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FOREWORD

This advisory circular (AC) provides certificate holders with guidance for obtaining operational approval to conduct Extended Operations (ETOPS) under Title 14 of the Code of Federal Regulations (14 CFR) part 135. The Federal Aviation Administration (FAA) may authorize operations over a route that contains a point farther than 180 minutes flying time from an adequate airport at an approved one-engine inoperative cruise speed under standard conditions in still air. This AC also provides guidance for obtaining authorization to conduct operations under part 135 in the North Polar Area.

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CHAPTER 1. GENERAL

100. PURPOSE.

a. This advisory circular (AC) provides certificate holders guidance for obtaining operational approval to conduct Extended Operations (ETOPS) under Title 14 of the Code of Federal Regulations (14 CFR) part 135, § 135.364. Operations under part 135 with multi-engine powered airplanes may be authorized over a route that contains a point farther than 180 minutes flying time, but no more than 240 minutes flying time, from an airport meeting the requirements of § 135.385 or § 135.393 and § 135.219 at an approved one-engine inoperative cruise speed (see part 135 and Appendix 1 for definition of one-engine inoperative cruise speed) under standard conditions in still air. This AC also provides guidance for obtaining authorization under § 135.98 to conduct operations in the North Polar Area.

b. This AC provides an acceptable means of complying with the regulations; however, it is not the only means of compliance. When this AC uses mandatory language (e.g., "must" or "may not") it is quoting or paraphrasing a regulatory requirement or prohibition. When this AC uses permissive language (e.g., "should" or "may"), it describes an acceptable means, but not the only means, of obtaining operational approval to conduct ETOPS under part 135, § 135.364.

c. This AC also provides information and guidance that could be useful for certificate holders conducting flights less than 180 minutes from an airport during other long range operations.

101. APPLICABILITY. This AC provides guidance to certificate holders applying for approval to conduct ETOPS under part 135. This AC also provides guidance to certificate holders and other operators currently conducting such operations in resolving operational issues that may arise.

102. CANCELED ACS AND POLICY LETTERS. None, this is a new AC having applicability to part 135 operations.

103. RELATED REGULATIONS (current editions).

a. Appendix G to part 135, Extended Operations.

b. Appendix P to part 121, Requirements for ETOPS and Polar Operations.

c. Appendix K to part 25, Extended Operations.

d. AC 120-42, Extended Range Operations With Two Engine Operations.

e. Sections 135.98, 135.345, 135.364, 135.385, 135.387, 135.393, 135.395, 135.219, 135.321, and 135.411.

CHAPTER 2. ETOPS BACKGROUND

200. ETOPS REGULATORY REQUIREMENTS.

a. All airplanes operated under part 135 are required to comply with § 135.364. This regulation imposes special requirements for multi-engine airplanes to operate over a route that contains a point farther than 180 minutes flying time at an approved one-engine inoperative cruise speed in still air from an adequate airport outside the continental United States. Special requirements are imposed for any airplane that operates a route, a portion of which enters these areas of operation. It is significant to note that this rule applies equally to airplanes operating over oceanic areas or over land.

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. However, appendix G to part 135 allows those airplanes manufactured prior to February 16, 2015, to be grandfathered from the ETOPS type certification requirements. In addition, the certificate holder must be approved for ETOPS under part 135. As with all other operations, a certificate holder requesting any route approval must 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.

201. EXTENDED OPERATIONS (ETOPS). Since 1985, the acronym, ETOPS, has been defined as “extended twin operations” and has been limited to part 121 airplanes with only two engines. Current regulations have extended these applications to airplanes operating in both 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 operations of all airplanes operating today and the common issues that impact such operations. Even though for continuity with current two-engine operations the existing acronym ETOPS is retained, the ETOPS acronym has been re-defined. The concept has been expanded to include all passenger carrying airplane operations in part 135 planned 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).

202. ETOPS APPLICABILITY TO PART 135 LONG RANGE OPERATIONS.

a. The Federal Aviation Administration (FAA) and industry analysis of the accidents and incidents involving longer range operations conducted in accordance with (IAW) part 135 indicate that they have been conducted for many years with a high degree of safety without regulatory limitations on range. Before February 15, 2007, no additional regulations had been promulgated. In recent years, several manufacturers have produced new airplanes with range capabilities that could take them well beyond 180 minutes from an airport. As a result these airplane operations are now compatible with those long range operations typically associated with large three- and four-engine part 121 airplanes. Because of their smaller maximum payload and seating capacity, despite their range capabilities, these airplanes are authorized to operate IAW part 135.

b. Those geographic areas not within 180-minutes of an airport tend to be remote areas of the world that are uniquely challenging for all certificate holders and airplanes, regardless of the number of engines. Some of these issues are extremes in terrain and meteorology and limited navigation and communications infrastructure. The margin of safety is increased when adequate consideration is made for a possible diversion and subsequent recovery in such areas. These considerations include additional crewmember and maintenance technician training, assurance that certain airplane equipment and systems are installed and functioning before takeoff, more thorough flight planning, and additional fuel reserves. The development and application of ETOPS requirements is intended to address all these issues.

c. ETOPS requirements are intended to address all these issues, while also bringing FAA regulations into compliance with International Civil Aviation Organization (ICAO) Standards and Recommended Practices.

NOTE: The ICAO Standards and Recommended Practices, Annex 6, Operations of Aircraft, Part I-International Commercial Air Transport-Airplanes, states that unless the operation has been specifically approved by the state of the certificate holder, no twin-engine aeroplane shall be operated on a route where the flight time at single engine cruise speed to an adequate airport exceeds a threshold time established for such operations. The United States is a signatory to ICAO.

203. ETOPS AREAS OF OPERATION.

a. An ETOPS area of operation is an area within the authorized ETOPS maximum diversion time approved for the operations being conducted. For multi-engine airplanes operating under part 135 it is described as an area beyond 180 minutes from an adequate airport, planned to be no more than 240 minutes from an adequate airport, in still air at normal cruise speed with one-engine inoperative. 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 Administrator for approval to operate in an ETOPS area using the methodologies in this AC and will be granted ETOPS authority for a specific ETOPS area of operations in their operations specifications (OpSpecs).

b. 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. The area bounded by distance circles from adequate airports representing the approved one-engine inoperative cruise speed under standard conditions in still air chosen by the applicant is normally used during the route planning stage to determine an ETOPS area of operation. During this initial route planning stage, an operator first undertakes a determination if the ETOPS requirements apply to the planned operation. Using a value of the airplanes one-engine inoperative cruise speed selected by the certificate holder (see Appendix 1, definition #12 of this AC) from a range of speeds approved by the FAA that is within the certificated operating limits of the airplane, the operator determines 180-minute distance circles from adequate airports in the area of the proposed routing. If the proposed routes remain within this area, the operation is not defined as ETOPS and is not subject to the

requirements of appendix G of part 135 and this guidance. As long as the adequate airports used in this process remained viable, this determination applies to any subsequent flight planning in this area bounded by these distance circles regardless of the actual conditions encountered on any particular flight. However, once a certificate holder determines from their route planning that the ETOPS requirements apply, all subsequent flight planning in the ETOPS area of operation must account for the affects of wind and temperature on the calculated distances from each ETOPS alternate airport. The time-limited capabilities of certain airplane systems must be able to support these varying distances to maintain dispatch reliability. It is therefore incumbent on a certificate holder who applies for ETOPS approvals to have time limited system capabilities that can satisfy the regulations under expected meteorological conditions over planned routes or have airports of sufficient availability to support the maximum ETOPS type design capability of the airplane-engine combination in their application.

