Log 1666

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

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Forwarded to:
Honorable Michael J. Fenello
Acting Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)
A-84-8 and -9
~~A-84-17 through -20~~

On May 5, 1983, Eastern Air Lines, Inc., Flight 855, a Lockheed L-1011 airplane, was en route from Miami, Florida, to Nassau, Grand Bahama Island, when the flightcrew noted an indication of loss of oil pressure on the No. 2 engine and shut it down. Rather than continue the descent to Nassau, which was about 50 nautical miles away, the captain decided to return to Miami because of better weather and terminal approach aids there. However, after the airplane's course was reversed and it was level at 16,000 feet, the No. 3 engine flamed out; about 5 minutes later, the No. 1 engine flamed out. With none of the airplane's engines operating, the flightcrew began a descent designed to maximize the glide distance, and began efforts to restart the No. 2 engine. At the same time, the flightcrew considered it probable that they would be forced to ditch the airplane and the flight engineer told the senior flight attendant to prepare the cabin for imminent ditching. After descending about 11,000 feet, the flightcrew succeeded in restarting the No. 2 engine, and subsequently landed the airplane safely in Miami. There were no injuries to the 162 passengers and 10 crewmembers. 1/

The Safety Board's investigation of this accident disclosed that O-ring seals were missing from the master chip detector 2/ on each of the airplane's three RB-211-22B engines, and that the lack of seals permitted the lubricating oil to leak from each of the engines. The Nos. 1 and 3 engines stopped operating because of damage to the internal gearboxes which interrupted operation of the fuel pumps. The No. 2 engine which had been shut down earlier was successfully restarted and remained serviceable although it contained only about 1 quart of oil in the engine's oil tank and 2 quarts of oil in the external gearbox for internal lubrication -- less oil than remained in the Nos. 1 and 3 engines which had flamed out.

1/ For more information read, Aircraft Accident Report—"Eastern Airlines, Inc., Lockheed L-1011, N334A, Miami International Airport, Miami, Florida, May 5, 1983" (NTSB/AAR-84-04).

2/ A magnetic plug in the engine oil system that is periodically removed and inspected for adherence of metallic particles which are indicative of the onset of engine problems.

Maintenance Operations

Examination of Eastern Air Lines maintenance records and the testimony at Safety Board-conducted deposition proceedings of Eastern Air Lines and Federal Aviation Administration (FAA) personnel revealed that between September 1981 and May 1983 there had been 12 earlier incidents involving oil loss on RB-211-22B engines. Eight incidents involved the shutdown of one engine; three of these incidents resulted from the master chip detector having been installed without any O-ring seals. Nine incidents involved defective seals, improperly installed master chip detectors, or missing chip detectors. These 12 incidents resulted in 7 unscheduled landings.

The FAA principal maintenance inspector (PMI) for Eastern Air Lines testified that he and other FAA maintenance inspectors assigned to the surveillance of Eastern Air Lines had been aware of each of the 12 incidents. He stated that the "FAA has been aware of a problem with not only O-rings but the magnetic chip detector since September 1981." After the first four incidents, the FAA required Eastern Air Lines to modify the maintenance work card procedures for changing master chip detectors; the modification was completed in December 1981. However, as the record indicates, eight subsequent incidents occurred without the FAA taking any other surveillance or enforcement action to address the problem.

On May 17, 1983, during the deposition proceeding, the PMI said that his inspectors had reviewed the circumstances of each oil leak incident from reports submitted by Eastern Airlines, and, in each case, agreed with the corrective action taken by the airline. The corrective actions consisted of disciplinary action and/or retraining the mechanic involved in the faulty installation of the chip detector. The PMI was convinced that the continuing recurrences were not due to Eastern Air Lines maintenance management but solely the responsibility of each individual mechanic who failed to perform according to written instructions. Thus, each incident was treated by the PMI as an isolated incident. The PMI stated that prior to May 5, 1983, he did not view these incidents of oil loss from master chip detectors as collectively indicating the existence of a major safety problem. Consequently, he did not assign a surveillance priority to the work card procedure or to the training of mechanics, and he was not aware whether any FAA inspectors had specifically observed the changing of master chip detectors to determine whether the modified procedures and the retraining had been effective measures for the prevention of further incidents.

The PMI stated that about 500 individual surveillance inspections were conducted on various Eastern Air Lines activities between October 1982 and May 1983. However, he had not seen nor requested data from the FAA's Service Difficulty Report Program or other FAA computerized data banks that would have shown a composite picture or trend of master chip detector failures. He also said that he had not inquired to determine if other major airlines that operated L-1011 airplanes had experienced similar problems with master chip detectors.

