

performance cannot maintain an inert tank ullage, primarily during descent when the change in ambient pressures draws air into the fuel tanks and those times when the FRS is inoperative due to failures of the system and dispatch with the system inoperative.

Specific Risk Flammability Limit

These proposed special conditions also include a requirement to limit fuel tank flammability to 3 percent during ground operations, takeoff, and climb phases of flight to address the specific risk associated with operation during warmer day conditions when accidents have occurred. The specific risk requirement is intended to establish minimum system performance levels and therefore the 3 percent flammability limit excludes reliability related contributions, which are addressed in the average flammability assessment. The specific risk requirement may be met by conducting a separate Monte Carlo analysis for each of the specific phases of flight during warmer day conditions defined in the special conditions, without including the times when the FRS is not available because of failures of the system or dispatch with the FRS inoperative.

Inerting System Indications

Fleet average flammability exposure involves several elements, including—

- The time the FRS is working properly and inert the tank or when the tank is not flammable;
- The time when the FRS is working properly but fails to inert the tank or part of the tank, because of mission variation or other effects;
- The time the FRS is not functioning properly and the operator is unaware of the failure; and
- The time the FRS is not functioning properly and the operator is aware of the failure and is operating the airplane for a limited time under MEL relief.

The applicant may propose that MMEL relief is provided for aircraft operation with the FRS unavailable; however, it is considered a safety system that should be operational to the maximum extent practical. Therefore, these proposed special conditions include reliability and reporting requirements to enhance system reliability so that dispatch of airplanes with the FRS inoperative would be very infrequent. Cockpit indication of the system function that is accessible to the flightcrew is not an explicit requirement, but may be required if the results of the Monte Carlo analysis show the system cannot otherwise meet the flammability and reliability requirements defined in these proposed

special conditions. Flight test demonstration and analysis will be required to demonstrate that the performance of the inerting system is effective in inerting the tank during those portions of ground and the flight operations where inerting is needed to meet the flammability requirements of these proposed special conditions.

Various means may be used to ensure system reliability and performance. These may include: system integrity monitoring and indication, redundancy of components, and maintenance actions. A combination of maintenance indication and/or maintenance check procedures will be required to limit exposure to latent failures within the system, or high inherent reliability is needed to assure the system will meet the fuel tank flammability requirements. The inerting system proposed by the applicant does not incorporate redundant features and includes a number of components essential for proper system operation. Past experience has shown inherent reliability of this type of system would be difficult to achieve. Therefore, if system maintenance indication is not provided for features of the system essential for proper system operation, system functional checks will be required for these features. At a minimum, proper function of essential features of the system should be validated once per day by maintenance review of indications or functional checks, possibly prior to the first flight of the day. The determination of a proper interval and procedure will follow completion of the certification testing and demonstration of the system's reliability and performance prior to certification.

Any features or maintenance actions needed to achieve the minimum reliability of the FRS will result in fuel system airworthiness limitations as defined in § 25.981(b). Boeing will be required to include in the instructions for continued airworthiness (ICA) the replacement times, inspection intervals, inspection procedures, and the fuel system limitations required by § 25.981(b). Overall system performance and reliability must achieve a fleet average flammability that meets the requirements of these special conditions. If the system reliability falls to a point where the fleet flammability exposure exceeds these requirements, Boeing will be required to define appropriate corrective actions, to be approved by the FAA, that will bring the exposure back down to the acceptable level.

Boeing has proposed that the FRS be eligible for a 10-day MMEL dispatch

interval. The approved interval will be established by the Flight Operations Evaluation Board (FOEB) based on data submitted by the applicant to the FAA. The MMEL dispatch interval is one of the factors affecting system reliability analyses that must be considered early in the design of the FRS, prior to FAA approval of the MMEL. Boeing has requested that the authorities agree to a MMEL inoperative dispatch interval to be used for design of the system. Data presented by Boeing indicates that certain systems on the airplane are routinely repaired prior to the maximum allowable interval. These proposed special conditions require an MMEL dispatch inoperative interval of 60 hours to be used in the analysis as representative of the mean time for which an inoperative condition may occur for the 10-day MMEL maximum interval requested, and that Boeing include actual dispatch inoperative interval data in the quarterly reports required by these special conditions. Boeing may request to use an alternative interval in the reliability analysis. Use of a value less than 60 hours would be a factor considered by the FOEB in establishing the maximum MMEL dispatch limit. The reporting requirement will provide data necessary to validate that the reliability of the FRS achieved in service meets the levels used in the analysis.

Appropriate maintenance and operational limitations with the FRS inoperative may also be required and noted in the MMEL. The MMEL limitations and any operational procedures should be established based on results of the Monte Carlo assessment, including possible effects of the risk associated with portions of the fleet that operate in warmer climates where the fuel tanks are flammable a significant portion of the operational time when not inert. While the system reliability analysis may show that even with an MMEL allowing very long inoperative intervals, it is possible to achieve an overall average fleet exposure equal to or less than that of a typical unheated aluminum wing tank, the intent of the rule is to minimize flammability and the shortest practical MMEL relief interval should be proposed. To ensure limited airplane operation with the system inoperative and to meet the reliability requirements of these proposed special conditions, appropriate level messages that are needed to comply with any dispatch limitations of the MMEL must be provided.