



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

SP-20 Log 1871

Date: March 4, 1986

In reply refer to: A-86-14 through -19

Honorable Donald D. Engen
Administrator
Federal Aviation Administration
Washington, D.C. 20594

About 0102:30 Pacific standard time on January 21, 1985, Galaxy Airlines Flight 203, a Lockheed Electra (N5532) charter flight en route to Minneapolis, Minnesota, departed runway 16R of the Reno-Cannon International Airport. Approximately one minute later, the crew requested a turn to a left downwind to return to the airport because of a vibration in the airplane. In accordance with the request, the tower controller cleared the flight to make a left turn to a downwind traffic pattern. The airplane crashed at 0104 into an area 1 1/2 miles from the departure end of runway 16R, and 3/4 mile to the right of the extended runway centerline. The impact and subsequent fire killed the crew of six and 64 of the 65 passengers onboard. The airplane was destroyed. The sky was clear and the visibility was 12 miles at the time of the accident. 1/

The investigation disclosed that vibrations caused by open air start access doors on the Electra were known to many pilots and that Galaxy's former director of operations had experienced the phenomenon during the 1970's. Reports of other Electra pilots who had experienced the open access door seem to support the sense that they were not aware of the cause of the severe vibrations during the encounter, but the experience remained with them as a significant event in their careers.

Several carriers with pilots who had encountered such severe vibrations from open air start access doors modified the doors. One such carrier operates a fleet of 21 Electras, each of which has been modified. Since the FAA has not issued a supplemental type certificate (STC) to modify the door, operators can acquire an Electra which has one of any number of air start access door types, none of which require additional FAA aircraft certification.

The Safety Board concludes that the possible adverse consequences of an air start access door opening inflight are such that the FAA should require operators to modify these doors, as soon as possible, to prevent these consequences from occurring. The Board believes that the FAA should issue an airworthiness directive to Electra operators to require that these doors be so modified.

1/ For more detailed information read Aviation Accident Report—"Galaxy Airlines Inc., Lockheed Electra-L-188C N5532, Reno, Nevada, January 21, 1985" (NTSB/AAR-86/01)

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Galaxy was not informed of the problems that could be encountered inflight in the Electra when an air start access door is inadvertently left open. Several reasons seem to explain why they and other operators were not so informed. At the time the Electra was first certificated and operated, no system existed for pilots to directly communicate with a government agency about operational problems concerning an aircraft with assurance that retribution would not be taken against them. This problem has since been corrected, up to a point, by the establishment in 1976 of the Aviation Safety Reporting (ASRS) system. The Electra vibration problem also did not fall within a clearly defined category of the FAA's Service Difficulty Reporting (SDR) requirements since it did not involve a major structural or mechanical defect. In addition, as the time since the Electra was first certificated has advanced, the communications between operators and the manufacturer of the airplane, which has long since ceased production of that airplane, have become increasingly less direct. The problem of communication has been exacerbated by the increasing number of operators, such as Galaxy, who operate relatively small Electra fleets. As a result, neither the FAA nor Lockheed was apparently aware of the potentially adverse consequences of an open air start access door on the Electra since neither had records of these types of vibrations in their files, despite the fact that some pilots knew of the problem. Had the flightcrew of Galaxy 203 been informed, they would have been prepared to respond when confronted with the vibration. The Safety Board concludes that until all Electra wing mounted air start access doors are modified, the FAA should inform operators of the potential inflight aerodynamic consequences encountered with Electra airplanes both to ensure that all pilots of Electras are made aware of the problems and that they can recognize and react appropriately to such situations.

The Safety Board believes that full adherence to required procedures and regulations by a carrier depends on a continuous interaction between that carrier and responsible government agencies. This interaction, critical though it is in aviation, is especially critical when a carrier is new and its procedures are still evolving with the evolution of the operations. Moreover, due to its unique history, Galaxy should have been, and the Safety Board believes was not, inspected beyond the high level usually required by a relatively young carrier. It experienced an uncommonly high turnover among critical management personnel. It was controlled by an individual with a less than optimum record of compliance with financial obligations. The recordkeeping, which was recognized by Galaxy's principal inspectors as deficient, showed numerous instances of changes to aircraft logs. Its operations moved periodically according to contractual needs, but the major portion of the FAA surveillance activities was confined to the south Florida area in spite of stated procedures which should provide for surveillance outside this area.

