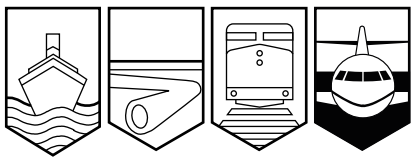
Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

The Transportation Safety Board of Canada (TSB) is investigating this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability. Because the investigation is ongoing, the information provided is subject to change as additional facts become available.

The purpose of this communication is to update interested organizations and persons on the factual information gathered to date, to provide information regarding safety-related activities, and to provide information about further investigation activities.



Investigation Update

TSB Investigation Number A05F0047

4 May 2005

Canada

Investigation Organization

On 06 March 2005, Air Transat Flight 961, an Airbus 310-308, Canadian registration C-GPAT, serial number 597, lost the major part of its rudder while in flight from Varadero, Cuba, to Québec City, Canada. The flight returned to Varadero where an uneventful landing was carried out.

The Transportation Safety Board of Canada (TSB) was notified of the accident at 1100[1] and responded by deploying two investigators from the Dorval, Canada, regional office and one investigator from the TSB Engineering Laboratory in Ottawa, Canada. Because the event occurred over international waters, Canada, as the State of Registry, is conducting the investigation.

The investigation team is composed of the following six main groups: operational, air traffic control (ATC), human factor, technical, performance, and recorders group. Four subgroups under the technical group have been established; a system group, a structure and maintenance group, a maintenance records group, and a manufacturing group. The Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation Civile (BEA) of France, the German Federal Bureau of Aircraft Accidents Investigation (BFU), and the National Transportation Safety Board (NTSB) of the United States assigned accredited representatives to participate in the investigation. Technical advisors from Airbus, Transport Canada, the Direction Générale de l'Aviation Civile (DGAC), the Federal Aviation Administration (FAA), the German Aerospace Center (DLR), and Air Transat are also participating and assisting in the investigation.

Factual Information

The A310-308, operated by Air Transat, was on a charter flight from Varadero, Cuba, to Québec City, Canada, with a crew of 9 and 261 passengers on board. While at an altitude of 35 000 feet, the flight crew heard a loud bang with simultaneous vibrations that lasted a few seconds. The aircraft entered a periodic rolling and yawing motion known as *dutch roll* that decreased as the aircraft descended to a lower altitude. Once the aircraft reached about 19 000 feet, the flight crew had no indication of any abnormalities from systems monitoring. The flight crew considered landing at Fort Lauderdale, Florida, but elected to return to Varadero where an uneventful landing was carried out. It is only once on the ground that the flight crew noted during a visual inspection that a major part of the rudder was missing. There were no fatalities. One flight attendant sustained minor injuries.

The investigation team observed that only the lower rudder spar and the base rib of the rudder were remaining. Less than five per cent of the total rudder surface actually remained attached to the spar. The rudder is attached to the vertical fin through seven A-frame hinges, numbered one to seven, starting from the bottom. The remaining parts of the rudder were attached to the vertical fin's rear spar by the actuators and the four lower rudder hinges. Hinges five and six were still in place on the fin spar, but only the attachment fittings of the rudder were attached to them. The rudder position sensor was still attached to the remaining piece of rudder. Rudder hinge number seven was torn off from the fin spar.

[1] All times are Coordinated Universal Time (eastern standard time plus five hours).

The panels that cover the rudder are made of carbon fibre reinforced plastic (CFRP). The panels were manufactured in 1991 by Soko in Mostar, former Yugoslavia. The rudder panels (serial number 1331) were assembled at Airbus facilities in Stade, Germany, and then installed on the aircraft in 1992. The aircraft had accumulated 49 224 flight hours since manufactured in 1992.

The flight data recorder (FDR), the cockpit voice recorder (CVR), and the digital AIDS (aircraft integrated data system) recorder (DAR) were sent to the TSB Engineering Laboratory for downloads of all data recorded to determine the sequence of events and the contributing factors of this event. The work is still in progress.

On 19 March 2005, the vertical tailplane (VTP) and the rudder were transported from Cuba to Bremen, Germany, for further examination. The VTP, to which the rudder is attached, is bolted to the top of the fuselage by six attachment lugs. The VTP was subject to ultrasonic inspection, which revealed delamination damage to the two rear attachment lugs. Loads and aeroelastic models are being formulated to evaluate the noted damage. An elasticity laminate checker (ELCH) test on sample in-service rudders is also in progress to check rudder panels in depth, from the outer skin to the inner skin. This test will provide information on rudder skin and core damage over a sampling, ranging from 13-year-old rudders to more recent rudders. At this time, one test has been carried out on one of the selected rudders, and no discrepancies have been found.

The rudder control systems were checked and tested in Varadero with no anomalies found. The three servo-controls that control rudder movement were inspected and tested at Goodrich facilities in Paris, France, during the second week of April. Rudder servo-control spring rods were also investigated in Airbus facilities in Hamburg, Germany, and no deficiencies were found.

Maintenance and technical records of the aircraft are being reviewed by the maintenance and records group to determine if any past maintenance activities on the aircraft, or if any past reported operational events may have played a role in the detachment of the rudder.

Safety Action Taken

Following the event, a number of actions have been taken. On 17 March 2005, Airbus produced an All Operator Telex (AOT) to verify the structural integrity of the rudder and its attachment by means of a one-time detailed visual inspection and tap test inspection as a precautionary measure. On 18 March 2005, the Direction Générale de l'Aviation Civile (DGAC) of France issued an Emergency Airworthiness Directive (EAD) that includes mandatory actions and compliance times to perform inspection and apply corrective measures if necessary in accordance with the instructions specified in the Airbus AOT. On 28 March 2005, the FAA issued a similar Airworthiness Directive (AD). All results and feedback from these mandatory inspections are being compiled by Airbus.

Once validated safety deficiencies are identified during the course of an investigation, the Board can, at any time during the investigation, recommend action designed to reduce or eliminate such deficiencies from the transportation system.

Investigation Plan

There is still a considerable amount of work to be done to bring this investigation to a conclusion by the Board. In the following months, further ELCH tests will continue on other rudders of the defined samples to check rudder panels in depth, from outer to inner skin, and to measure rudder structural rigidity. The preparation of the draft report will take months to be completed with emphasis on the analysis of collected factual information gathered by the detailed examination of the failed rudder, the fin box lugs, the AOT and ELCH test results and any appropriate investigation work.

When the investigation team's draft report is complete, it will be reviewed by the Investigation Branch Standards and Performance section, and approved by the Director, Air Investigations. The draft report will then be submitted to the Board for its approval and released as a confidential draft report to designated reviewers. The Board will consider the representations of the designated reviewers, amend the report if required, and issue the final investigation report.