The Safety Board is concerned that the FAA's maintenance surveillance program for Eastern Air Lines, prior to the accident, appears to have been reactive rather than prospective by failing to use data analysis and trend forecasting to identify a potential safety problem. While collecting and monitoring a substantial amount of data -- 500 surveillance reports in 8 months, and daily and weekly reviews of reports submitted by Eastern Air Lines -- the FAA treated incidents as unique, disconnected events, thereby overlooking their collective implication of a serious safety problem. The Safety Board recognizes that existing FAA programs, together with additional efforts being implemented, ultimately should give not only higher visibility to airline maintenance but make future FAA inspection activity more efficient.

Even though new FAA programs are underway to collect maintenance data, which currently are unavailable, this accident indicates that at least part of the air carrier inspector workforce is not using available data. Moreover, in this case, it appears possible that the FAA has collected the submissions of an airline on an unordered basis without adequate analysis as to the overall significance of the data and without sufficient attention to the efficacy of the remedial maintenance measures prompted by the FAA. These shortcomings may be corrected when planned FAA programs yet to be implemented become fully effective. However, the Eastern Air Lines accident represents a deficiency in the FAA air carrier surveillance program, and initiatives must be taken by the FAA to improve the current quality of surveillance inspections.

Passenger Emergency Briefings

In the course of its investigations of previous accidents and incidents, the Safety Board repeatedly has expressed concern about the adequacy of passenger briefings, the coordination between flightcrews and flight attendants during emergency situations, and the difficulties which passengers experience in locating, retrieving, and donning life vests. The issue of passenger safety briefings has been discussed most recently by our agencies in the exchange of correspondence regarding Safety Recommendation A-83-45 calling upon the FAA to sponsor a government/industry/consumer task force to develop more effective passenger safety briefing information and better techniques for communicating such information. The FAA declined to implement this recommendation. Accordingly, the Safety Board has placed Safety Recommendation A-83-45 in an "Open--Unacceptable Action" status pending FAA's reconsideration of this matter. Furthermore, because of the importance the Board attaches to this issue, it is considering pursuing this matter directly with the aviation industry.

Although the need in this accident to ditch the airplane was averted, the Safety Board's investigation of the activities and problems of the flightcrew, the flight attendants, and the passengers during preparations for the ditching corroborates many of the concerns previously expressed by the Safety Board. In this accident, the usual predeparture oral briefing of passengers for extended over water flights was conducted by the flight attendants and included a demonstration of the donning of life vests. The flight attendants noted that the cabin was particularly noisy during this predeparture briefing and that many of the passengers were inattentive; however, of the 92 passengers who responded to a Safety Board questionnaire 81 indicated that they recalled the briefing and had observed the life vest donning demonstration. Only 46 of these 92 passengers said that they had read the safety briefing card before takeoff. The passengers generally knew where the life vests were stowed; however, most were not aware that the vests would be folded and sealed in a plastic container.

During the emergency, there were four communications between the flightcrew and the flight attendants. After the No. 2 engine was shut down, the flightcrew informed the senior flight attendant that the flight was returning to Miami; 14 minutes later, the No. 3 engine flamed out and the flight engineer instructed the senior flight attendant to prepare the cabin for a ditching; 5 minutes later, following the flameout of the remaining (No. 1) engine, the flight engineer announced that a ditching was imminent. About 10 minutes later, the final communication informed the flight attendants that they should prepare for a normal landing.

The flight attendants responded immediately to the warning to prepare the cabin for a ditching. Passengers were told to retrieve and don their life vests; the flight attendants selected able bodied persons, briefed them on the operation of doors and slide/rafts, and

relocated them accordingly; and passengers were instructed on how to assume the brace position. The flight attendants believed, however, that they would have been more effective had they been told the nature of the emergency and given some estimate of the time available to them for the cabin preparation. Some of the flight attendants were uncertain about whether there would be further warning from the cockpit as to when to assume the brace position. Because the flight attendants were not aware of the time available, they tended to rush the preparations, possibly to the exclusion of providing individual assistance where it was needed. The flight engineer announced that a ditching was imminent while the airplane was still at an altitude of about 10,000 feet and descending at about 1,600 feet per minute. The flight attendants instructed passengers to assume the brace position immediately. The descent was subsequently arrested when the flightcrew succeeded in restarting the No. 2 engine. The passengers remained in the brace position for about 10 minutes until they were informed that the airplane would make a normal landing.