At times, the FAA's surveillance of Galaxy displayed the type of activity that the Safety Board considers proper; for example, comprehensive examination of the propeller on engine No. 2 of N5532 and its history before it granted approval of Galaxy's request for an extension of a required inspection. However, the fact remains that only after the accident was the FAA able to discover alleged violations of operational and maintenance regulations that occurred before the accident and that were sufficiently critical for the FAA to seek several hundred thousand dollars in civil penalties against Galaxy. In contrast, FAA inspectors, including the one who performed the investigation that resulted in the alleged maintenance violations, indicated during the Safety Board's public hearing general satisfaction with the degree of Galaxy's compliance with FAA regulations.

Therefore, the Safety Board concludes that FAA surveillance of Galaxy's operations and maintenance was seriously deficient. Moreover, that inspectors who were aware or were in a position to be aware of the FAA's investigation of Galaxy expressed in their

testimony general satisfaction with Galaxy's compliance with FAA regulations indicates that FAA inspectors were less than forthcoming in their interaction with the Safety Board in the conduct of its investigation.

Had the FAA carried out the type of surveillance of Galaxy that it performed after the accident, it is possible that Galaxy's operations would have improved substantially before the accident. Further, the Safety Board believes that it is imperative that the FAA, as the responsible agency for assuring operator compliance with federal aviation regulations, monitor and inspect operators to the extent necessary to verify that proper compliance is achieved. In addition, since Galaxy's operations were unique in that its charter bases were moved periodically to various locations and since there was no indication that the FAA carried out proper surveillance of operations based outside of south Florida, the Safety Board believes that the FAA should establish and enforce procedures to ensure that consistent levels of surveillance and inspection are carried out regardless of where an operator bases its operations.

The Safety Board believes that all persons who have responsibility for servicing, operating, or directing aircraft share in the safe outcome of that aircraft's operation. This accident illustrates the importance of ground handlers to, and their responsibility for, the operation of Galaxy 203. Consequently, the Safety Board concludes that the ground handlers contributed to the cause of this accident by failing to properly close the air start access door on N5532.

Despite the ground handler's contribution to the cause of this accident, the Safety Board believes that supplemental carriers such as Galaxy, operating under 14 CFR 121, must ensure that all servicing performed on their aircraft meets the requirements of 14 CFR 121.123. ^{2/} The Safety Board believes that the flightcrew of Galaxy 203 met the requirements of 14 CFR 121.123 since the flight engineer personally supervised or performed critical tasks such as baggage loading, fueling, and engine servicing, and since the broker agent supervised the servicing of the passenger cabin. Only the relatively simple tasks of connecting and disconnecting ground power units were performed, unsupervised, by Reno Flying Service personnel. Consequently, because of the relative simplicity of the tasks, the Safety Board concludes that Galaxy met the intent of 14 CF 121.123. However, the Safety Board believes that because all operators may not adhere to this regulation, the FAA should inform supplemental operators of their responsibility, described in this regulation, for the services that are performed on their aircraft.

Shortly after takeoff, at 0103:45, the first officer on Galaxy 203 informed the controller that they wanted to return to the field. Thirteen seconds later the first officer explained to him the reason for the request: a "heavy vibration in the aircraft." The controller immediately cleared them for a return to the airport and asked, "Do you need the (emergency) equipment?" Two seconds later, the first officer of Galaxy 203 responded "affirmative."

The controller testified that he interpreted this response as a declaration that Galaxy 203 was in an emergency condition. While the crew of N5532 should have declared an emergency, the controller nevertheless treated this as an emergency. His assessment of the situation was timely and appropriate.

^{2/} 14 CFR 121.123 states, in part, that:

Each supplemental air carrier or commercial operator must show that competent personnel and adequate facilities and equipment (including spare parts, supplies, and materials) are available for the proper servicing, maintenance, and preventive maintenance of aircraft and auxiliary equipment.

He then asked the crew, "How many people on board and say amount of fuel remaining?" The first officer answered and the controller then said, presumably to ensure accuracy: "Sixty-eight people and twelve hundred pounds of fuel?" As the first officer was answering the controller, the CVR indicates that the Ground Proximity Warning System (GPWS) began alerting the crew to "Pull up, Pull up."

