

NTSB Recommendation A-83-077

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Rec #: A-83-077

NTSB Status: Closed - Acceptable Action

Issue date: 10/31/1983

Accident Date: 6/2/1983

Source Event: ACCIDENT

Location: CINCINNATI Ohio

Mode: AVIATION

Most Wanted List: No

Closed date: 3/12/1987

Report Number: AAR-84-09

Accident ID: DCA83AA028

Background Synopsis:

THE NATIONAL TRANSPORTATION SAFETY BOARD IS CONTINUING ITS INVESTIGATION OF THE ACCIDENT INVOLVING AIR CANADA FLIGHT 797 WHICH OCCURRED ON JUNE 2, 1983, WHEN THE FLIGHTCREW OF THE MCDONNELL DOUGLAS DC-9 AIRPLANE WAS FORCED TO MAKE AN EMERGENCY LANDING AT THE GREATER CINCINNATI AIRPORT BECAUSE OF AN IN-FLIGHT FIRE. THE INTERIOR MATERIALS OF THE AIRPLANE'S CABIN CONTINUED TO BURN AFTER THE LANDING. FIVE CREWMEMBERS AND 18 PASSENGERS WERE ABLE TO EVACUATE THE BURNING CABIN; THE REMAINING 23 PASSENGERS DIED IN THE FIRE. THE SAFETY BOARD'S INVESTIGATION HAS DETERMINED THAT THE FIRE BEGAN IN THE AIRPLANE'S LEFT REAR LAVATORY, BUT THE SOURCE OF IGNITION HAS NOT YET BEEN IDENTIFIED. TO PROMOTE A COMPREHENSIVE PROGRAM TO ADDRESS THE POTENTIALLY HAZARDOUS SITUATION POSED BY IN-FLIGHT FIRES, THE SAFETY BOARD IS ISSUING NEW SAFETY RECOMMENDATIONS RATHER THAN REITERATING RELEVANT SAFETY RECOMMENDATIONS PREVIOUSLY ISSUED TO THE FAA.

Recommendation:

THE NTSB RECOMMENDS THAT THE FEDERAL AVIATION ADMINISTRATION: EVALUATE AND CHANGE AS NECESSARY THE PROCEDURES CONTAINED IN THE FAA-APPROVED AIRPLANE FLIGHT MANUALS (AFM) OF TRANSPORT CATEGORY AIRPLANES RELATING TO THE CONTROL AND REMOVAL OF SMOKE TO ASSURE THAT THESE PROCEDURES ADDRESS A CONTINUING SMOKE SOURCE AND ARE EXPLICIT WITH REGARD TO THE PRESENCE OF FIRE AND THE OPTIMUM USE OF CABIN PRESSURIZATION AND AIR CONDITIONING SYSTEMS.

Correspondence:

Response Date: 1/27/1984 From: Addressee

Response:

FAA COMMENT: THE FAA DOES NOT TOTALLY CONCUR WITH THIS RECOMMENDATION. THE REQUIREMENTS SPECIFIED IN 14 CFR 25.831 (B), (C), (D), AND (F); 14 CFR 25.857(A), (B), (C), (D), AND (E); THE CERTIFICATION PROCESS, AND THE INDUSTRY DESIGN EFFORT ALREADY OPTIMIZE FOR THE USE OF FIRE EXTINGUISHING, CABIN PRESSURIZATION, AIR CONDITIONING, AND VENTILATION SYSTEMS TO EXTINGUISH OR CONTROL FIRES AND/OR SMOKE. THE LOGICAL SEQUENCE OF STEPS ASSOCIATED WITH OPTIMIZING THE USE OF THESE SYSTEMS BEGINS WITH DEFINING LIKELY SMOKE SOURCES, THE DEFINITION OF HAZARDOUS SMOKE QUANTITIES, THE