The main problem confronting the 162 passengers was locating, retrieving, unpackaging, and donning the life vests. Of the 92 passengers who responded to the Safety Board questionnaire, 25 passengers reported problems locating the life vest stowage compartment, 29 passengers reported difficulty removing the package from the stowage compartment, and 17 passengers reported problems tearing open the sealed plastic packages. Sixty-three passengers reported difficulty in donning the lifevests; the most common problem being difficulty in extending the back panel on the vest. Thirty-three passengers stated that they could not don the life vest while seated with the lap belt fastened.

Many of the passengers received direct assistance from the flight attendants and these passengers praised the flight attendants for their professional manner. However, other passengers felt that they were neglected and uninformed. Many passengers stated that they were particularly apprehensive because they had not been told the nature of the problem with the airplane and what to expect if the airplane was forced to ditch. Several passengers expressed concern that they could not get information about whether the airplane would float, the time available for evacuation, and postevacuation procedures.

The Safety Board believes that the problems which were experienced by the passengers and crew of Flight 855 as they prepared for a ditching can be abated by assuring (1) that prescribed emergency procedures and crew training stress the importance of coordination and communications between the flightcrew and flight attendants during emergencies, (2) that flight attendant's predeparture oral briefings are complete and hold the attention of passengers, and (3) that life vests are optimally designed for ease of unpackaging and donning by passengers who are seated with their lap belts fastened.

Although the Safety Board believes that the revision to the Technical Standard Order (TSO-C13d) pertaining to life preservers published on January 3, 1983, has overcome a number of problems, it is concerned that this new standard may not adequately address the problems of donning a life vest while seated with the lap belt fastened. While the new standard requires both increased bouyancy and a donning demonstration, 3/ the Safety Board has been told that many life vests which meet the

3/ TSO C13d Appendix 1, paragraph 4.1.11 Donning. It must be demonstrated that an adult, after receiving only the customary preflight briefing on the use of life preservers, can don the life preserver within 15 seconds unassisted while seated. It must be demonstrated that an adult can install the life preserver on another adult, a child, or an infant within 30 seconds unassisted. The donning demonstration is begun with the unpackaged life preserver in hand.

predecessor standard of TSO C13c, like those which were aboard Flight 855, also meet the donning demonstration requirement of TSO C13d. However, it is significant that neither TSO C13c nor C13d specifies that the lap belt must be kept fastened during the demonstration. The Safety Board believes that the hazard which will exist if the passengers must unfasten their lap belts to don life vests should be recognized and dealt with. Furthermore, the Safety Board is concerned that the FAA has not established a date after which all life vests aboard air carrier airplanes must comply with the new standards. The Safety Board believes that standardized use of the improved life vests should be required at an early date.

Therefore, as a result of its investigation, the Safety Board recommends that the Federal Aviation Administration:

Provide FAA air carrier inspectors, for use in their surveillance activities, failure trend information based on airline maintenance data which have been reported by airlines, and analyzed and ranked by the FAA for their significance on flight safety. (Class II, Priority Action) (A-84-8)

Require the Federal Aviation Administration's principal maintenance inspectors to document and report periodically on the effectiveness of FAA-directed actions to correct deficiencies detected during surveillance activities. (Class II, Priority Action) (A-84-9)

Require the revision of the Eastern Air Lines flight manual emergency landing/ditching checklist in the emergency procedures section and the flight deck crew duties checklist in the ditching/crash landing procedures section (1) to make them consistent with those procedures in the flight attendant manual regarding the cockpit crew informing the flight attendants of the nature of the emergency and the approximate time available for cabin preparation, and (2) to prescribe a standardized signal to flight attendants to direct passengers to assume the brace position. (Class II, Priority Action) (A-84-17)

Require air carrier operations inspectors to review and to require modification as needed of the flight manuals, flight attendant manuals, and training programs of their respective air carriers to assure compatibility of emergency procedures and checklists. Specific attention should be given to communications among crewmembers during emergencies, including a requirement that the cockpit crew inform the flight attendants of the nature of the emergency and the approximate time available for cabin preparation, and a standardized signal to flight attendants to direct passengers to assume the brace position. (Class II, Priority Action) (A-84-18)

Initiate a research and development project directed at revising the minimum performance standards for life preservers contained in Technical Standard Order (TSO) C13d, to require that the life preservers manufactured under this standard can be donned in a minimum time by the average passenger without assistance while seated with the lap belt fastened. (Class II, Priority Action) (A-84-19)

Revise 14 CFR 121 to require the installation of TSO-C13d life vests on all air carrier aircraft within 12 months of the effective date of TSO-C13d. (Class II, Priority Action) A-84-20)

BURNETT, Chairman, GOLDMAN, Vice Chairman, and BURSLEY, ENGEN, and GROSE, Members, concurred in these recommendations.

By: Jim Burnett
Chairman