CARGO BAY FIRE SUPPRESSION USING A FUEL TANK INERTING SYSTEM

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Adding the capability of inert gas generation for fuel tank inerting to a commercial transport airplane has the potential to improve fire safety and reduce the weight and complexity of existing cargo bay fire suppression systems. To determine the effectiveness of a potential fuel tank inerting system for use as a cargo bay fire suppression make up system, a single ASM was tested to obtain specific performance points relevant to cargo bay fire suppression. These performance points were then used to calculate the time required to inert a single cargo bay with that inerting system and also to calculate how much time the cargo bay would not be inert using this OBIGGS with a discharge of Halon. ASM performance data acquired illustrated that an ASM based OBIGGS used for fuel tank inerting would be consistent with the requirements for a cargo bay fire suppression make up agent system. The NEA flow was very sensitive to ASM feed pressure (bleed air pressure) and the NEA flow from the ASM decreases as the static permeate pressure increases (aircraft altitude decreases). As expected it is easier to inert the cargo bay as pressure altitude increases. The results of modeling the oxygen concentration with a Halon discharge and representative air leakage into the bay to determine time not inert for given conditions illustrated the same trends observed in the results of the time to inert results with the same parameters that decrease the calculated times to inert also reduced or eliminated the calculated times not inert. When observing the sensitivity of the time not inert results to decreasing the air leakage rate and increasing the size of the Halon shot both decreased calculated time not inert values, although both values are also very sensitive to the ASM feed pressure. The time not inert values calculated were not that sensitive to cargo bay size with the same size OBIGGS provided that the leakage rate was the same and cargo bay had the same relative size Halon discharge. Increasing cargo bay density (fullness) decreased large positive time not inert results.