

C I V I L A E R O N A U T I C S B O A R D
A I R C R A F T A C C I D E N T R E P O R T

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Released: August 13, 1963

CANADIAN PACIFIC AIR LINES, BRISTOL BRITANNIA 314
CANADIAN REGISTRY CF-CZB
HONOLULU INTERNATIONAL AIRPORT, HONOLULU, HAWAII
JULY 22, 1962

SYNOPSIS

On July 22, 1962, at 2319 H.s.t., a Canadian Pacific Air Lines Bristol Britannia crashed while attempting a three-engine go-around following a landing approach to runway 8 at Honolulu International Airport, Honolulu, Hawaii. Except for the rear portion of the fuselage, and attached tail section, the aircraft was destroyed by impact and fire. Thirteen of the 40 persons aboard survived the crash.

Shortly after takeoff from Honolulu for Nandi, Fiji Islands, a fire warning indication caused the pilot to feather the propeller on the No. 1 engine. Fuel was jettisoned, and the flight returned to Honolulu for landing approximately 40 minutes after departure. The three-engine landing approach appeared normal until the aircraft had proceeded beyond the runway threshold and had commenced its landing flare at an altitude of approximately 20 feet above the runway centerline. A go-around was attempted from this position and the aircraft banked and veered sharply to the left. Initial ground contact was made by the left wing tip approximately 550 feet to the left of the runway centerline. The aircraft progressively disintegrated as it moved

across the ground, then struck heavy earth-moving equipment parked approximately 970 feet from the runway centerline.

The Board determines that the probable cause of this accident was the attempted three-engine go-around, when the aircraft was in a full landing configuration, at insufficient airspeed and altitude to maintain control.

Investigation

CF-CZB, a Bristol Britannia 314, had arrived in Honolulu at 0507 ^{1/} on July 21, 1962, as Canadian Pacific Air Lines (CPA) Flight 323 from Vancouver, British Columbia. The aircraft and its crew remained in Honolulu overnight as scheduled, and departed the following evening as Empress Flight 301 for Nandi, Fiji Islands; Auckland, New Zealand; and Sydney, Australia. There were 29 passengers and a crew of 11 aboard Empress 301.

The only aircraft maintenance required while in Honolulu was the replacement of the No. 4 inverter. There were no carry-over items, and no discrepancies were entered on the preflight inspection form.

An Instrument Flight Rules (IFR) flight plan was filed to Nandi via Victor 9 to South Honolulu, thence via the Great Circle route at 20,000 and 24,000 feet, with an estimated time en route of 9 hours and 25 minutes.

The aircraft was serviced to a total of 64,000 pounds of fuel which was properly distributed within the four main and three transfer fuel tanks. The weight and balance manifest filed prior to the departure of the flight indicated the gross ramp weight of the aircraft was 170,074 pounds and the center of gravity (c.g.) was within approved limits. Examination of this document by Board investigators subsequent to the accident revealed that approximately 4,000 pounds of cargo had not been included in the gross weight and, consequently, was not reflected in the c.g. computations. The recomputed gross weight of the aircraft at the ramp was found to have been 174,005 pounds rather than the 170,074 pounds originally calculated. The maximum allowable

^{1/} All times herein are Hawaiian Standard based on the 24-hour clock.

gross takeoff weight for this flight was 185,000 pounds. Computations based on the recomputed weight and loading configuration indicated the aircraft's actual c.g. at takeoff was 20.6 percent Mean Aerodynamic Chord (MAC) which was within the allowable British Civil Airworthiness c.g. limitations. ^{2/}

Empress 301 was issued an IFR clearance in accordance with its flight plan and was cleared for takeoff on runway 8. This runway is level, approximately 13 feet m.s.l., 12,380 feet long, and 200 feet wide. There were no notices to airmen in effect that would have restricted the runway from being used for normal or emergency operation.

Takeoff was commenced at 2238. Approximately two minutes after the aircraft became airborne, and during the climbout, a fire warning indication for the No. 1 engine was received in the cockpit. The No. 1 propeller was feathered and the fire warning indication ceased. The crew then advised the tower local controller that the No. 1 engine had been shut down and they would return to Honolulu for landing. The tower advised Empress 301 that all runways were available and the wind was from the northeast at six knots. The flight then requested runway 8 for landing. Emergency crash and rescue units were alerted and proceeded to standby positions adjacent to this runway.