FAA Air Traffic Control Handbook offers controllers only general guidance in responding to an inflight emergency since emergencies are so varied. However, it does direct the controller to act on an emergency once information on the pilot's desires and the nature of the emergency are learned. By immediately clearing Galaxy to return to the airport, the controller responded appropriately to the situation.

In addition, a letter of agreement between the Reno Air Traffic Control Tower and the Washoe County Airport Authority directs the controller, in the event of an inflight emergency, to provide crash/fire-rescue units with information on the number of people and the amount of fuel onboard. By soliciting this information from the crew, he acted in accordance with this letter of agreement.

However, the Safety Board believes that the FAA should reexamine the need for controller requests for such information during critical inflight events. Although the first officer acted inappropriately under the circumstances by responding to the controller and not monitoring the aircraft's instruments, it is clear that the ATC requests increased flightcrew workload at a critical point in the flight.

The Safety Board recognizes that inflight emergencies create demands for information. Crash/fire-rescue units may require information on the number of people and the approximate amount of fuel aboard. However, the need to solicit such information from a flightcrew responding to the emergency is less clear. The Safety Board believes that the FAA should reexamine both the guidance it provides controllers on information requirements during inflight emergencies and the letters of agreements its Air Traffic Control Towers have signed with local crash/fire-rescue agencies, so that the abilities of flightcrew members to respond to emergencies are not compromised by emergency response-related information requirements. The Safety Board believes that if a reexamination provides satisfactory documentation of the need to solicit such information for crash/fire-rescue units, then the FAA should develop alternative methods of obtaining this information so that flightcrew members are disturbed as little as possible during an inflight emergency.

The captain was characterized as "always in command." In addition, a first officer described him as the type of captain who would often check first officers on their knowledge of equipment and procedures. This characteristic of "being in command" may have been heightened by the composition of the flightcrew on Galaxy 203. The first officer and flight engineer differed considerably from the captain in two important dimensions that affect the nature of the interpersonal relationships of flightcrew members in the cockpit: age and flight experience. The captain was more than 20 years older than the junior crewmembers, and he had been piloting aircraft in general and the Electra in particular for years, whereas the others had been operating the airplane for only a few months. Such diversity can contribute, under routine circumstances, to deference by the junior crewmembers to the senior member. Under the type of critical conditions that Galaxy 203 experienced, where flight experience is a valuable asset in responding to an emergency, the interaction could, and did, become one-sided as demonstrated by CVR conversation. The captain, who typically employed a commanding leadership style, took complete control of not only his actions but also those of the other flightcrew members after the onset of the vibrations.

Despite their relative inexperience, the junior crewmembers were qualified in the Electra. They could have assisted the captain in monitoring the flight instruments and controlling the aircraft. Instead, they responded directly to the captain's commands; the first officer, by communicating with the Reno tower, and the flight engineer, by monitoring the engines. If the first officer had noted the airspeed sooner and forcefully informed the captain of the deteriorating airspeed, thus acting contrary to the captain's direction, it is possible that power could have been applied in sufficient time to have prevented the accident.

Moreover, the inappropriate actions of the first officer extended beyond his interaction with the captain to his interaction with the local air traffic controller as well. His failure to place more important aircraft monitoring duties at a higher priority than responding to the question of the controller, albeit in accordance with the captain's direction, demonstrated a failure to apply a critical tenet of flying: aircraft control takes precedence over all other flight related duties.

Given the composition of the crew on Galaxy 203 and their differences in age and flight experience, it is possible that training in crew coordination or cockpit resource management techniques may have enhanced the quality of the interaction of the crewmembers as well as their ability to cope effectively with their increasing acute stress. Certainly, the actions of the crewmembers suggest that a less dominating captain and a more assertive junior crew would have likely improved the flightcrew's overall response to what quickly developed into an emergency. Although Galaxy personnel testified that they addressed crew coordination in training, there is no record of it in the curriculum or in the crew's training records. Moreover, Galaxy personnel appeared not to understand fully the concepts themselves as illustrated by a former pilot's description of Galaxy's emergency resource training and crew responsibilities during emergencies.