204. ETOPS RISK MANAGEMENT AND THE LEVEL OF SAFETY.

a. Current service experience for the newest generation of engines developed for airplanes typically operated over long distances IAW part 135 indicate that engine reliability may not be the most significant issue relative to the safety of ETOPS or any long range flight. As propulsion systems have achieved ever-increasing levels of reliability, other systems and operational issues have increased in their relevance to the overall level of safety of the flight.

b. The number of airplanes and operations conducting ETOPS under part 135 is forecast to remain relatively small for the foreseeable future. This greatly reduces the usefulness and reliability of safety trend analysis based on fleet averages of specific airframe/engine combinations. Accordingly, the means of ensuring an adequate level of safety for ETOPS is to require that certificate holders and manufacturers of airplanes conducting ETOPS evaluate each reported malfunction, incident, or accident pertaining to an airframe, powerplant system, or other critical component on an airplane that is relevant to the conduct of ETOPS. Subsequent to this evaluation, corrective action may be required on the part of the certificate holder or manufacturer before ETOPS operations continue.

205. ETOPS RELIABILITY AND SYSTEMS SUITABILITY REQUIREMENTS.

a. The safety of long-range operations (ETOPS) depends on the reliability of all critical airplane systems, including the propulsion systems. Therefore, a comprehensive program to monitor the reliability of flight-critical systems is essential. The type design requirements of ETOPS certification consider the probability of any condition that reduces 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 ETOPS 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.

b. Following a determination that the airframe systems and propulsion systems are ETOPS type design approved as per Federal Air Regulation (FAR) 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.

206. PRECLUDE AND PROTECT.

a. ETOPS is intended to preclude a diversion and, if it were to occur, have programs in place that protect that diversion. Under this concept, propulsion systems and other airplane systems are designed and tested to ensure an acceptable level of reliability. Maintenance practices monitor the condition of engines so as to identify problems before they cause diversions, and take aggressive steps to identify and resolve airplane systems and engine problems once they are identified. All are intended to minimize the potential for procedural and human errors, thereby precluding a diversion.

b. However, despite the best design/testing and maintenance practices for airplanes, situations may occur that require an airplane to divert. Regardless of whether the diversion is for technical (airplane or engine systems) or non-technical reasons (crewmember or passenger illness), there must be a flight operations plan to protect that diversion, ensuring that it is successful. Such a plan may include ensuring that pilots are knowledgeable about the availability of en route alternate airport alternates, weather conditions at those alternates, adequate ability to communicate with appropriate flight following services and air traffic control (ATC), sufficient fuel to divert to the alternate, etc.

c. Under the preclude and protect concept, various failure scenarios are considered. For example, during the design of the airplane, time limited systems such as oxygen capability must be considered. Fuel planning must account for an engine failure, the possibility of a decompression, and subsequent descent to a lower altitude. It must also include considerations for encountering en route icing at the lower altitude. The best options under any of these scenarios should be provided to the pilot before and during the flight.

d. Airplanes divert from time to time for various reasons, most of which are not related to failure of a powerplant. Airplanes with more than two engines also operate in areas where there are a limited number of en route airports, the support infrastructure is marginal, or there are challenging weather conditions. All ETOPS flights, therefore, regardless of the number of engines on the airplane, must adopt the same preclude and protect concept. If operations with airplanes with more than two engines are contemplated in areas where en route airports are farther than 180 minutes flight time, these operations also are required to meet the standards defined under ETOPS. This ensures that sufficient efforts are made to preclude a diversion and, if a diversion does occur, procedures are in place to protect that diversion.

207. ETOPS ALTERNATE AIRPORT 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 after a single failure or combination

of failures. Whereas most airplanes operate in an environment where there is a choice of diversion airports available within close proximity to the route of flight, an airplane conducting ETOPS may have only one alternate within a range dictated by the endurance of a particular airframe system. Therefore, it is important that any airport designated as an ETOPS alternate airport has the capabilities and facilities to safely support the airplane and its passengers and crewmember for the diversion. The weather conditions at the time of arrival should provide assurance that adequate visual references are available upon arrival at decision height or minimum descent altitude (MDA), and the surface wind conditions and corresponding runway surface conditions must be within acceptable limits to permit the approach and landing to be safely completed with an engine and/or systems inoperative.

b. When the airplane departs on a route planned for ETOPS, an en route alternate must meet alternate weather requirements specified in the certificate holder's OpSpec. 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 to provide for some deterioration in weather conditions after planning, prior to the time that the instrument approach will be conducted. This increases the probability, considering weather conditions, that the flight will land safely after a diversion to an alternate airport.

c. While en route, the forecast weather for designated ETOPS alternate airports is expected to remain at or above operating minima. This allows the pilot in command (PIC) of an ETOPS flight to successfully resolve diversion decisions. While in-flight, the suitability of an ETOPS alternate airport is based solely on a determination that the weather and field conditions at that airport at the predicted time of arrival will permit an instrument approach to be initiated and a safe landing completed.

208. ETOPS IN-SERVICE EXPERIENCE.

a. Safety is enhanced when, before conducting ETOPS, a certificate holder gains operational experience in the type of airplane capable of ETOPS, and with the operational environment typically encountered on longer range flights in areas where airports available for an en route diversion are limited. Typically, this involves prior operational experience on overwater flights to international areas of operation IAW part 135. However, it is recognized that once a certificate holder is authorized to conduct ETOPS with one type of airplane, the procedures and systems are in place to support additional airplane types. Therefore, when a certificate holder currently authorized to conduct ETOPS adds additional ETOPS capable airplane types, the 12 months experience requirements under appendix G, part 135, § G135.2.2. Required certificate holder experience prior to conducting ETOPS, will not apply.

b. A firm commitment by the certificate holder to establish adequate ETOPS procedures before the start of actual operations, and continued commitment throughout the life of the program to continually review these procedures, is a significant factor in safe and reliable ETOPS.

CHAPTER 3. REQUIREMENTS FOR ETOPS AUTHORIZATION

Section 135.364 permits operation of passenger-carrying airplanes over a route that contains a point farther than 180 minutes flying time from an airport in still air at normal cruising speed with one-engine inoperative when approved by the Administrator. Certificate holders seeking approval for ETOPS must incorporate ETOPS requirements into their approved operations, and if required, maintenance programs. ETOPS must be authorized in the certificate holder's OpSpecss and conducted in compliance with those sections of part 135 applicable to ETOPS, including appendix G.

Two independent transmitters and two independent receivers, appropriate to the planned route, are required for ETOPS flights. At least one of each must be capable of voice communication. If operating in areas where voice communication is not possible or of poor quality, alternate systems such as data link may be used.

300. AIRPLANE REQUIREMENTS FOR ETOPS AUTHORIZATION.

a. Airplanes Manufactured after February 15, 2015. No person may operate a passenger-carrying multi-engine airplane that was manufactured after February 15, 2015 IAW ETOPS unless the airplane is certificated for ETOPS under 14 CFR part 25, § 25.1535.

b. Airplanes Manufactured on or Before February 15, 2015. Passenger-carrying, multi-engine airplanes manufactured on or before February 15, 2015 do not need to be type designed for ETOPS IAW § 25.1535. However, the airplane should be acceptable to the Administrator.

301. CERTIFICATE HOLDER REQUIREMENTS FOR ETOPS AUTHORIZATION.

a. Operational Experience.

(1) As international operating experience typically involves long-range flights, before applying for authorization to conduct ETOPS a certificate holder must have at least 12 months experience operating a transport-category multi-engine airplane in international operations (excluding Canada and Mexico). Operations to or from the State of Hawaii may be considered as experience in international operations.

