No. 22

Canadian Pacific Airlines, Douglas DC-6B, CF-CUQ, accident 20 miles west of 100 Mile House, British Columbia, Canada, on 8 July 1965. Report undated, Serial No. 2628, released by the Department of Transport, Canada

1. - Investigation

1.1 History of the flight

Flight 21 was a scheduled domestic flight from Vancouver, British Columbia, to Whitehorse, Yukon Territory via Prince George, Fort St. John, Fort Nelson in British Columbia and Watson Lake, Yukon Territory.

At 1442 hours PST, the aircraft took off on an instrument flight plan for Prince George, via Victor 300 and Blue 22 airways. In the vicinity of Hope, north-bound on Blue 22 airway, it was sighted by CPA Flight 22 and communication was established. Shortly afterwards at 1517 hours Flight 21 requested and received clearance to proceed from its position north of Hope direct to Williams Lake, which track would pass to the west of Ashcroft. At 1529 hours, it reported to the Vancouver Air Traffic Control Centre that it had passed Ashcroft at 1527 hours at 16 000 ft and was estimating William Lake at 1548 hours. This transmission was acknowledged by the Vancouver Centre.

At 1538 hours, Vancouver Centre called Flight 21 and did not receive a reply. About two minutes later, three "Mayday" calls were heard by Vancouver Centre. At approximately the same time a four-engined aircraft, subsequently identified as Flight 21, was observed by witnesses flying in the clear over the Gustafson Lake area about 20 miles west of 100 Mile House, B.C. The aircraft appeared to be in normal flight when an explosion was heard, following which smoke was observed and the tail separated from the fuselage. The main portion of the wreckage assumed a nose down attitude and spiralled to the left until it crashed into a wooded area about 4.5 miles north of Gustafson Lake. The accident occurred at 1541 hours and the co-ordinates of the accident site were 51°37' N, 121°46' W.

1.2 Injuries to persons

Injuries	Crew	Passengers	Others
Fatal	6	46	
Non-fatal			
None			

1.3 Damage to aircraft

The aircraft was destroyed.

1.4 Other damage

There was no other damage.

1.5 Crew information

The pilot-in-command, aged 41, held an airline transport pilot's licence with a Class I instrument flight rating. His last route check was completed on 6 May 1965, and he passed a medical examination on 11 March 1965. He had flown a total of 13 218 hours including 2 690 hours on DC-6 aircraft, of which 184 hours were flown during the 90 days preceding the accident.

The co-pilot, aged 29, held a commercial pilot's licence with a Class I instrument flight rating. His last route check was completed on 6 November 1964, and he passed his last medical examination on 2 April 1965. He had flown a total of 2 657 hours including 982 hours on DC-6 aircraft, of which 230 hours were flown during the 90 days preceding the accident.

The second officer, aged 26, held a commercial pilot's licence with a Class I instrument flight rating. His last route check was completed on 6 January 1965, and he passed a medical examination on 16 July 1964. He had flown a total of 3 430 hours including 230 hours on DC-6 aircraft, of which 75 hours were flown during the 90 days preceding the accident.

Also aboard were a steward and two stewardesses. All three were medically fit.

1.6 Aircraft information

Since manufacture the aircraft had flown a total of 29 998 hours, including 6 335 hours since last overhaul. The aircraft was being maintained in accordance with a system of continuous maintenance and inspection approved by the Department of Transport. The engines had all been overhauled within the prescribed overhaul periods.

A review of the maintenance records of the aircraft revealed no irregularities prior to the aircraft's departure from Vancouver during the afternoon of 8 July 1965. The weight on departure was 89 814 lb which was below the maximum permissible of 92 735 lb, and the centre of gravity was within the prescribed limits.

1.7 Meteorological information

The weather information given to the crew before departure indicated there would be vertical cloud based at 5 000 ft in the Hope area, some cumulus at Princeton, 3/10 heavy cumulus at Ashcroft, 6/10 heavy cumulus at Kamloops with 4/10 scattered cumulus based at 4 000 ft and 1/10 scattered cirrus at 20 000 ft at Williams Lake. A cumulonimbus cloud was reported east-north-east of Prince George. Moderate to heavy rime and clear ice was forecast in vertical development clouds. On the average the sky was covered by about 4/10 of heavy cumulus and cumulus cloud. The crew of Flight 22, who observed Flight 21 in the vicinity of Hope indicated they had experienced no problem with weather, turbulence, icing or electrical storm activity between Prince George and Vancouver.

1.8 Aids to navigation

Not mentioned in the report.

1.9 Communications

No communication difficulties were reported.

1.10 Aerodrome and ground facilities

Not pertinent to this accident.

1.11 Flight recorders

Not mentioned in the report.

1.12 Wreckage

The wreckage was scattered for about three quarters of a mile from south to north along a line parallel and close to the centre of Blue 22 airway between Ashcroft and Williams Lake, B.C. The accident area was flat with swampy areas and was heavily wooded. The main wreckage area was about one quarter of a mile wide with considerable light debris scattered downwind for about 3 miles. The burned out aircraft except for the aft fuselage and empennage was lying on a heading of 320°M at the north end of the wreckage trail. The vertical fin with rudder attached, the horizontal stabilizer and the elevators were located near the southern extremity of the wreckage trail.