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DEFINITION OF SMOKE DURATION, AND THE ASSESSMENT OF THE DEGREE OF SMOKE PROTECTION NEEDED. PROBLEMS ASSOCIATED WITH DEALING WITH FIRE AND SMOKE CAN BE COMPOUNDED BY THE CONTROL OF VENTILATION OR PRESSURIZATION. A DECREASE IN VENTILATION MAY INCREASE THE EXPOSURE TO SMOKE, AS IT WILL PREVENT THE EXHAUST SYSTEMS FROM WITHDRAWING THE SMOKE BEING GENERATED. ON THE OTHER HAND, IF TOO MUCH VENTILATION IS BEING SUPPLIED, THE FIRE MAY INCREASE OR SPREAD. DEPRESSURIZATION IS A VIABLE MEANS TO EVACUATE SMOKE AND LIMIT BURN RATES, BUT PASSENGERS ARE PHYSIOLOGICALLY LIMITED AS TO WHAT ALTITUDE THEY CAN BE EXPOSED TO WITH LIMITED OXYGEN EQUIPMENT. TO FURTHER COMPOUND THE PROBLEM, THE USE OF OXYGEN EQUIPMENT MAY INTRODUCE ADDITIONAL FIRE HAZARDS. THESE FACTORS ARE CONSIDERED DURING THE DESIGN AND CERTIFICATION PROCESS AND CULMINATE IN THE PROCEDURES CONTAINED IN EACH FAA-APPROVED AIRPLANE FLIGHT MANUAL (AFM). DURING THE CERTIFICATION PROCESS, DENSE SMOKE (ENOUGH TO FILL THE COCKPIT) IS GENERATED IN THE COCKPIT DURING FLIGHT. PROPOSED AFM FIREFIGHTING AND SMOKE EVACUATION PROCEDURES ARE THEN FOLLOWED, AND THEIR ADEQUACY IS EVALUATED FOR THE VARIOUS AIRPLANE PRESSURIZATION AND VENTILATION OPERATIONAL CONFIGURATIONS. THE RESULTS OF THIS TESTING ARE INCORPORATED IN THE APPROVED AFM. ELECTRONIC BAYS BELOW THE CABIN FLOOR AND CARGO COMPARTMENTS ARE EVALUATED USING THE FIRE PENETRATION AND SMOKE EVACUATION PROCEDURES PERTINENT TO THE COMPARTMENT BEING EVALUATED. SMOKE IS GENERATED IN FLIGHT FOR PENETRATION TESTS TO SATISFY 14 CFR 25.831 AND THE SPECIFIC CARGO COMPARTMENT REQUIREMENT OF 14 CFR 25.857. HARMFUL OR HAZARDOUS QUANTITIES OF SMOKE MUST NOT PENETRATE THE PASSENGER CABIN AS SPECIFIED IN 14 CFR 25.831(B), (C), AND 25.857(C)(3), (D)(2), AND (E)(4). HOWEVER, LIGHT SMOKE MAY PENETRATE THE COCKPIT, BUT SMOKE CLEARING PROCEDURES MUST BE DEMONSTRATED FOR COMPLIANCE WITH 25.831(C) AND (D), AND 25.857(B)(2), (C)(3), (D)(2), AND (E)(4). THE FAA HAS NOT IN THE PAST, NOR DO WE NOW FEEL IT NECESSARY, TO REQUIRE AS PART OF THE CERTIFICATION PROCESS THE CONSIDERATION OF A CONTINUOUS SMOKE SOURCE FOR OCCUPIED COMPARTMENTS. OUR POSITION CONTINUES TO BE THAT ANY FIRE WITHIN ANY OCCUPIED COMPARTMENT SHOULD BE LOCATED AND EXTINGUISHED. FOR THAT REASON, SMOKE SOURCES FOR THESE OCCUPIED COMPARTMENTS ARE CONSIDERED TO BE OF LIMITED DURATION (NOT CONTINUOUS). FOR CONTINUOUS SOURCES OF SMOKE, SUCH AS SUPPRESSED OR CONTROLLED DEEP-SEATED CARGO FIRES THAT CONTINUE TO SMOLDER, OUR EFFORTS ARE DIRECTED TO PREVENT SMOKE FROM PENETRATING INTO OCCUPIED COMPARTMENTS. SMOKE PENETRATION TESTS ARE CONDUCTED BY GENERATING ENOUGH SMOKE TO SATISFY THE FAA TEST OBSERVER THAT HAZARDOUS QUANTITIES OF SMOKE WILL NOT PENETRATE OCCUPIED COMPARTMENTS. HOWEVER, IT MUST BE REALIZED THAT IF FIRES ARE NOT EXTINGUISHED OR CONTROLLED, THE VENTILATION SYSTEM METHOD

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DESIGNATED FOR CONTROL OR EVACUATION MAY BE DESTROYED OR OVERWHELMED. BASED ON THE ABOVE, OUR EFFORT RELATIVE TO RECOMMENDATION A-83-77 WILL BE TO CONDUCT A REVIEW TO INSURE THAT THE AFM AND THE TRAINING PROCEDURES CONTAIN THE FOLLOWING OBJECTIVES: 1. IT MUST BE CLEARLY STATED AND UNDERSTOOD THAT: A. AFTER CONDUCTING THE FIRE SUPPRESSION AND SMOKE EVACUATION PROCEDURES, EVEN THOUGH THE SMOKE HAS DISSIPATED, IF IT HAS NOT OR CANNOT BE VISIBLY VERIFIED THAT THE FIRE HAS BEEN PUT OUT, IMMEDIATELY LAND AT THE NEAREST SUITABLE AIRPORT. B. AFTER CONDUCTING THE CARGO COMPARTMENT FIRE SUPPRESSION OR SMOKE EVACUATION PROCEDURES, REGARDLESS OF THE DURATION CAPABILITY OF THE CARGO FIRE EXTINGUISHING SYSTEM, LAND AT THE NEAREST SUITABLE AIRPORT. 2. AFM CHANGES WILL BE MADE IF NEEDED, BUT NOT IF EXISTING PROCEDURES ARE FOUND TO BE ADEQUATE OR MORE CONSERVATIVE. FOR EXAMPLE, THE PROCEDURE SHOULD NOT BE CHANGED IF IT CALLS FOR LANDING AT THE NEAREST SUITABLE "LANDING SITE" RATHER THAN THE NEAREST SUITABLE "AIRPORT."