(2) Certificate holders granted authority to operate under part 135 or part 121 before February 15, 2007, may credit up to 6 months of domestic operating experience (including Canada and Mexico) in a transport category airplane as part of the required 12 months of international experience.

(3) Operating experience gained by a certificate holder in operating any type of equipment in ETOPS may be credited towards the operating experience requirements.

b. Oversight Activities.

(1) Certificate holders should ensure that:

(a) All appropriate management personnel are aware of the unique and demanding nature of ETOPS.

(b) Airplanes involved in ETOPS receive the highest feasible level of flight-following services.

(2) Certificate holders should:

(a) Ensure that airplanes flown IAW ETOPS are maintained and equipped according to recommended ETOPS standards and practices.

(b) Ensure that flightcrew and maintenance personnel involved in ETOPS are properly trained and qualified in all aspects of ETOPS per the certificate holders approved programs.

(c) Develop a minimum equipment list (MEL) that reflects the unique aspects of ETOPS for each type of airplane operating IAW ETOPS.

(d) In addition to the information required in § 135.83, certificate holders must ensure flight crewmembers, for preflight and during flight, have access to the most current information available about possible ETOPS alternates, destination and destination alternate airports to include:

1. Airports.

- Facilities (for example snow removal, fuel availability, aircraft rescue, and fire fighting capability)
- Navigation and communications aids,
- Construction affecting takeoff, landing, or ground operations, and
- Air traffic facilities.

2. Runways, clearways, and stopways.

- Dimensions,
- Surface,
- Marking and lighting systems, and
- Elevation gradient.

3. Displaced thresholds.

- Location,
- Dimensions, and
- Take off, landing or both.

302. FLIGHT CREWMEMBER TRAINING REQUIREMENTS FOR ETOPS. The certificate holder's flight crewmember training program must provide ETOPS training for flight crewmember IAW its approved program for ETOPS. The training should include, but is not limited to, the following areas:

a. ETOPS regulations and advisory materials.

b. Review of representative routes and airports within a ETOPS area of operation.

c. Procedures for determining the ETOPS entry point and maximum diversion distance allowed under ETOPS.

d. Procedures for determining, before entry into an ETOPS area of operation, that critical systems and components are operating within normal parameters. Critical Systems and components that may affect the decision to enter into the ETOPS area of operation include, but are not limited to the following:

(1) Engines and powerplants.

(2) Pressurization.

(a) Dual sources of pressurization.

(b) Automatic pressurization mode.

(3) A sufficient supply of oxygen for the planned flight, and the impact oxygen endurance may have on fuel requirements.

(4) Auto flight system, including:

(a) Altitude hold.

(b) Heading hold.

(5) Electrical systems.

e. Airplane performance, including engine-out performance data, driftdown, engine-out service ceiling data, and engine-out instrument approach procedures.

f. Flight preparation, planning, and preflight, including:

(1) ETOPS alternate airport requirements.

(2) Conduct a crewmember briefing for each ETOPS leg.

(3) Inflight procedures for updating weather forecasts and other reports of airport conditions.

(4) Fuel/oil requirements at departure, including calculation of reserves required for:

(a) Identification of the most critical fuel-use scenario and most critical point for a diversion during a flight, considering possible one-engine failure and/or airplane depressurization with all engines operating or one engine out.

(b) The uncertainty of long term terminal and en route weather forecasts.

(c) The uncertainty of en route wind forecasts in remote areas.

(d) Possible navigational inaccuracy.

g. Flight progress monitoring, including fuel management procedures in the event a diversion is necessary for any reason.

h. Criteria for selecting appropriate ETOPS alternate airports, both during flight planning and in flight, including the impact of en route changes in weather forecasts and other operational conditions that may impact use of these airports.

i. Procedures and guidelines for making timely and appropriate diversion decisions and implementing appropriate diversion procedures, including:

(1) Use of alternate navigation and communication systems, including flight management devices.

(2) Abnormal and emergency procedures to be followed in the event of equipment or systems failures during ETOPS, including:

(a) Considerations for single, multiple, and compounding (that is, one failure leads directly or indirectly to the failure of another piece of equipment) failures in flight that would precipitate a go/no-go and diversion decision. For example, if standby sources of electrical power significantly degrade cockpit instrumentation to the pilots, training should include considerations for flying an instrument approach with instruments powered only by an alternate source of electrical power.

(b) Operational restrictions associated with equipment or component/systems failures, including restrictions associated with existing deferred maintenance items (MEL and/or Configuration Deviation List considerations).

(c) Use of emergency equipment, including duration of time limited systems such as battery, oxygen, and fire extinguishing.

(d) Procedures to be followed in the event a planned ETOPS alternate airport is no longer acceptable.

j. Understanding of normal and abnormal/emergency procedures for additional or equipment modified specifically for ETOPS (modified oxygen and fuel systems).

k. Fuel management procedures and monitoring/logging procedures to be followed during the en route portion of the flight. These procedures should provide for an independent cross

check (manual versus automatic or pilot versus copilot) of fuel quantity indicators. For example, fuel flows could be used to calculate fuel burned and compared to fuel loaded minus indicated fuel remaining.

l. ETOPS Pre-departure Service Check (PDSC) is a maintenance task, performed by trained, qualified, and certificated maintenance personnel immediately prior to an ETOPS flight. In the event an ETOPS flight is departing from an airport lacking the required maintenance personnel to perform the task, a flight crewmember that holds an airframe and powerplant certificate and is ETOPS trained and qualified to perform the PDSC, may perform the task.

m. Methods of maintaining position and situational awareness.

n. Methods of determining the location of the nearest en route alternate airports.

o. Use of plotting charts, both preflight and in flight.

p. Responsibilities following an unscheduled landing.

NOTE: Check airman used by the certificate holder for ETOPS training should ensure standardized flight crewmember practices and procedures are followed and emphasize the special nature of ETOPS. In addition to the check airman qualification and training requirements of §§ 135.337 and 135.339, certificate holders should require that company check airman understand the unique requirements of ETOPS.

303. 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 § 135.411(d), which are discussed in this section.

a. Maintenance Program Requirements. The basic maintenance program for the airplane being considered for ETOPS is the certificate holder's continuous airworthiness maintenance program. Each airplane authorized to conduct ETOPS must be maintained under such a program as provided in § 135.411(a)(2) regardless of the airplane-engine combination, size and seating configuration, plus the additional requirements contained in appendix G to part 135. In addition to the basic, minimum CAMP requirements, the certificate holder must develop and use an ETOPS maintenance program to include the following:

(1) 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 OpSpecs. 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 basic ETOPS requirements, which will be incorporated as supplemental requirements to the 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 are referred to in the industry as ETOPS processes or ETOPS process elements. Prospective ETOPS certificate holders must supplement their basic CAMP with the following program elements defined in paragraph b through p below.

b. ETOPS Maintenance Document. The certificate holder must develop a document for use by personnel involved in ETOPS. This may be a separate document or a part of other maintenance documents. It 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 and each revision must be submitted to the CHDO and be approved before being adopted.

