



# National Transportation Safety Board

Washington, D.C. 20594  
Safety Recommendation

Log 2112 SP-20

Date: September 25, 1989  
In reply refer to: A-89-101 and -102

Honorable James B. Busey  
Administrator  
Federal Aviation Administration  
Washington, D.C. 20591

On July 27, 1988, about 1817 Alaska daylight time, a Fairchild SA-227-AC (Metro III) 21-seat airplane, N482SA, operating as Peninsula Airways commuter flight 303M under Title 14 CFR Part 135, sustained substantial damage after an in-flight fire erupted in the left wing wheelwell shortly after departing Anchorage International Airport, Anchorage, Alaska. 1/ The flight returned to Anchorage International after the fire was detected and made an emergency landing without injury to any of the six passengers or two crewmembers on board.

The Safety Board's investigation revealed that the wheelwell fire burned through the left aileron control tube and engine nacelle. The wing flap on the left trailing edge was damaged and the main fuel tank on the left wing was severely scorched from excessive heat. The flight did not end in a catastrophic explosion because the tank was nearly full of fuel and the fuel-air mixture in the tank was too rich to support combustion at the early stage of the flight.

Disassembly of the left wheel brake assembly revealed that a cocked thermal insulator in the piston bore had prevented the complete retraction of brake lining from the rotor lining, causing the brake to drag and build up heat. The overheated brake assembly, when retracted into the wheelwell, ignited the fire. The hydraulic fluid supply lines to the brakes were damaged either by heat or an explosion of the overheated tire. The damaged lines resulted in hydraulic fluid being fed into the fire.

The wheel brake assembly used on the Fairchild SA-226 (serial Nos. 398 to 419) and the SA-227 (serial Nos. 420 to 999), excluding airplanes equipped with antiskid brakes and airplanes with a gross weight of 16,000 pounds, is a single rotor, non-antiskid design manufactured by B.F. Goodrich and identified as part number 2-1203-3. This brake was selected when the gross weight of the airplane increased from the initial 12,500-pound certification limit. Earlier versions of the airplane had a lining-free rotor; the B.F. Goodrich 2-1203-3 brake is allowed as a retrofit in the earlier versions. The 16,000-pound airplane is equipped with a Goodyear Corporation dual rotor brake assembly.

1/ For more information, read Field Accident Brief No. 1006 (attached.)

The Safety Board reviewed the 5-year history of Fairchild SA-226 and SA-227 airplanes equipped with the B.F. Goodrich brake system. The review shows that 68 Service Difficulty Reports and Malfunction and Defect Reports were filed with the Federal Aviation Administration (FAA). The reports documented brake overheating with either a partial or total brake lockup; at least six incidents resulted in fire. Sufficient details are not available to explain the cause of these events. The Safety Board believes, however, that the cocking of the piston insulator may have been a factor in several incidents.

Cocking of the insulator is a result of bowing that occurs as a part of the normal wear pattern for the brake wear pads. Normal wear causes the leading and trailing edges to be worn thinner than the center section of the pad. The B.F. Goodrich maintenance manual requires a wear measurement to be made at the center of the pad, the area of minimum bowing. Bowing increases as the pad wears and increases the possibility of piston insulator cocking. With the increased potential for cocking, the brake assembly will more likely not retract completely when hydraulic pressure is relieved. The Metro III airliner exhibited this condition.

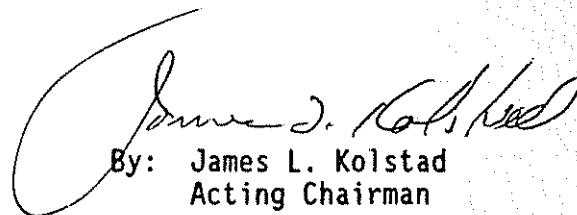
A solution to the cocking problem would be to modify the acceptable wear limits of the wear pad or the measurement of those limits at an area of maximum bowing so that the cocking would be controlled within limits that would prevent brake binding. However, we believe that the FAA should conduct a directed safety investigation of the problems to determine the most appropriate corrective action.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Conduct a directed safety investigation of the Fairchild SA-226 and SA-227 wheel braking systems that utilize the B.F. Goodrich 2-1203-3 wheel brake assembly to: (1) determine the potential for brake lockups or overheating as a result of piston insulator cocking; and (2) evaluate the current wear limits for proper brake operation at the maximum wear allowed. (Class II, Priority Action) (A-89-101)

Take appropriate corrective action, determined by the directed safety investigation of the Fairchild SA-226 and SA-227 wheel braking systems referenced in Safety Recommendation A-89-101, to prevent brake binding and overheating. (Class II, Priority Action) (A-89-102)

KOLSTAD, Acting Chairman, BURNET, LAUBER, NALL, and DICKINSON, Members, concurred in these recommendations.