Empress 301 then advised the tower that an over-gross landing weight ^{3/} condition existed and fuel jettisoning would be required in order to lighten the aircraft. The aircraft was vectored by radar approach control to an isolated area over the water approximately 20 miles south of Honolulu at an altitude of 4,000 feet. Fuel jettisoning was initiated at 2253 and completed at 2306.

^{2/} The British Civil Airworthiness forward c.g. limit for this weight and configuration is 19.3 percent MAC.

^{3/} The maximum three-engine gross landing weight is 135,000 pounds.

One of the surviving stewardesses as well as several of the surviving passengers stated that during the fuel jettisoning, Check Captain Giguere and First Officer Eldred came back to the rear passenger cabin on several occasions to visually check on the operation. It was stated that they used a flashlight to observe the jettisoning of fuel from both wings. During one of these trips Captain Giguere mentioned to Mr. William O'Connell (a Canadian Department of Transport Air Carrier Inspector who was seated in the rear passenger cabin) that 35,000 pounds of fuel was being jettisoned. Empress 301 maintained radio silence during this operation; however, radar monitoring and vectoring were continued by approach control. After completing the jettisoning operation two-way radio communication was resumed and the flight was vectored west of the outer marker to intercept the ILS final approach course for runway 8. The flight later reported departing the outer marker, and, after receiving clearance to land, reported the landing gear down. After the flight reported passing the low frequency radio range station it was again cleared by the tower to land. The acknowledgement of this landing clearance was the final transmission received from Empress 301 and occurred approximately 50 seconds prior to impact.

Fire and rescue personnel first observed Empress 301 when its landing lights were turned on. The aircraft was then on final approach over Pearl Harbor Channel. Witnesses stated that the aircraft passed over the approach end of runway 8 in what appeared to be a normal approach attitude at an estimated altitude of between 50 and 100 feet. The No. 1 propeller was observed to be feathered and the landing gear extended. After continuing above the

runway for a short distance, the aircraft was described to bank and turn sharply to the left, contact the ground, and burn.

Twenty passengers and the seven flight crew members sustained fatal injuries. The 13 survivors received varying degrees of crash injuries and burns.

Nine of the survivors were interviewed and their recollections generally corroborate the statements of the witnesses on the ground. A detailed account of the landing approach was given by passenger O'Connell. He said the three-engine approach was normal, . . . "rather flat," and that he felt the landing gear, . . . "come down and lock," approximately two minutes before the aircraft crossed over the runway threshold at an altitude of approximately 100 feet. The aircraft continued its descent to an altitude of between 20 and 40 feet and approximately over the runway centerline. It then leveled off momentarily, the nose was raised, and engine power applied as if a go-around were being initiated. The aircraft then banked and veered to the left, passed over the runway's left boundary, and seconds later contacted the ground on its left wing. He also stated that approximately eight seconds elapsed from the momentary level-off to the first impact.

It was determined that the aircraft first contacted the ground on its left wing tip approximately 550 feet left of the centerline of runway 8 and approximately 1,700 feet beyond the threshold of the runway. Evidence indicated that the aircraft was, at the point of initial contact, in a left bank of between 10 and 20 degrees, slightly nose-down, and on a heading of approximately 40 degrees magnetic. Examination of the wreckage distribution path

indicated that the dragging of the left wing across the ground caused its disintegration and at the same time decreased the radius of curvature of the path of the aircraft. This was accompanied by rotation of the aircraft about its vertical axis and was immediately followed by the destruction of the forward fuselage when it contacted the ground. The aircraft proceeded across the ground for approximately 680 feet in a tightening arc until it was nearly perpendicular to runway 8 with the tail pointing away from the runway. It continued rearward, tail-high, into three construction vehicles ^{4/} that were parked approximately 970 feet from the runway centerline. The rear portion of the fuselage and attached tail section separated from the main wreckage and continued tail-first approximately 50 feet to the north, right side up, and canted 45 degrees to the right.