c. ETOPS 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. The prerequisite for an acceptable PDSC is 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. Specifically, the PDSC is a maintenance task that should include an applicable maintenance records review and an interior and exterior inspection. The PDSC is sometimes referred to as an expanded transit check inspection. The PDSC should include visual inspections and procedures applicable to determining ETOPS Significant Systems airworthiness status. The airworthiness status determination should include a process for determining engine and auxiliary power unit (APU) oil quantities, and consumption rates prior to ETOPS dispatch. Note: Proper servicing of fluids, such as engine, APU, generator systems, and hydraulic systems is a vital ingredient to successful ETOPS operations. Some current Part 121 ETOPS operators have had incidents resulting from improper fluid servicing, or not properly determining or addressing high consumption rates. This has resulted in in-flight shutdowns (IFSD) and diversions. Part 135 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 enhanced CASS program and are not related to ETOPS significant systems. However, the certificate holder clearly must identify the ETOPS related tasks on their PDSC if non-ETOPS qualified maintenance personnel are to accomplish the non-ETOPS tasks. An appropriately trained maintenance person who is ETOPS-qualified, and authorized by the certificate holder, must accomplish and certify by signature the completion of ETOPS specific tasks. An appropriately trained person who is ETOPS qualified and authorized by the certificate holder must certify by signature, that the ETOPS pre-departure service check has been completed. Appropriately trained persons are those that have satisfactorily completed the certificate holder's

ETOPS training program. The signatory person that certifies the completion of the PDSC must also meet the following criteria:

(a) Inside the United States, the signatory person holds a U.S. mechanic's certificate with airframe and powerplant ratings, and works for an operator authorized to engage in part 135 or part 121 operations, or works for a part 145 repair station,

(b) Outside the United States, the signatory person holds a U.S. mechanics certificate with airframe and powerplant ratings, or holds a certificate IAW § 43.17(c) (1), or

(c) Works for an ETOPS maintenance entity and has the requisite experience or specific training needed to accomplish the task and is authorized to complete the PDSC and return the aircraft to service on behalf of the ETOPS maintenance entity. (The signatory person does not have to hold a U.S. or Canadian certificate),

(d) An ETOPS maintenance entity is an entity that has been authorized to perform ETOPS maintenance and authorized by the certificate holder to complete ETOPS pre-departure service checks. That entity is certificated to engage in part 135 or part 121 operations; a repair station certificated under part 145, or an entity authorized pursuant to § 43.17(c)(2),

(4) The 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, and

(5) 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 an ETOPS Significant System discrepancy that requires maintenance intervention, another PDSC is required.

d. ETOPS Dual Maintenance Procedures.

(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 operation 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 on both air cycle machines (or equivalent) in the air conditioning systems during a turnaround flight; removal of 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 and the No. 2 engine-driven pump.

(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 or non-routine 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 also 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, for example, when an ETOPS airplane has inbound discrepancies on both engines' oil systems, or there is a generator problem on one engine, and an oil system discrepancy on the other engine. 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 should attempt to minimize dual maintenance on ETOPS Significant Systems wherever/whenever possible.

(a) 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 address this situation. At a minimum, the certificate holder must ensure:

1. Separate ETOPS-qualified maintenance persons perform the tasks,

2. 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

3. It verifies the effectiveness of the corrective actions to those ETOPS Significant Systems before the airplane enters the ETOPS area of operations. The 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 Central Maintenance Control person may perform the dual maintenance and the ground verification methods only if in-flight verification action is performed.

(b) The FAA acknowledges that the servicing of fluids and gases is not considered maintenance; however, these task 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 programs should include detailed servicing instructions or make readily available servicing instructions. Additionally, the certificate holders should consider including oil servicing in their ETOPS on-the-job training (OJT) program, regardless of whether one individual or multiple individuals perform the task.

e. Verification Program.

(1) The certificate holder must develop a verification program for resolution of airplane discrepancies (corrective action) in 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 and prior to ETOPS flight or entering ETOPS entry point. The ground verification method is accomplished by following the ICA contained in the airplane maintenance manuals or the certificate holder's maintenance manuals. These ICAs include built-in test equipment, functional, and 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 maybe 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 ETOPS cruise altitude after cold soaking. In-flight verification may be conducted on revenue flights provided the action is completed before the ETOPS entry point. In those cases where the verification flight will reach the ETOPS entry point approximately 60 minutes into the flight, e.g., departing from an island, and the inflight verification is for APU inflight starting which requires a two-hour cold soak, (see paragraph 301m., "APU In-Flight Start Program"), the operator can initiate the flight with the APU running and shut it down two hours prior to top of descent and initiate the inflight APU start before top of descent. 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 it 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 tasks must be accomplished by ETOPS-qualified personnel.

g. Centralized Maintenance Control Procedures. An ETOPS certificate holder, regardless of the size of the 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 the 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 that ensures that 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 necessary ETOPS configuration.

i. Enhanced Continuing Analysis and Surveillance System (CASS) Program. The CASS program must be enhanced to include all of the elements of the ETOPS CAMP. The program must include the additional reporting procedures for significant events detrimental to ETOPS flights contained in appendix G to part 135.

j. Propulsion System Monitoring.

(1) The certificate holder must conduct an investigation into the cause of each IFSD and submit findings to the CHDO. If the certificate holder or CHDO determines that corrective action is necessary. The certificate holder must implement a corrective action. For all Propulsion System reportable events the certificate holder should determine whether corrective action is required. If the cause of an event is identified within a certificate holder's area of responsibility, the certificate holder should take immediate corrective action.

(2) Causes of IFSDs or other engine/propulsion system problems may be associated with type design problems, and/or maintenance and operational procedures applied to the airplane. It is very important to identify the root cause of events so that an indication of corrective action is available; a fundamental design problem requires an effective final fix. Repetitive inspections may be satisfactory as interim solutions but long term design solutions such as terminating actions, may be required. Design problems can affect an entire fleet of airplanes. A certificate holder, who experiences a failure that is a type design related event, should not be operationally penalized by the Administrator 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.

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 they should establish a program that demonstrates an equivalent level of monitoring and data analysis. The goal of this monitoring program should be to detect deterioration at an early stage, and to allow for corrective action before safe operation is affected. In order to achieve this goal, engine data analysis should be accomplished as often as practical. The FAA recommends a five-day maximum interval. Engine limit margins must 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, 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 any ETOPS flight. The certificate holder's consumption limit must not exceed the manufacturer's recommendations, and it must trend oil consumption. The certificate holder's oil consumption trending program should be capable of recognizing a spike in the oil consumption rate. A certificate holder who operates an ETOPS aircraft in ETOPS and Non-ETOPS operations may elect to develop a program that documents the indicated flight deck oil quantity at each Non-ETOPS station to supplement their oil consumption trend monitoring programs capability to discover an oil spike. For example, if an ETOPS airplane oil is serviced infrequently, and the quantities are not regularly recorded, it would be difficult to determine whether the oil added during an ETOPS pre-departure service check was the result of normal oil consumption over several flight hours, or a sudden increase which would merit investigation and corrective action prior to the ETOPS flight. The certificate holders trending program may be done manually or by an 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 calculated 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. Specifically, the program is intended to verify the start and run capability. It is not required to actually load the APU in flight with the generator and /or pneumatics. This monitoring program should include periodic

sampling of each airplane's APU in-flight starting capabilities. Specifically, the certificate holder should 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 APU in-flight start rate 12 month rolling average 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 IAW the applicable Configuration Maintenance Procedures (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 constrains, 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 should 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's recommended procedures.

(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. Maintenance Training.

(1) 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.

(2) The certificate holder must review the existing airplane-engine combination maintenance training program with its CHDO to ensure that it adequately provides the necessary training. 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 must ensure that each person's level of ETOPS training is commensurate with their level of involvement with ETOPS airplanes. Customarily, ETOPS training is intended for Line and Hanger Maintenance personnel, Centralized Maintenance Control personnel and Engineering personnel, where applicable, but it does not necessarily include the various shop level employees For example, a mechanic who is performing per-departure service checks may be required to have a higher level of ETOPS training and qualification than a mechanic performing routine tasks on non ETOPS significant systems during a heavy maintenance check. A technician working ETOPS significant systems in a heavy maintenance visit environment must be appropriately trained for ETOPS, but need not be ETOPS qualified. Recurrent training in all maintenance arenas 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.