Response Date: 7/9/1984 From: NTSB

Response:

The Board agrees that the one best first action to be taken in dealing with in-flight fire and smoke is to locate and extinguish the source of the smoke. It also agrees that failing in the above, a prudent pilot should land immediately. However, as with the Air Canada accident, it may not be possible to extinguish the fire or stop continued generation of smoke as the situation becomes more critical before finding a suitable landing site. The Safety Board understands that there could be many situations in which the use of ventilation, pressurization, and passenger oxygen could aggravate a situation. However, it continues to believe that the FAA should evaluate procedures for the control and removal of smoke and should address the continuous smoke source problem. Pending a response containing such a proposed action, this recommendation will be classified as "Open-- Unacceptable Action."

Response Date: 1/22/1985 From: Addressee

Response:

FAA LTR: OUR IN-DEPTH EVALUATION OF CURRENT SMOKE CONTROL AND REMOVAL PROCEDURES IN AIRPLANE FLIGHT MANUALS (AFM) HAS BEEN COMPLETED. OUR RECOMMENDATIONS REGARDING THE AFM'S FOR SMALLER TRANSPORT CATEGORY AIRPLANES HAVE BEEN SENT TO THE APPROPRIATE AIRPLANE MANUFACTURERS FOR IMPLEMENTATION. WE ANTICIPATE THAT THE PROPOSED CHANGES TO THE AFM'S WILL BE COMPLETED BY MID-1985. WE ARE PRESENTLY IN THE PROCESS OF TRANSMITTING, TO THE MANUFACTURERS OF LARGER TRANSPORT CATEGORY AIRPLANES, OUR COMMENTS AND RECOMMENDATIONS REGARDING THEIR AFM'S. WE ANTICIPATE, DEPENDING UPON THE TIMELY RESPONSES OF THE MANUFACTURERS, THAT THE PROPOSED CHANGES TO THEIR AFM'S WILL BE COMPLETED BY LATE 1985.

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Response Date: 5/10/1985 From: NTSB

Response:

The Safety Board is pleased to learn that the FAA's in-depth evaluation of smoke control and removal procedures contained in current AFM has been completed and that recommendations regarding the AFM's for transport category airplanes have been or are in the process of being transmitted to the manufacturers for implementation. Safety Recommendation A-83-77 has been classified as "Open--Acceptable Action," pending assurances from the FAA that all operators of transport airplanes have been provided this vital information. Your efforts to improve aviation safety are appreciated.

Response Date: 12/6/1985 From: Addressee

Response:

FAA MEETING: FAA IS IN THE PROCESS OF CHANGING THE AFMS. WHEN ALL OPERATORS HAVE UPDATED THEIR APMS, THE SAFETY BOARD WILL BE NOTIFIED. ACTION SHOULD BE COMPLETED BY MAY 1988.

Response Date: 1/15/1987 From: Addressee

Response:

The FAA has contacted the U.S. manufacturers of transport category airplanes, and all have either completed the revision of their airplane flight manuals (AFM) to include smoke removal procedures that the FAA has determined necessary, or they have Data Source: NTSB Recommendations to FAA and FAA Responses committed to do so at the next AFM revision. The last U.S. manufacturer of transport category airplanes that are used in air carrier service will complete the necessary AFM revisions by May 1987. The foreign airworthiness authorities have indicated that they would withhold action until the FAA has formally issued its position on this subject. On July 29, 1986, the FAA issued Advisory Circular (AC) 25-9, Smoke Detection, Penetration, Evacuation Tests and Related Flight Manual Emergency Procedures, which provides guidance for the conduct of certification tests relating to smoke detection, penetration, and evacuation, and to evaluate related AFM procedures. I believe that the issuance of the AC satisfies this request. A copy of the AC is enclosed for the Board's information. I consider the FAA's action to be completed on this recommendation.

Response Date: 3/12/1987 From: NTSB

Response:

The Safety Board is pleased to learn that the U.S. manufacturers of transport category airplanes have all either completed the revision of their airplane flight manuals (AFM) to include smoke removal procedures or have committed to do so at the next AFM revision. The Board is additionally pleased that the necessary AFM revisions for the remaining transport category airplanes will be completed by May 1987 and that the FAA plans to work with the foreign airworthiness authorities in developing similar requirements. Based upon this action, Safety Recommendation A- 83-77 has been classified as "Closed--Acceptable Action." Your efforts to improve aviation safety are appreciated.