National Transportation Safety Board
Washington, D.C. 20594
Safety Recommendation

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Date: August 14, 1992

In reply refer to: A-92-79 and A-92-80

A3-10

Honorable Thomas C. Richards
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On September 11, 1991, about 1003, Central Daylight Time, Continental Express Flight 2574, an Embraer 120, operating under Title 14 of the Code of Federal Regulations (CFR) Part 135, experienced a structural breakup in flight and crashed in a cornfield near Eagle Lake, Texas.[1]

The National Transportation Safety Board determined that the probable cause of this accident was the failure of Continental Express maintenance and inspection personnel to adhere to proper maintenance and quality assurance procedures for the airplane's horizontal stabilizer deice boots, which led to the sudden in-flight loss of the partially secured left horizontal stabilizer leading edge and the immediate severe nose-down pitchover and breakup of the airplane. Contributing to the cause of the accident was the failure of the Continental Express management to ensure compliance with the approved maintenance procedures and the failure of Federal Aviation Administration (FAA) surveillance to detect and verify compliance with approved procedures.

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[1]For more detailed information, read Aircraft Accident Report--"Britt Airways, Inc., d/b/a Continental Express Flight 2574, In-flight Structural Breakup, EMB-120RT, N33701, Eagle Lake, Texas, September 11, 1991" (NTSB/AAR-92/04)

In this accident, the evidence clearly indicates that the events during the maintenance and inspection of the airplane the night before the accident were directly causal to the accident. The upper row of screws had been removed from the leading edge of the left horizontal stabilizer in preparation for a replacement of the deicing boots. Subsequently, a decision was made to postpone the deicing boot replacement and return the airplane to service. That the screws had already been removed was undetected because the maintenance, supervisory, and quality control personnel, who were charged with evaluating the airworthiness of the airplane, did not follow the approved procedures in the General Maintenance Manual (GMM) of Continental Express. Despite the fact that the work was on a critical assembly of the airplane--the horizontal stabilizer leading edges--the Safety Board found that there were no special inspections conducted of the stabilizer leading edge. Moreover, there was no indication in the pilot's airplane log book that such work had been performed.

Continental Express' maintenance program, under "Manual Requirements," 14 CFR 135.427, paragraph (b) states:

> Each certificate holder shall put in its manual the programs required by paragraph 135.425 that must be followed in performing maintenance, preventive maintenance, and alterations of that certificate holder's aircraft, including airframes, aircraft engines, propellers, rotors, appliances, emergency equipment, and parts, and must include the following:
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> (2) A designation of the items of maintenance and alteration that must be inspected (required inspections) including at least those that could result in a failure, malfunction, or defect endangering the safe operation of the aircraft, if not performed properly or if improper parts of materials are used.

The Safety Board believes that, based on the above reference, the leading edge/deicer boot assemblies should fall within the category of required inspection items (RIIs) under either the category of "airframes" or "those that could result in a failure, malfunction, or defect endangering the safe operation of the aircraft."

In spite of the fact that the Continental Express GMM 1, section 5, paragraph E, identified "stabilizer" as an RII, the Continental Express management and quality control inspectors stated that the removal and replacement of the horizontal stabilizer leading edge deice boots were not RIIs, which are required to

be inspected by a quality assurance inspector. However, the M-602 maintenance work order cards, used the night before the accident to assign the work to change both the left and right horizontal stabilizer deice boots, had the RII "Yes" block circled. Further, the completion of the deice boot change, the removal of the used deice boot, and the bonding of a new boot to the right side leading edge assembly were signed off by a quality control inspector on the third shift. However, the inspector stated that he knew that the boot was not an RII and therefore conducted only a cursory walk around the tail without inspecting the final installation of the leading edge/deice boot.

Embraer Aircraft Corporation stated that the deice boots and leading edges, as assemblies, were RIIs and were part of the larger stabilizer assembly, listed in the FAA-approved operator's GMM as an RII. The manufacturer also said that the assembly met the operational requirement of the FAA for an RII, in accordance with 14 CFR 135.427(b)(2).

Continental Express' management maintained that the leading edge/deice boot assembly was a separate assembly and that if the manufacturer or FAA had wanted the assembly treated as an RII or critical item they should have made that clear.

The Safety Board believes that the Continental Express maintenance and quality assurance personnel erred in not considering the removal and replacement of the horizontal stabilizer leading edge deice boot as an RII. The Safety Board is aware that the deice boot is bonded to the leading edge of the horizontal stabilizer and by itself would not constitute an RII. However, because the leading edge of the stabilizer must be removed to remove and replace the deice boot, the Safety Board concludes that the process of changing the horizontal stabilizer deice boots should have been designated an RII so that there could have been a more rigorous treatment of this component during maintenance.

In view of the confusion that existed in this case, and based on the potential for similar confusion by airlines in designating RIIs, the Safety Board believes that the FAA should conduct a thorough review of the regulations, policies and practices for establishing RIIs. Such a review should include manufacturers and airlines in order to develop more specific requirements.

The Safety Board believes that a pilot's awareness of maintenance performed on an airplane since the last flight may prompt more attention to potentially unsafe conditions during the preflight inspections of the aircraft. Currently, pilots are not

normally provided with such information. For example, because the work performed on the horizontal stabilizers of the Continental Express EMB-120 was considered scheduled maintenance, it was not noted in the pilot's airplane log book. Moreover, there are no regulatory provisions for pilots to be made aware of routine maintenance work, regardless of its complexity.

In this case, if the flightcrew had been informed of the previous night's maintenance of the airplane, they might have been able, with the advantage of morning daylight, to assist in checking the work.

The top of the horizontal stabilizer on the airplane's "T-tail" is about 20 feet above the ground. Therefore, the flightcrew could not have seen the area of the missing crews on top of the leading edge/deice boot during their normal preflight inspection. However, if they had been informed of the maintenance, they might have discussed the work with maintenance personnel and requested them to conduct a visual inspection of the stabilizer's upper surface. Because the flightcrew was unaware of the previous night's work on the airplane, the possibility of having another set of eyes observe the work was eliminated.

Therefore, the Safety Board believes that a study should be undertaken on the feasibility of developing a means to advise flightcrews about recent maintenance actions, both routine and nonroutine, on the airplanes they are about to fly, so that they have the opportunity to be alert to discrepancies during preflight inspections and possibly to make an additional inspection of critical items, such as RIIs, that may affect the safety of flight.

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

> In cooperation with aircraft manufacturers and airlines, conduct a review of the regulations, policies, and practices related to establishing required inspection items (RIIs) for airline maintenance departments with the view toward developing more specific identification of RIIs. (Class II, Priority Action) (A-92-79)
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> Require that airlines operating under 14 CFR Parts 135 and 121 study the feasibility of developing a means to advise flightcrews about recent maintenance, both routine and nonroutine, on the airplanes that they are about to fly, so that they have the opportunity to be alert to discrepancies during preflight inspections and possibly to make an additional inspection

of critical items, such as required inspection items (RIIs), that may affect the safety of flight. (Class II, Priority Action) (A-92-80)

Vice Chairman COUGHLIN, and Members LAUBER, HAMMERSCHMIDT and HART concurred in these recommendations.

Chairman Vogt did not participate.

By: Susan M. Coughlin
Vice Chairman