(3) ETOPS-qualified maintenance personnel are those who have successfully completed the certificate holder's ETOPS qualification program and who have satisfactorily performed extended range tasks under the direct supervision of an FAA-certificated maintenance person who has 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 that newly introduced make and model airplane. In this instance, the training received from the manufacturer's maintenance training program would be acceptable.

o. CMP.

NOTE: There may not be a CMP for aircraft operating under ETOPS manufactured prior to February 16, 2015 that are not type designed for ETOPS.

(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 is typically published and maintained by the airplane manufacturer and includes identified CMP requirements. The certificate holder must implement the basic configuration, maintenance, and operating procedures standard, identified in the CMP, before beginning ETOPS operations unless the CMP includes an incorporation schedule with a later date than the beginning of the certificate holder's ETOPS operations. If a CMP document exists for an ETOPS certificate holder's airplane, the certificate holder must ensure that all applicable:

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

(b) Maintenance procedures are incorporated into the maintenance program, and

(c) Demonstrated capabilities are incorporated into the flight operations manual and the MEL, as required.

(d) Operators must coordinate any deviation from the manufacturer's CMP requirements with the CHDO or Aircraft Certification Office (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 configuration, maintenance, or procedural changes necessary for continued safe ETOPS operations through the airworthiness directive 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 and date.

p. Reporting Requirements.

(1) In addition to the reporting requirements of §§ 135.415 and 135.417, the certificate holder must report the following items on their ETOPS airplanes (regardless of ETOPS or non-ETOPS operation) to the CHDO.

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

(b) Diversions and turn backs for failures, malfunctions, or defects associated with any ETOPS Significant Systems.

(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.

(2) The certificate holder must submit a report quarterly to the CHDO and the airplane and engine manufacturer for each airplane authorized for ETOPS containing the hours and cycles for each airplane. The reports may be submitted in an electronic format.

CHAPTER 4. ETOPS FLIGHT PLANNING

400. TIME-LIMITED SYSTEMS REQUIREMENTS.

a. For ETOPS, the time required to fly the distance to the planned ETOPS alternate(s), at the all-engines-operating cruise speed, correcting for wind and temperature, may not exceed the time specified in the Aircraft Flight Manual (AFM) for the airplane's most limiting fire suppression system time required by regulation for any cargo or baggage compartments (if installed), minus 15 minutes.

b. Except as provided in a. above for ETOPS, the time required to fly the distance to the planned ETOPS alternate(s), at the approved one-engine inoperative cruise speed, correcting for wind and temperature, may not exceed the time specified in the AFM for the airplane's most time limited system time (other than the most limiting fire suppression system time required by regulation for any cargo or baggage compartments) minus 15 minutes.

NOTE: Certificate holders operating multi-engine airplanes whose AFM does not contain the time-limited system information needed to comply with the requirements of a and b above may continue ETOPS operations until February 15, 2015.

401. FLIGHT PLANNING/MANAGEMENT REQUIREMENTS.

a. Flight Information. In addition to the requirements of 14 CFR part 91, § 91.503, the certificate holder should ensure that the following information is available for use by the flight crewmember before departure:

(1) Planned route of flight.

(2) ETOPS entry/exit points.

(3) Planned ETOPS alternate airports.

(4) Equal time points.

(5) Fuel consumption and expected use log.

(6) Flight progress reporting points.

(7) Weather and status of services and facilities at all ETOPS alternate airports as well as a reasonable number of 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 departure.

b. Communication. Each airplane used in ETOPS must be equipped with two independent communication transmitters and receivers, at least one of which allows voice communication. Both of these systems must be operational at dispatch. The airplane must also have two headsets or one headset and one speaker installed and operational. In areas where voice

communication facilities are not available, or are of such poor quality that voice communication is not possible, communication using an alternative system such as data link must be substituted.

c. Potential Diversion Airports after Departure.

(1) After departure, designated ETOPS alternate airports are expected to remain at or above forecast operating weather minima. If the weather at the designated airports falls below operating minima, the flight crewmember should designate new ETOPS alternate airports within the ETOPS diversion limit that meet appropriate operating weather minima.

(2) The pilot or certificate holder 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. If this monitoring is done by the certificate holder, a reliable method of communication with the airplane must be readily available.

(3) During the course of the flight, the flight crewmember must be aware 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.

(4) Before an ETOPS flight proceeds beyond the ETOPS entry point, the weather during the expected times of arrival (from the earliest to the latest possible landing time) at the designated ETOPS alternates, as well as the landing distances, airport services, and facilities should be evaluated. If weather conditions at each ETOPS alternate are forecast to be below the operating minima in the certificate holder's OpSpecs for that airport during this time (from the earliest to the latest possible landing time), another ETOPS alternate must be substituted within the maximum ETOPS diversion time that could be authorized for that flight with weather conditions at or above operating minima. The maximum diversion time determined by the newly selected ETOPS alternate(s) must not exceed 240 minutes.

(5) Once the flight has gone beyond the ETOPS Entry Point, an unexpected worsening of the weather at the designated ETOPS alternate to below operating landing minima, or any event that makes the runway at that airport unusable does not require a turn back. It is expected that the PIC must, in coordination with the dispatcher if appropriate, exercise judgment in evaluating the situation and make a decision as to the safest course of action. This may be a turn back, or re-routing to another ETOPS alternate, or continuing on its planned routing.

d. Engine Failures. All multi-engine part 135 airplanes must satisfy the performance requirements of part 135, subpart I in the event of engine(s) failure. The purpose of ETOPS flight planning is to provide the flightcrew with a minimum number of airports that are suitable for an en route diversion for any circumstance, including engine failure. For any situation that the PIC determines a diversion is necessary, no part of this AC is meant in any way to prejudice or limit the final authority and responsibility of the PIC for the safe operation of the airplane. The decision to divert to the planned ETOPS alternate or any other available airport will be a decision of the PIC based on his/her determination of what is the most suitable for the situation. The PIC

should consider all relevant factors in determining the suitability of an airport. The following factors and others may be relevant in determining whether or not an airport is suitable:

- 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 nearby terrain, weather and wind,
- Runways available and runway surface condition,
- Approach navigation aids and lighting available,
- Availability of crash, rescue and firefighting equipment,
- Facilities for passenger and crewmember disembarkation and accommodations, and
- Pilot's familiarity with the airport.

e. One Engine Failure. 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 accommodations, other than passenger safety, and
- Availability of maintenance or repair resource.

f. System Failures and Partial Failures. If, as a result of reevaluating airplane systems, a change in flight plan is required, the pilot should revise the flight plan information based on the conditions, including weather conditions, at designated ETOPS alternates.

g. Other Diversion Scenarios. During ETOPS an airplane may divert for reasons other than an engine or systems failure such as medical emergencies, onboard fire or decompression. 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 flightcrew must decide on the best course of action based on all available information. The ETOPS Alternate Airports required by appendix G to part 135, § G135.2.5, Operational Requirements, 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 PIC.

402. ETOPS FUEL PLANNING REQUIREMENTS. A certificate holder should consider the following factors when determining the amount of fuel to carry onboard an airplane departing on an ETOPS flight:

a. Unique Planning Factors.