1.13 Fire

The fire was confined to the main wreckage area and involved the fuselage, wings and powerplants. There was no evidence of pre-impact fire and the focal point of the fire was the fuel tanks.

1.14 Survival aspects

There were no survivors.

1.15 Tests and research

Post-mortem examination did not reveal any pathological or toxicological findings indicative of pre-impact physical or mental impairment.

2. - Analysis and Conclusions

2.1 Analysis

Statements of nine eye witnesses were generally in agreement and indicated the aircraft was flying straight and level at an apparently normal altitude in clear weather. The sound of an explosion was heard with some witnesses reporting two explosions. Smoke observed after the explosion was described by the majority of witnesses as being white or grey in appearance. The tail and aft fuselage separated from the aircraft and fell to the ground in pieces. The aircraft assumed a nose down attitude and entered a spiral to the left. Separate pieces of wreckage were observed falling with the aircraft.

The engines and propellers were found in approximately their proper position relative to the main structure and indicated that power was not being developed on impact. There was no evidence of engine or propeller failure. The engines were heard during the descent following the explosion.

The fracture faces of the fuselage skin showed no evidence of defective material.

The landing gear and the flaps were fully retracted.

There was no evidence that any fault existed in the flight control system prior to the explosion.

Three large sections of fuselage side skin extending from the cabin floor level to above the windows were found in a wreckage trail south of the main wreckage. These sections exhibited failures along rivet lines and tears with no evidence of defective material.

The vertical stabilizer with the rudder attached was found near the southern limit of the wreckage trail. All static wicks remained attached and complete. Lack of damage to the trees in the immediate area indicated that this portion had descended vertically.

The horizontal stabilizer with the elevator attached was found to the west of the vertical stabilizer and lay flat on the ground inverted. The elevator attachments were intact and the integrity of this system prior to explosive and impact damage was established.

Sections of the fuselage framing and skin from the left rear portion of the fuselage indicated the fuselage had burst immediately forward of the pressure dome. The extent of the deformation was indicative of an explosion.

The tail heater unit located in the tail cone outside the pressure dome exhibited impact and blast damage. The blast was sufficient to crush the double wall stainless steel heater exhaust shroud and the heavy stainless steel combustion air check valve assembly. Examination of the heater showed no evidence of heater malfunction or fire.

The aircraft lavatory installations were found slightly west of the tail section parts. The right toilet hopper, the wash basin assembly and water heater were substantially undamaged. The major portion of the left lavatory toilet that was found, consisted of the forward lower part of the bowl and the clean-out valve with associated fittings. These parts were flattened by an explosive force and, from fragments that remained attached to the base ring, it was apparent that the entire periphery had been forced outwards with hemispherical deformations from gas blast near the top. The left lavatory stainless steel wash basin was found in two sections and had been subjected to blast from below which resulted in reversal of normal curvature. The surrounding stainless steel was distorted upward pivoting on the bulkhead attachments. The associated water heater showed impact damage.

The aft fuselage area including the lavatories, rear seats and tail heater system were reconstructed at Vancouver. When the reconstruction was complete, parts of the left toilet, lavatory floor adjacent to the left toilet and parts of the fuselage skin above the left toilet showed high frequency reversals of fracture direction, typical of an explosive fracture. Pieces of stainless steel from the left toilet were found embedded in the tail heater cold air inlet duct. The fuselage skin slightly above and forward of the toiled indicated a burst from within.

This examination of the left lavatory indicated that an explosion having an origin in or near the toilet bowl had an intensity beyond that of a gasoline air mixture explosion, explosive decompression, or explosion of any materials native to the aircraft.

During the early stages of the investigation when evidence of an explosion was revealed, the Royal Canadian Mounted Police were advised because of possible criminal aspects of the accident. During their investigation traces of explosive material were found on wood from the left lavatory area of the aircraft.

2.2 Conclusions

Findings

The flight crew were properly qualified.

The aircraft was airworthy when it departed from Vancouver.

Examination of the wreckage disclosed no evidence of any malfunction or failure of the aircraft, its powerplants, propellers or systems, prior to an explosion in the left lavatory.

The weather was suitable for the flight, and there was no evidence that weather was a factor in the accident.

All available evidence indicated that the aircraft was flying at its assigned altitude in straight and level flight in clear weather when an explosion occurred and the aft portion of the fuselage separated from the aircraft.

The physical evidence showed that the undercarriage and flaps were up and the engines were producing little or no power at the time of impact. The rear portion of the fuselage had separated from the aircraft at a considerable altitude.

Examination including reconstruction and laboratory analysis of parts of the aft portion of the fuselage established that an explosion had occurred in the left lavatory in the aft section of the aircraft. The explosion was of such magnitude that it could not have been caused by a substance native to the aircraft. Traces of an explosive substance were found on material from the left lavatory area.

Cause or
Probable cause(s)

Explosion of a device which resulted in aerial disintegration.

3. - Recommendations

None were contained in the report.