  
By: James L. Kolstad  
Acting Chairman

Brief of Accident

File No. - 1006      7/27/88      ANCHORAGE, AK      A/C Reg. No. N482SA      Time (Lcl) - 1817 ADT

-----Basic Information-----

Type Operating Certificate - COMMUTER      Aircraft Damage  
Name of Carrier - PENINSULA AIRWAYS      SUBSTANTIAL  
Type of Operation - SCHEDULED, DOMESTIC, PAX/CARGO      Fire      Fatal      Serious      Minor      None  
Flight Conducted Under - 14 CFR 135      IN FLIGHT      Crew      0      0      0      2  
Accident Occurred During - CLIMB      Pass      0      0      0      6

-----Aircraft Information-----

Make/Model - FAIRCHILD SA227-AT      End Make/Model - GARRETT TPE-331-1146      ELT Installed/Activated - YES/NO  
Landing Gear - TRICYCLE-RETRACTABLE      Number Engines - 2      Stall Warning System - YES  
Max Gross Wt - 14500      Engine Type - TURBOPROP  
No. of Seats - 20      Rated Power - 1000 HP

-----Environment/Operations Information-----

Weather Data      Itinerary      Airport Proximity  
Wx: Briefings - FSS      Last Departure Point      ON AIRPORT  
Method - TELEPHONE      SAME AS ACC/INC  
Completeness - WEATHER NOT PERTINENT      Destination      DILLINGHAM, AK  
Basic Weather - VMC      ATC/Airspace  
Wind Dir/Speed - 170/016 KTS      Type of Flight Plan - IFR  
Visibility - 60.0 SM      Type of Clearance - IFR  
Lowest Sky/Clouds - 6000 FT SCATTERED      Type Apcch/Lndg -- TRAFFIC PATTERN  
Lowest Ceiling - NONE  
Obstructions to Vision - NONE  
Precipitation - NONE  
Condition of Light - DAYLIGHT

-----Personnel Information-----

Pilot-In-Command      Age - 39      Medical Certificate - VALID MEDICAL-WAIVERS/LIMIT  
Certificate(s)/Rating(s)      Biennial Flight Review      Current      YES      Flight Time (Hours)      14800  
ATP      Months Since - 3      Aircraft Type - SA-227      Total      14800      Last 24 Hrs - 6  
SE LAND, ME LAND, SE SEA      Aircraft Type - SA-227      Make/Model - 2650      Last 30 Days - 145  
Instrument Rating(s) - AIRPLANE      Multi-Eng - 13325      Instrument - 2841      Last 90 Days - 293

-----Narrative-----

DURING THE TAXI TO THE RUNWAY, THE FLIGHT CREW NOTED A VIBRATION IN THE AIRPLANE AND STOPPED TO CHECK THE TIRES, THINKING THAT THEY WERE UNDERINFLATED. NO OBVIOUS PROBLEM WAS SEEN, AND THEY ELECTED TO TAKEOFF. SHORTLY AFTER TAKEOFF, A FIRE ERUPTED IN THE LEFT MAIN GEAR WHEELWELL. THE PILOT RETURNED TO THE AIRPORT AND LANDED SAFELY. HOWEVER, THE AIRPLANE SUSTAINED EXTENSIVE DAMAGE TO THE LEFT WING AND AILERON CONTROL SYSTEM. EXAMINATION OF THE BRAKES REVEALED A COCKED THERMAL INSULATOR IN THE PISTON RORE. THERE WAS EVIDENCE THAT THE BRAKES WERE WORN, HAD BEEN DRAGING, THEN OVERHEATED; AND THAT THE TIRES HAD EXPLODED PRIOR TO THE FIRE. THE FIRE DAMAGE INDICATED THAT THE FIRE HAD STARTED NEAR THE BRAKES. AN ALUMINUM FITTING WAS USED AS PART OF THE HYDRAULIC BRAKE SYSTEM ON THE STEEL BRAKE HOUSING. THE EXAM INDICATED THAT THE FITTING HAD BEEN INSTALLED BUT COULD NOT BE FOUND AFTER THE FIRE. THE CREW SAID THAT THEY DELAYED LOWERING THE GEAR, IN CONTRADICTION TO THE CHECKLIST REQUIREMENT WHEN THE WHEELWELL AND WING OVERHEAT LIGHT IS ON.

Brief of Accident (Continued)

File No. - 1006      7/27/88      ANCHORAGE, AK      A/C Reg. No. N482SA      Time (Lcl) - 1817 ADT

Occurrence #1      AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION  
Phase of Operation      TAXI - TO TAKEOFF

Finding(s)

1. LANDING GEAR, NORMAL BRAKE SYSTEM - BINDING (MECHANICAL)
2. ACFT/EQUIP, INADEQUATE AIRCRAFT COMPONENT - MANUFACTURER
3. PROPER ASSISTANCE - NOT OBTAINED - PILOT IN COMMAND

Occurrence #2      FIRE  
Phase of Operation      CLIMB

Finding(s)

4. LANDING GEAR, NORMAL BRAKE SYSTEM - OVERTEMPERATURE
5. HYDRAULIC SYSTEM, FITTING - MELTED
6. EMERGENCY PROCEDURE - NOT FOLLOWED - PILOT IN COMMAND

----Probable Cause----

The National Transportation Safety Board determines that the Probable Cause(s) of this accident is/are finding(s) 1,2,3,4,5

Factor(s) relating to this accident is/are finding(s) 6