(1) Current forecast winds and meteorological conditions along the expected flight path at the appropriate one-engine inoperative cruise altitude and throughout the approach and landing;

(2) Any necessary operation of ice protection systems and performance loss because of ice accretion on the unprotected surfaces of the airplane;

(3) Any necessary operation of the APU, including APU oil consumption;

(4) Loss of airplane pressurization; consideration should be given to flying at an altitude meeting passenger and crewmember oxygen requirements in the event of loss of pressurization;

(5) Holding for 15 minutes over the airport with a subsequent approach and landing;

(6) Required navigational accuracy; and

(7) Any known ATC delays or restrictions.

b. Fuel Supply. No person may dispatch or release for flight or takeoff a multi-engine airplane in ETOPS unless the fuel carried onboard is the greater of:

(1) Fuel required under § 135.223, or;

(2) Considering wind and other weather conditions expected, it has enough fuel to satisfy (a) through (d) below:

(a) Greater of the fuel sufficient to fly to an ETOPS alternate:

1. Assuming a rapid decompression at the most critical point followed by descent to a safe altitude in compliance with the oxygen supply requirements of § 135.157, or;

2. 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 § 135.157, or;

3. 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.

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

(c) 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 (2)(a) 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, allow 5 percent of the fuel required for (2)(a) above, as reserve fuel to allow for errors in wind data. A wind aloft forecast distributed worldwide by the World Area Forecast System is an example of a wind model acceptable to the FAA.

(d) After completing the calculation in (c), compensate in (2)(a) above for the greater of:

1. 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.

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

(e) 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 in (2)(a) (after completing the calculation in (c)) by 5 percent to account for deterioration in cruise fuel burn performance.

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

(g) 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 (d) above may apply to some models of airplane based on their characteristics and the manufacturer's recommended procedures.

403. ETOPS ALTERNATE WEATHER MINIMA REQUIREMENTS. Alternate weather minima standards specified in a certificate holder's OpSpecs apply to destination and en route alternates. A summary of a typical certificate holder's ETOPS OpSpecs is reflected in the table below. An individual certificate holder's OpSpec will reflect its current requirements. Although no consideration for the use of global positioning system/Area Navigation approaches (GPS/RNAV) is presented here, operators may request to receive this authorization through the FAA, which would be reflected in the operator's OpSpecs. Appropriate ETOPS alternate minima will be determined by AFS-1, Director, Flight Standards Service.

ETOPS ALTERNATE MINIMA

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 straight –in non-precision approach procedure, or Category I precision approach, or, when applicable, a circling maneuver from an instrument approach procedure (IAP).	Add 400 ft to the MDA or DH as applicable	Add 1 statute mile or 1,600 meters 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 1/2 statute mile or 800 meters[4] to the higher authorized landing minimum of the two approaches used.
One useable authorized category II ILS IAP	300 feet	3/4 statute mile (1,200 meters) or RVR 4,000 feet (1,200 meters)
One useable authorized category III ILS IAP	200 feet	1/2 statute mile (800 meters[4]) or RVR 1,800 feet (550 meters)

404. LANDING DISTANCE REQUIREMENTS. For the runway expected to be used, the landing distance available must be sufficient based on AFM landing performance data to meet the landing distance limitations specified in § 135.385 or § 135.393. The certificate holder should take into account the altitude of the airport, wind conditions, runway surface conditions, and airplane handling characteristics.

[1] When determining the usability of an IAP, wind velocity plus gust must be forecast within operating limits, including reduced visibility limits.
[2] Conditional forecast elements need not be considered, except that a PROB40 or TEMPO condition below the lowest applicable operating minima should be considered.
[3] When departing using the provisions of the MEL, those MEL limitations affecting instrument approach minima should be considered in determining ETOPS alternate minima.
[4] For operations outside United States, because of variations in the international metric weather forecasting standards, 700 meters may be used in lieu of 800 meters.

CHAPTER 5. APPLICATIONS TO CONDUCT ETOPS

The unique nature of long range operations 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. Each certificate holder applying for ETOPS approval should demonstrate the ability to continuously maintain and operate the particular airframe systems and engines at levels of reliability appropriate for the intended operation. The certificate holder also should show that it has trained its personnel to achieve competency in ETOPS. The certificate holder should show compliance with the flight operations and, if applicable, the maintenance requirements of this AC.

Before a certificate holder is granted operational approval, the FAA Administrator will examine its capability to conduct operations and implement effective ETOPS programs IAW the criteria detailed in this AC. Only certificate holders who have demonstrated capability to conduct long range flights will be considered for approval. The flights conducted under ETOPS authority will be limited to a maximum diversion time of 240 minutes from an ETOPS alternate airport, at an approved one-engine inoperative cruise speed (under standard conditions in still air) selected by the certificate holder from a range of speeds approved by the FAA that is within the certificated operating limits of the airplane

500. APPLICATION REQUIREMENTS FOR ETOPS APPROVAL.

a. Approval. A certificate holder requesting approval for ETOPS should submit the request, with any required supporting data, to its CHDO at least 60 days before the proposed start of ETOPS operations. The certificate holder's application will be for a specific airplane-engine combination and should address the following topics: (See Appendix 2 for an application checklist.)

b. Airplane. The applicant should list the specific make and model of airplane and engine and the airplane serial and registration numbers to be used in ETOPS.

c. Airplane Performance. The altitudes and airspeeds used for establishing the ETOPS area of operation for each airframe-engine combination should be shown to permit compliance with the terrain and obstruction clearance requirements of §§ 135.381, 135.383 and the requirements of § 135.181(a)(2), as may be applicable.

d. MEL. The certificate holder should submit an MEL, or revision to its MEL, developed IAW the Master MEL, appropriate to ETOPS.

e. Communication and Navigation Facilities. As per § 135.165, the certificate holder must demonstrate the availability of two-way communication during diversion at anticipated diversion altitudes.

f. Training. The certificate holder should document that it has incorporated ETOPS training into its crewmember training programs, and that personnel conducting ETOPS training are properly qualified.

501. OPERATING EXPERIENCE REQUIREMENTS.

a. Each certificate holder requesting approval to conduct ETOPS should have appropriate operational experience, including sufficient maintenance and operation familiarity with the particular airframe-engine combination. Appropriate operational experience involves conducting long-range flights that require more complex flight planning and careful execution in areas where diversion alternatives are limited.

b. A certificate holder must satisfy the operating experience requirements of § G135.2.2. as stated in Chapter 3, paragraph 302a of this AC.

502. VALIDATION FLIGHT REQUIREMENTS.

a. Before granting initial ETOPS authorization, the FAA may require validation testing to demonstrate the certificate holder's ability to safely conduct ETOPS. Validation testing may be included as part of a certificate holder's airplane proving test as required by § 135.145. Validation testing can include evaluation of the certificate holder's policies and procedures, systems, and, where practical, flight simulation or table-top simulation. In some cases, a validation flight may be required.

b. If required, a validation flight can be included in proving flights and can be flown using representative ETOPS routes. AFS-1 will determine the conditions for each certificate holder's validation testing following a review, on a case-by-case basis, of the certificate holder's experience and the proposed operation. In the event a proving test did not include ETOPS validation, the certificate holder shall notify their CHDO at least 7 days before conducting the first ETOPS flight to allow the FAA to monitor the operation.

NOTE: Validation flights may not be required for certificate holders that meet the operating experience requirements of § G135.2.2.

CHAPTER 6. FAA APPROVAL

600. ETOPS APPROVAL PROCEDURES.

a. For certificate holders seeking ETOPS authority for the first time, the application and supporting data, along with the CHDO's principal inspectors (principal maintenance inspector, principal avionics inspector and principal operations inspector) recommendations are forwarded to AFS-1 for review and concurrence. AFS-1 will authorize ETOPS operations or state what additional requirements are necessary to gain ETOPS authorization. When authorized by AFS-1, the CHDO will issue the certificate holder OpSpecs authorizing ETOPS.

b. For certificate holders that have existing ETOPS authority, the application and supporting data should be forwarded to the CHDO for approval. The CHDO will issue the certificate holder OpSpecs authorizing additional ETOPS airplane-engine combinations and/or areas of operation.

