Transportation Safety Board of Canada | Bureau de la sécurité des transports du Canada

REASSESSMENT OF RESPONSES TO AVIATION SAFETY RECOMMENDATION A02-03

BRAKE SYSTEM PRESSURE WARNING INDICATOR

Background

On 18 June 1998, a Fairchild-Swearingen Metro II (SA226-TC), registration C-GQAL, serial number TC 233, took off as Propair 420 from Dorval/Montréal International Airport, Quebec, around 0701, Eastern Daylight Time, bound for Peterborough Airport, Ontario. On board were 9 passengers and 2 pilots. About 12 minutes after takeoff, at an altitude of 12 500 feet above sea level (asl), the crew advised air traffic control (ATC) that they had a hydraulic problem and requested clearance to return to Dorval. ATC granted this request. Around 0719, at 8600 feet asl, the crew advised ATC that the left engine had been shut down because it was on fire. Around 0720, the crew decided to proceed to Mirabel/Montréal International Airport, Quebec. At 0723, the crew advised ATC that the engine fire was out. On final for Runway 24, the crew advised ATC that the left engine was again on fire. The landing gear was extended on short final, and when the aircraft was over the runway, the left wing broke upwards. The fuselage pivoted more than 90° to the left around the longitudinal axis of the aircraft and struck the ground. All 11 occupants were fatally injured.

The Board concluded its investigation and authorized the release of report A98Q0087 on 02 April 2002.

Board Recommendation A02-03 (24 May 2002)

The Propair crew took off unaware that residual brake pressure remained on the left brake system during the taxi and the takeoff roll. During the takeoff roll, the heat generated by the friction of the left dragging brake increased exponentially. This extreme heat resulted in brake seal failure, brake fluid leak on the hot brake components and ignition and fire in the wheel well, eventually causing failure of the wing structure in flight.

From 1983 to present, a large number of incidents and a few accidents involving landing gear failures, tire failures, flat tires, wheel fires, and loss of control on ground have been reported for these types of aircraft. Of this number, 62 incidents and 3 accidents involving circumstances similar to those found in this accident have been reported. Some of the incidents and accidents had the potential to result in a catastrophe similar to this accident.

For the most part, the Board's recommendations resulting from this occurrence were directed at minimizing the consequences of such an occurrence and at providing better information to the crews about recognizing the symptoms of a wheel well fire. However, 1 recommendation dealt with the installation of a brake temperature system to provide timely overheat information to

the crew. This recommendation was negatively received as being too costly to implement in view of the expected remaining life of the aircraft.
In spite of the risk controls implemented to date, flight crews are still not provided with an unambiguous alert of a dragging brake condition caused by residual hydraulic pressure in the brake system. Failure to identify and warn the crew about a dragging brake in a timely manner will result in a continued high risk of fire with possible ensuing loss of life and property. The brake system manufacturer has indicated that a brake pressure cockpit indicator for each wheel brake system is feasible.

Therefore, the Board recommends that:

> Transport Canada, the United States Federal Aviation Administration, and Fairchild explore options for SA226 and SA227 aircraft to be equipped with a brake pressure warning indicator for each main wheel brake system.

A02-03

Transport Canada's Response to A02-03 (20 August 2002)

During the course of investigating solutions in response to TSB Interim Recommendation A98-03 regarding brake overheat detection issued on 26 October 1998, the brake system manufacturer indicated that a brake pressure indicator for each wheel brake system installed in the cockpit would be feasible. This system would alert the crew that, due to the residual hydraulic pressure in the brake system, a dragging brake condition might exist.

The Federal Aviation Administration (FAA) did not implement recommendation A98-03; however, the FAA initiated another course of action, which was to reduce the probability of overheated brakes occurring during aircraft takeoff. Transport Canada (TC) also believes that the most effective safety actions can be achieved by providing safety barriers to preclude the occurrence of brake overheating rather than a system to detect brake overheat conditions.

Given the Transportation Safety Board of Canada (TSB) position that the flight crew should be provided with an unambiguous warning of a dragging brake condition, and considering the vendor's opinion that the cockpit brake pressure indicator is feasible, TC has requested the FAA contact the aircraft manufacturer and the brake vendor to investigate the feasibility of installing a brake pressure warning indication system in the Fairchild SA226 and SA227 airplanes as per TSB Recommendation A02-03.

Board Assessment of Transport Canada's Response to A02-03 (05 February 2003)

In its response, TC clearly indicated that it endorsed the TSB position and that it had asked the FAA to contact the aircraft manufacturer to study the possibility of installing a braking circuit pressure indicator on Fairchild SA226 and SA227 planes.

Given the foregoing, TC's response is considered as a **Satisfactory Intent**.

Next TSB Action (05 February 2003)

The TSB shall continue to follow the action taken by TC and the responses of the FAA, the aircraft manufacturer and the brake supplier.

FAA Response to A02-03 (15 January 2003)

As a result of TSB's recommendation A02-03, a number of mandatory changes have been incorporated into both the SA226 and SA227 Series aircraft. The changes are embodied in Airworthiness Directives (AD) 2000-17-01, 2002-08-01, and 2002-08-02.

All of these changes are designed to ensure that the brakes themselves will not malfunction and cause the brakes to drag due to excessive wear of the brake. These changes should also prevent unintended residual pressure at the brakes after normal brake applications. In addition, in the unlikely event that a dragging brake does occur and results in a fire, these changes should ensure that the fire will not result in damage to the aircraft systems or the structure.

In addition, changes have been made to the Airplane Flight Manual to clarify the pilot's response to a wheel well fire indication.

The FAA's Office of Accident Investigation convened a Safety Recommendation Review Board to review the response to FAA Safety Recommendation 02.208 (TSB Recommendation A02-03). As a result, the Review Board classified this recommendation as "Closed Acceptable Action."

2004 Board Reassessment of A02-03 (09 June 2004)

Actions taken to date to mitigate risks associated with the SA226/SA227 brake systems have focused on reducing the probability of a brake overheat event rather than providing a warning for the aircrew. As both the aircraft manufacturer and the FAA have rejected the option of incorporating a brake pressure warning system and the effectiveness of these initiatives have yet to be confirmed the assessment is categorized as **Satisfactory in Part**.

Next TSB Action (09 June 2004)

The TSB staff shall continue to follow the action taken by TC and the responses of the FAA, the aircraft manufacturer and the brake supplier.

Board Reassessment of A02-03 (11 May 2005)

The FAA has issued a series of Airworthiness Directives (Ads) (ADs 2000-17-01, 2002-08-01, 2002-08-02) to address the unsafe conditions related to residual brake pressure. The implementation of these ADs substantially reduces the risk and precludes the requirement for a brake pressure warning indicator for each main wheel brake system called for in Recommendation A02-03.

Consequently, as the action taken will substantially reduce the safety deficiency the assessment is changed to **Fully Satisfactory**.

Next TSB Action (11 May 2005)

No further action warranted.

This deficiency file is assigned an **Inactive** status.