holder currently is conducting ETOPS with a different airplane-engine combination, it may be able to document that it has proven ETOPS processes in place with only minimal further validation required. If the certificate holder has similar non-ETOPS operations and can simulate or demonstrate proven ETOPS processes in such operations, credit can be given for such successful evaluations. In either case, the certificate holder should demonstrate that the means are in place to assure equivalent results with the airplane-engine combination being proposed for ETOPS operational approval. The following elements may aid in justifying a reduction in the validation requirement of ETOPS processes:

(a) Experience with other airframes and/or engines,

(b) Previous ETOPS experience,

(c) Experience with long range, overwater operations with two-, three-, or four-engine airplanes, and

(d) Experience gained by flight crewmembers and maintenance and flight dispatch personnel while working with other ETOPS-approved certificate holders.

c. Application for Accelerated ETOPS Program. The certificate holder seeking accelerated ETOPS operational approval should submit an Accelerated ETOPS operational approval plan to the FAA six months before the proposed start of ETOPS. This will provide sufficient time for the certificate holder and the FAA to validate the effectiveness of all ETOPS process elements (''proven process''). The certificate holder's application for ETOPS should—

(1) State the ETOPS authority requested. Define proposed routes and the ETOPS diversion time necessary to support these routes and the airplane-engine combination to be flown.

(2) Define processes and related resources being allocated to initiate and sustain ETOPS operations in a manner that demonstrates commitment by management and all personnel involved in ETOPS maintenance and operational support.

(3) Provide a documented plan for compliance with requirements listed in this section for Accelerated ETOPS.

(4) Define Review Gates. A review gate is a milestone-tracking plan to allow for the orderly tracking and documentation of specific provisions of this Appendix. Each review gate should be defined in terms of the process elements to be validated. Normally, the review gate process will start six months before the proposed start of ETOPS and should continue until at least six months after the start of ETOPS. The review gate process will help ensure that the proven processes comply with the provisions of this AC and are capable of continued ETOPS operations.

d. Validation of Process Elements. When the certificate holders accelerated ETOPS plan receives approval by the CHDO and final concurrence by AFS–200, a validation of the process elements of the accelerated ETOPS plan should begin. Close coordination between the certificate holder and the FAA is necessary for a successful validation of the ETOPS plan. All process elements required in paragraph (a) should be validated.

(1) Before the start of the validation of the process elements, the following information should be part of the Accelerated ETOPS plan submitted to the FAA:

(a) Validation periods, including start dates and proposed completion dates.

(b) Definition of airplane(s) to be used in the validation. List should include registration numbers, manufacturer and serial number and model of the airframes and engines.

(c) Description of the areas of operation (if relevant to validation objectives) proposed for validation and actual ETOPS.

(d) Definition of designated ETOPS validation routes. The routes should be of duration necessary to ensure process validation occurs.

(2) Process validation reporting. The certificate holder should compile results of ETOPS process validation. The certificate holder should:

(a) Document how each element of the ETOPS process was utilized during the validation.

(b) Document any shortcomings with the process elements and measures in place to correct such shortcomings.

(c) Document any changes to ETOPS processes that were required after an IFSD, unscheduled engine removals, or any other significant operational events.

(d) When there is concurrence between the certificate holder and the CHDO that a process element has been successfully proven, the review gate should be closed and confirmation documented.

(e) Provide periodic process validation reports to the FAA. This should be addressed during the review gates.

(3) The certificate holder should include a final review gate prior to final ETOPS approval that is the validation flights described in Chapter 4, paragraphs 404 and 405 of this AC. This review gate should ensure that all ETOPS processes have been proven.

(4) Any validation program should address the following:

(a) The certificate holder should show that it has considered the impact of the ETOPS validation program with regard to safety of flight operations. The certificate holder should state in its application any policy guidance to personnel involved in the ETOPS process validation program. Such guidance should clearly state that ETOPS process validation exercises should not be allowed to adversely impact the safety of operations especially during periods of abnormal, emergency, or high cockpit workload operations. It should emphasize that during periods of abnormal or emergency operation or high cockpit workload ETOPS process validation exercises may be terminated.

(b) The validation scenario(s) should be of sufficient frequency and operational exposure to validate maintenance and operational support systems not validated by other means.

(c) A means must be established to monitor and report performance with respect to accomplishment of tasks associated with ETOPS process elements. Any recommended changes to ETOPS maintenance and operational process elements should be defined.

e. Final Approval for Accelerated ETOPS Authority. At the successful completion of the certificate holder's accelerated ETOPS validation program all process elements should have been validated and appropriate review gates closed. Report of a successful completion of review gates will be forwarded by the CHDO to AFS–200. Upon final concurrence and approval, the applicant should forward to the FAA a plan for final validation flights to be conducted over proposed routes in the ETOPS area of operation and in the airframe-engine combination listed in the certificate holder's application. This FAA witnessed ETOPS validation flight or flights will be conducted in accordance with Chapter 4, paragraphs 404 and 405 of this AC. The purpose of these flights is for the certificate holder to demonstrate to the FAA that it has the competence and capability to safely conduct and adequately support the intended ETOPS operation.

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