601. ETOPS OPSECS. As a minimum, OpSpecs for ETOPS should provide the following authorizations and limitations:

a. Approved airframe-engine combination(s).

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

c. ETOPS area(s) of operation.

d. Approved maintenance and enhanced CASS program for ETOPS including those items specified in the type design approved standard, if required.

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

602. PROCESSES AFTER RECEIVING ETOPS AUTHORITY. If the certificate holder fails to maintain its ETOPS program and operation IAW regulations and this guidance, or if the airplane does not perform IAW its ETOPS type design requirements, the CHDO may initiate a special evaluation. This may result in the imposition of any necessary, prudent operational restrictions and corrective action to resolve problems in a timely manner. If any problem associated with airplane design is identified, the CHDO should notify the ACO responsible for type design approval.

603. 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.

APPENDIX 1. DEFINITIONS

The following definitions are applicable to extended operations (ETOPS). They include definitions from Title 14 of the Code of Federal Regulations (14 CFR) parts 1 and 135 definitions as well as terms that are used within the context of this advisory circular (AC) with respect to ETOPS:

1. Adequate Airport. An airport that an airplane operator may list with approval from the Federal Aviation Administration (FAA) because that airport meets the landing limitations of part 135, § 135.385 or is a military airport that is active and operational (airports outside FAA jurisdiction may be considered adequate provided that they are determined to meet the equivalent standards and intent of § 135.385.)

2. ETOPS (Extended Operations). An operation authorized under part 135 that has a point on a planned routing that is beyond 180 minutes flying time (in still air at normal cruise speed with one-engine inoperative) from an adequate airport.

3. ETOPS Area of Operation. The area between 180 minutes and 240 minutes flying time (as determined in the ETOPS definition above) from an adequate airport.

4. ETOPS Alternate Airport. An adequate airport listed in the certificate holder's 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.

5. ETOPS Entry Point. ETOPS entry point is the first point on the route of an authorized flight which is more than 180 minutes from an adequate airport. The ETOPS entry point is calculated at an approved one-engine inoperative cruise speed under standard conditions in still air.

6. ETOPS Dual Maintenance. Maintenance on the "same" ETOPS significant system. Dual maintenance is maintenance actions 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.

7. 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 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.

(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. Group 2 system failures will not cause aircraft flight performance loss or cabin environment problems but may result in diversions or turn backs.

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

9. 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.

10. In-Flight Shut Down (IFSD). When an engine ceases to function (when the airplane is airborne) and is shutdown, whether self induced, flightcrew initiated or caused by an external influence. The FAA considers IFSD for all causes: for example, flameout, internal failure, flightcrew 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 shutdown.

11. North Polar Area. The entire area north of 78º North latitude.

12. One-Engine Inoperative Cruise Speed (Approved). For the purposes of the part 135 applicable to ETOPS, the one-engine inoperative cruise speed is a speed selected by the certificate holder from a range of speeds approved by the FAA that is within the certificated operating limits of the airplane. This speed is used to determine whether a proposed routing is subject to the requirements of appendix G of part 135 (ETOPS) and is used during ETOPS flight planning for calculating both fuel reserve requirements and the still air distance associated with the ETOPS area of operation for a specific flight.

13. Satellite Communication (SATCOM). SATCOM equipment.

APPENDIX 2. ETOPS APPLICATION CHECKLISTS

The following checklists are provided to facilitate a certificate holder's application for extended operations (ETOPS) approval.

1. ETOPS APPLICATION CHECKLIST — MAINTENANCE

Type Design
1. Date of type design and review of each airframe/engine for ETOPS. **2.** In-service experience for each airframe/engine combination: **a.** Number of months/years of operational experience with the specific airframe/engine combination, **b.** Total number of international (excluding Canada and Mexico) flights with the specific airframe/engine, **c.** Airframe/engine hours and cycles, **d.** In-flight shutdown rate (all causes), **e.** Mean time between failure for ETOPS critical systems/components, **f.** Record of auxiliary power unit (APU) start and run reliability, **g.** Record of delays and cancellations, and identify causes by airplane system, and **h.** Record of significant certificate holder events: **(1)** Uncommanded power changes (surge or roll back), **(2)** Inability to control engine or obtain desired power, and **(3)** Total number of in-flight shutdown events.

ETOPS Maintenance Requirements

A Supplemental ETOPS Maintenance Program is required and must contain the following elements:

1. ETOPS Manual.

a. Identify as a chapter in the general maintenance manual.

b. Submit to the Flight Standards District Office 60 days before the implementation of ETOPS flights.

c. Preclude identical action being applied to multiple similar elements in ETOPS critical system (for example, fuel control change on both engines).

d. Identify ETOPS tasks on routine work forms and instructions.

e. Clearly define ETOPS procedures in maintenance program, such as, centralized maintenance control.

f. Develop ETOPS service check:

(1) Verify the airplane status and ensure that certain critical items are acceptable.

(2) Have check signed off by an ETOPS qualified person.

2. Oil Consumption Program.

a. Reflect manufacturers' recommendations.

b. Be sensitive to oil consumption trends.

c. Record the amount at dispatch stations.

d. Monitor running average consumption.

e. Include Spectrographic Oil Analysis Program samples, if meaningful to make and model.

f. Add APU to the program.

3. Engine Condition Monitoring.

a. Describe the parameters to be monitored.

b. Identify method of data collection.

c. Describe corrective action process.

d. Detects deterioration at an early stage.

ETOPS Maintenance Requirements

4. Resolution of Airplane Discrepancies.

a. Describe verification program to ensure corrective action following:

(1) Engine shutdown,

(2) ETOPS Significant System failure, and

(3) Adverse trends or any events, which require verification flight (or other action to assure their accomplishment).

b. Describe who must initiate verification actions and the section responsible for the determination of what action is necessary.

c. Describe the conditions requiring verification actions.

5. Enhanced CASS Program.

a. Should be event oriented.

b. Incorporate reporting procedures (96 hours) for significant events detrimental to ETOPS.

(1) In addition to the items in mechanical reliability reports (Title 14 of the Code of Federal Regulations (14 CFR) part 135, §§ 135.415 and 135.417) the following are included:

- In-flight shutdowns,
- Diversion or turn back,
- Uncommanded power changes or surges,
- Inability to control the engine or obtain desired power,
- Problems with systems critical to ETOPS, and
- Any other event detrimental to ETOPS.

(2) The report should identify the following:

- Airplane identification (make and "N" number),
- Engine identification (make and serial number),
- Total time, cycles and time since last shop visit,
- For systems: time since overhaul or last inspection of the unit,
- Phase of flight, and
- Corrective action.

6. Propulsion System Monitoring In-Flight Shut Down (IFSD). Describe the process to investigate all IFSDs.

7. Maintenance Training. Focus on special nature of ETOPS and maintenance requirements.

ETOPS Maintenance Requirements
8. ETOPS Parts Control. **a.** Ensures proper parts and configuration are maintained for ETOPS. **b.** Verify parts placed on ETOPS airplanes during parts borrowing or pooling arrangements. **c.** Tracks and verifies those parts used after repair or overhaul.

APPENDIX 2. ETOPS APPLICATION CHECKLIST — OPERATIONS

1. Type Design.

a. Date of type design approval of each airframe/engine for ETOPS and maximum diversion time approved for the airframe/engine.

b. In-service experience for each airframe/engine combination.

NOTE: The data for item a above may be submitted in the maintenance portion of the application.

