

that the flight crew be informed and aware of changing weather as well as airport status.

#### E. Operational Requirements

The proposed rule would require that the flight crew only plan and conduct ETOPS on instrument flight rules. The FAA believes that ETOPS cannot be conducted safely under visual flight rules. The flight crew may not proceed beyond the ETOPS entry point unless the weather and operating conditions at the required enroute alternate airports are reviewed and expected to be at or above the operating minimums specified in the operations specifications during the period in which that airport may be expected to be used based on expected estimated times of arrival at that airport. The planned route of flight may be amended while en route to allow use of additional enroute alternate airports provided weather is forecast to be at or above operating minima and the airport is within the maximum ETOPS diversion time.

In ETOPS operations wind becomes an increasingly significant factor with increasing diversion times and should be considered in ETOPS operations beyond 180 minutes to assure that Airplane Flight Manual (AFM) system time limits are not exceeded. For example, while diverting with an engine inoperative, it is essential to ensure that there is sufficient amount of oil in the tank for continuous operation of the remaining engines at Maximum Continuous Thrust for the actual duration of divert. As a result, for ETOPS operations with approved diversion times greater than 180 minutes the one engine inoperative cruise speed (approved) maximum diversion time, taking forecast wind and temperature into account, to each ETOPS alternate may not exceed the time specified in the airplane flight manual for the airplane's most time-limited system minus 15 minutes (for approach and landing). However, there are some other time limited systems like cargo fire suppression, where the use of cargo fire suppression may not have as much relevance to the one engine inoperative diversion time. Data was presented that showed the likelihood of an engine failure at the critical point followed by cargo fire is extremely remote. Hence for ETOPS beyond 180 minutes, cargo fire suppression requirement would be based on covering the diversion distance authorized (maximum diversion time authorized at the approved one engine inoperative speed) at the all engine operating speed. Therefore this

proposed rule requires that for ETOPS beyond 180 minutes with airplanes equipped with a Class C cargo fire suppression system, the cargo fire suppression time required be based on the airplane operating at all engine operating speed with actual wind.

The certificate holder may continue ETOPS with airplanes that lack the airplane flight manual information regarding time-limited systems (e.g. cargo fire suppression) for a period not to exceed 8 years from the effective date of this rule. See the discussion in the airplane requirements above.

#### F. Communications Requirements

The proposal would establish the minimum standard for communication for ETOPS. Two independent transmitters and two independent receivers, appropriate to the planned route, would be required for ETOPS flights. At least one of each would have to be capable of voice communication. If operating in areas where voice communication is not possible or of poor quality, alternate systems (data link, SATCOM, etc.) may be used.

#### G. Fuel Planning Requirements

An airplane should not be released for an ETOPS flight unless it carries sufficient fuel and oil to meet the requirements of section 135.223, and any additional fuel that may be determined in accordance with the critical fuel reserves of this section. In establishing the critical fuel reserves, the operator would determine the fuel necessary to fly to the most critical point and execute a diversion to an ETOPS alternate under the conditions outlined in paragraph 1(b) of this section for the critical fuel scenario. The computed critical fuel reserve would be compared to the normal section 135.223 fuel requirements for the flight. If it is determined by this comparison that the fuel to complete the critical fuel scenario exceeds the fuel that would be on board at the most critical point, as determined by section 135.223 requirements, additional fuel should be included to the extent necessary to safely complete the critical fuel scenario.

To determine the critical fuel reserves necessary, the operator would plan on that which is operationally the most critical considering both time and the airplane configuration, such as one engine inoperative or all engines running. For those airplanes that are not certificated to operate above Flight Level (FL) 450, the flight would also be planned for failure of the pressurization system to an altitude of 10,000 feet or at an altitude in compliance with the

oxygen supply requirements of section 135.157. (ICAO Annex 6, Part I, section 4.3.6.4(d) for fuel planning requires consideration of additional fuel in the event of loss of pressurization).

The critical fuel scenario would require an immediate descent to the determined altitude and continued cruise at the planned one-engine inoperative speed to the enroute alternate and upon reaching the alternate airport, a descent to 1,500 feet, hold for 15 minutes, and then conduct an instrument approach and land.

A pad for wind speed error would be required. Based on the weather forecasting techniques of the early 1980s, ETOPS critical fuel planning required a five percent fuel pad to account for wind forecast errors. However, winds aloft forecasting has improved dramatically in the last twenty years as a result of sophisticated wind modeling with super computers, and weather information that is automatically down linked at much more frequent intervals. There are many more collection points, as well as satellite depictions of air mass movement. This information is collected, analyzed, and distributed worldwide by the World Area Forecast System (WAFS). This centralized distribution of weather information provides for a consistent level of accuracy that can eliminate the assignment of arbitrary penalties, provided that individual airlines subscribe to the service and make use of this level of information. Therefore, given the documented improvements in forecasting accuracy when using WAFS, a more accurate means of determining the fuel used during a decompression profile involves adding a pad to the actual forecast winds in making the fuel calculation rather than adding an arbitrary fuel penalty. The addition of a five-percent wind error pad provides an accurate case-by-case adjustment as compared with a five-percent fuel penalty, while preserving the necessary level of safety. However, if a certificate holder elects not to use such accurate winds in the computation of decompression fuel, then the proposed rule will require the operator to continue applying the five percent fuel pad to account for wind forecast errors.

Consideration of fuel for icing at the cabin depressurization cruise altitude is also required. Studies done by the Atmospheric Environment Service of Canada with the assistance of airplane manufacturers under the second Canadian Atlantic Storms Program (CASP II) confirm that the probability of a continuous or repetitive significant icing encounter is very small on a long