The Board believes that this accident again demonstrates the need for training in crew coordination or cockpit resource management, a need that has been identified in past accidents. As a result, the Board reiterates Recommendation A-85-27, in which it urged the Federal Aviation Administration to:

Conduct research to determine the most effective means to train all flightcrew members in cockpit resource management, and require air carriers to apply the findings of the research to pilot training programs.

The FAA has responded that it is in the process of creating a program to develop and apply advanced behavioral analysis to flight safety. This program should address the need cited in this recommendation. The Safety Board urges the FAA to develop such a program and implement its results as soon as practical. It has classified the response to this recommendation as "Open-Acceptable Action."

However, this accident demonstrates the need for all flightcrew members who are engaged in passenger transport, to be trained in cockpit resource management. While there is currently little data to support the merits of a particular cockpit resource management curriculum or instructional medium to carry out training in it, the Safety Board believes that a substantial number of flightcrew members are unaware of the tenets of cockpit resource management, when these tenets are critical to flight safety, and how they should be practiced in flight. Consequently, the Safety Board concludes that action should be taken before the results of the FAA sponsored research are determined.

The FAA provides guidance in several aspects of piloting and flight instruction. Guidance in cockpit resource management can be particularly beneficial to small carriers, such as Galaxy, who may not have access to the resources available to larger carriers to

implement a program of training in cockpit resource management. The Safety Board believes that the size of the carrier should not play a part in its ability to implement training in this important topic. Consequently, the Safety Board believes that the FAA should provide, on an interim basis, guidance in the principles of cockpit resource management to all carriers who are engaged in passenger transport.

As a result of its investigation of this accident, the National Transportation Safety Board recommended that the Federal Aviation Administration:

Issue an Airworthiness Directive to Electra operators to modify the air start access door to prevent an inadvertent inflight opening from affecting airfoil aerodynamics. (Class II, Priority Action). (A-86-14)

Until such time as Electra air start access doors are modified issue an Air Carrier Operations Bulletin to have Principal Operations Inspectors inform operators of Electra aircraft of the potential of an open air start access door to cause vibration or buffet during takeoff and inflight, and ensure that such information is included in recurrent pilot training programs for these operators. (Class II, Priority Action). (A-86-15)

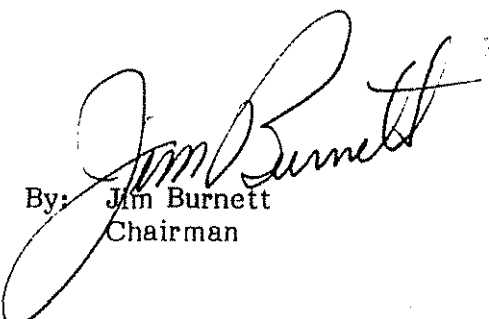
Establish procedures to ensure that adequate surveillance of operators is maintained when a carrier's operations are located away from the office responsible for the carrier's ongoing surveillance. (Class II, Priority Action). (A-86-16)

Instruct Principal Operations Inspectors to verify that supplemental operators are fulfilling their responsibility to ensure that competent personnel are available to properly maintain and service the operator's aircraft at all transient locations. (Class II, Priority Action). (A-86-17)

Evaluate the information needed by crash/fire-rescue agencies to deal with inflight emergencies, and the best method of obtaining that information, so that flightcrew members are disturbed by air traffic controllers as little as possible while they are responding to an inflight emergency. (Class II, Priority Action). (A-86-18)

Provide, to all operators, guidance on topics and training in cockpit resource management so that operators can provide such training to their flightcrew members, until such time as the FAA's formal study of the topic is completed. (Class II, Priority Action) (A-86-19)

BURNETT, Chairman, GOLDMAN, Vice Chairman, and LAUBER, Member, concurred in these recommendations.

By: 
Jim Burnett
Chairman

Safety Recommendation Reiteration List

SR Number	Reiteration Number	Report Number	Report Date	Accident Description	Accident City	Accident State	Accident Date
A-86-019	1	AAR-87-02	2/18/1987	Simmons Airlines, Flight 1746, Embraer Bandeirante, EMB-110P1, N1356P	Alpena	MI	3/13/1986