2. Authorized Area of Operations for Each Airframe/Engine Combination.

a. Maximum diversion time and distance from an adequate airport. Show performance chart, which is used to calculate the distance.

b. Describe how flight planning will consider terrain clearance along planned and diversion routes based on a selected range of single-engine speeds.

c. Calculate obstacle clearance as follows:

(1) The diversion profile/airspeed used to calculate the area of operations should be used in evaluating obstacle clearance;

(2) NET performance data should be used;

(3) Maximum possible diversion gross weight should be used;

(4) Plus 10 temperature deviation should be used;

(5) Wing and engine anti-ice should be assumed to be OFF;

(6) Advantage may be taken of drift down from cruise altitude to single engine inoperative cruise altitude; and

(7) All terrain and obstructions should be cleared by 1000 feet (2000 feet in driftdown).

3. Plotting Chart Showing Area of Operations. Describe how the flightcrew will be provided a plotting chart. Diversion distance circles should be plotted from en route alternates used to calculate the area of operations.

4. Copy of Minimum Equipment List. Show compliance with Master Minimum Equipment List. (For each airframe/engine combination, if necessary.)

5. Sample Copies.

a. Computer flight plan,

b. Plotting chart with annotations required for typical flight (e.g., ETP's, route of flight). May be shown on plotting chart submitted under item c(3), above.

6. En Route Alternates.

a. Describe how ETOPS alternates will be selected to:

(1) Indicate compliance with landing distances, services, and facilities.

(2) Show consideration of en route alternate minimums and crosswind component in selection of en route alternates.

b. Show maximum crosswind component used for ETOPS alternate selection at dispatch.

c. Ensure en route alternate minimums comply with operation specification paragraph C055.

d. Show compliance with evaluation of alternate conditions during the en-route phase.

7. Communication and Navigation Facilities. Describe how crewmembers will determine adequacy of communication and navigation facilities.

8. Airplane Performance Data. For each airframe/engine combination, show operations manual pages used as a reference to insure compliance with the requirements in this AC.

9. Fuel and Oil Supply. Show how crewmembers will comply with the fuel and oil requirements.

10. Flight crewmember Training and Evaluation Program.

a. Show where flight crewmember training items identified in paragraph 302 of this AC are covered.

b. Show that any training issues, if appropriate, identified in the Flight Standardization Board have been incorporated in the training program.

11. Weather. Show how the crewmembers will obtain required weather information.

12. Equipment. Show how the crewmembers will comply with § 135.165 and appendix G to part 135.

13. Plan of Validation Flight or Flights.

a. Proposed dates.

b. Diversion required.

c. Revenue or non-revenue.

APPENDIX 3. POLAR OPERATIONS UNDER 14 CFR PART 135

1. Title 14 of the Code of Federal Regulations (14 CFR) part 135, § 135.98 states that no certificate holder may operate an aircraft in the region north of 78^{o} North latitude ("North Polar Area"), other than intrastate operations wholly within the state of Alaska, unless authorized by the Federal Aviation Administration (FAA). This appendix provides an acceptable means, but not the only means, of conducting polar operations in accordance with (IAW) § 135.98.

2. Since Polar operational guidance is also provided for certificate holders operating under 14 CFR part 121, the following advisory circulars (AC) may be helpful in planning Polar operations.

a. AC 120-ETOPS, Extended Operations.

b. AC 120-61A, In-Flight Radiation Exposure.

3. NORTH POLAR OPERATIONS. Before conducting operations in the North Polar Area, a certificate holder should develop plans in preparation for all such flights. Certificate holders must consider airplane and equipment configuration requirements, and in planning, must also consider the following items that are unique to polar operations.

a. Airport Requirements for Designation as Polar-Diversion Airports. Before each flight, certificate holders must designate alternate airports that can be used in case an en route diversion is necessary. The airplane should have a reasonable assurance that the weather during periods when the certificate holder would need the services of the airport are within the operating limits of the airplane. The airplane should be able to make a safe landing and maneuver off the runway at the diversion airport. In addition, those airports identified for use during an en route diversion should be capable of protecting the safety of all personnel by allowing:

(1) Safe offload of passengers and crewmember during possible adverse weather conditions;

(2) Providing for the physiological needs of the passengers and crewmember until a safe evacuation is completed; and

(3) Safe extraction of passengers and crewmember as soon as possible (execution and completion of the recovery should be within 12 to 48 hours following landing).

b. Recovery Plan for Passengers at Diversion Alternates. Passenger recovery plans are required for all approved and designated diversion airports used in part 135 operations in Polar areas. All certificate holders conducting North Polar operations must have a plan for recovering passengers at these designated diversion airports. The recovery plan should address the care and safety of passengers and crewmembers at the diversion airport.

(1) A specific passenger recovery plan is required for each diversion airport listed in an operator's OpSpecs for this operation (OpSpec B055, North Polar Operations).

(2) 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 to include continuing safety, shelter, facilities that provide for physiological needs, and food. Any list of considerations for the passengers and crewmembers need not be an exhaustive list; however, in 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 continued travel provisions for the crewmembers and passengers. It has generally been accepted that any plan should be designed to effectuate closure within 48 hours to be viewed as meeting the overall requirement to provide for the care and safety of the passengers and crewmembers.

c. Fuel Freeze Strategy and Monitoring Requirements for Polar Operations. Certificate holders must develop a fuel freeze strategy and procedures for monitoring fuel freezing for operations in the North Polar Area. A fuel freeze analysis program in lieu of using the standard minimum fuel freeze temperatures for specific types of fuel may be used. In such cases, the certificate holder's fuel freeze analysis and monitoring program for the airplane fuel load must be acceptable to the FAA Administrator. The certificate holder should have procedures for determining the fuel freeze temperature of the actual fuel load on board the airplane. These procedures relative to determining the fuel freeze temperature and monitoring the actual temperature of the fuel on board should require appropriate levels of coordination between maintenance and the flight crewmember.

d. Minimum Equipment List (MEL) Considerations for Polar Operations. Before receiving approval to conduct polar operations, a certificate holder must review their MEL for such operations and should amend their MEL. The following systems and equipment should be addressed in the MEL based on specific needs applicable to this operation.

(1) Fuel Quantity Indicating System (to include a fuel tank temperature indicating system).

(2) Communication system(s) needed for effective communications by the flight crewmember while in flight.

(3) Expanded medical kit.

e. Training Issues for Polar Operations. Before conducting polar operations, certificate holders must ensure that flight crewmembers are trained on any applicable passenger recovery plan used in this operation. Certificate holders should also ensure that flight crewmembers are trained on the following items, which should be included in a certificate holder's approved training programs:

(1) Atmospheric pressure at Field Elevation/Barometric pressure for Local Altimeter Setting and meter/feet conversion issues (flight crewmember training).

(2) Training requirements for fuel freeze (maintenance and flight crewmember training).

(3) General polar-specific training on weather patterns and aircraft system limitations (flight crewmember training).

(4) Proper use of the cold weather anti-exposure suit, if required (flight crewmember training).

(5) Radiation exposure (see AC 120-61A, In-Flight Radiation Exposure).

f. Special Equipment for Polar Operations. Certificate holders must have at least two cold weather anti-exposure suit(s) for the crewmembers on the airplane if outside coordination by a crewmember at a diversion airport with extreme climatic conditions is determined to be necessary. The certificate holder may be relieved of this requirement based on seasonal temperatures that would render the use of such suits unnecessary. This determination must be made with concurrence of the CHDO.

g. Additional Flight Planning Issues. In addition to the above, the certificate holder must have a plan to ensure communication capability for operations in the North Polar Area and a plan for mitigating crew exposure to radiation during solar flare activity.