The flight deck and main fuselage section were essentially destroyed by impact and the fire that ensued. The rear fuselage section, from a position just forward of the galley, remained intact with the tail section still attached. It passed over and partially demolished a construction field office building before coming to rest beyond the parked earth-moving equipment. Because of the tail-first movement of this section, most of the damage was inflicted to the tail cone and empennage.

Light fire damage and heavy sooting were concentrated on the right side of the vertical fin and rudder, and on the right side and top of the fuselage

^{4/} Four earth-moving vehicles in the 10 to 22 ton weight class were parked approximately 850 feet to the north of, and parallel to runway 8. This equipment was being utilized in the construction of a jet taxiway which is parallel to and 750 feet from the runway. Three of these vehicles formed a partial barricade to the progress of the disintegrating aircraft and confined the main portion of the wreckage in this area.

over the entire length of this segment. This sooting continued down to the window level on the left side. Light sooting was present on the upper surface of the right horizontal stabilizer. The soot pattern on the fuselage continued across the exposed inner structure of the right wing root, indicating the wing had already become separated from the aircraft at the time of the fire. Popped rivet heads in the areas of heaviest sooting revealed bright unsooted countersunk surfaces. Items of the aircraft's cargo, upon which this section had come to rest, were themselves unmarked by heat or fire but had wiped clean the sooted areas of the fuselage with which they were in contact. There was no evidence of fire prior to initial impact.

The Assistant Fire Chief was standing by in an emergency truck just off the edge, and near the approach end of the runway prior to the accident. He stated that all conditions observed during the approach appeared to be normal and that the landing gear was in the extended position. He observed no vehicular or pedestrian traffic on or adjacent to the runway. The tower local controller verified his statement that no vehicular traffic was observed on or in proximity to runway 8. The fire and rescue crews proceeded to the crash scene immediately and succeeded in keeping the fire from the rear portion of the fuselage but were unable to extinguish the fire which had completely engulfed the main section of the aircraft.

All three landing gear assemblies were recovered and although the impact and fire damage was severe, it was determined that they were in the up or nearly up position at impact. The left main gear up-lock mechanism was engaged, the truck was rotated, and the retract cylinder actuator rod was

fully retracted. The right main gear and the nose gear retract cylinders were also found in the retract position. The nose gear door panel was recovered and had no significant edge deformation but was extensively abraded on its outer surface, indicating it was in the closed or nearly closed position at impact. Portions of the drive units for the landing lights were recovered and were determined to be in the fully extended position on both units.

All eight flap screwjacks were found in the fully extended position corresponding to a 45-degree flap setting.

A flight recorder was not installed nor was it required on the aircraft.

The control pedestal was recovered but was so severely damaged from impact and fire that the only significant evidence present was the longitudinal trim indication which was in the takeoff position on both the pilot and copilot indicators. Other trim settings, control positions, or cockpit instrument readings could not be determined.

Control surface positions at impact could not be determined because of the extensive damage to the flight control system from impact and fire. However, there was no evidence to indicate a flight control or structural failure prior to impact.

Only one of the two left side fuel jettison valves was found. Due to impact and fire damage the valve position could not be determined. Neither of the two right wing jettison valves was recovered from the wreckage area.

All four engines and propeller assemblies separated from the aircraft during its disintegration and were recovered in the wreckage area. It was determined that the No 1 propeller was in the fully feathered position and that the engine was not operating at the time of impact. Inspection of

powerplants Nos. 2, 3, and 4 indicated that they were operating at impact and their propellers were at approximate blade angles of 27, 25, and 27 degrees, respectively. The flight low pitch (flight fine) stop is 22 degrees.

None of the engine control items recovered yielded definitive information except for the No. 2 engine high pressure fuel cock, which was found in the open position.

The propeller turbine shafts of engines Nos. 2 and 4 had been failed in torsion by impact forces as had the propeller coupling shaft of the No. 3 engine. There was only minor impact rotational damage to the rotor assembly indicated in each of the engines.

The control unit actuator for the No. 2 propeller was found in the maximum r.p.m. position and the maximum switch was in the "ON" position. There were no significant propeller control indications for the No. 3 or 4 powerplants.

No evidence was found in any of the powerplants, including No. 1, that would indicate a failure or malfunction prior to impact.

Eleven of the 13 survivors had been seated in the rear fuselage section which had separated from the aircraft. The other two survivors had been seated in the main fuselage section just forward of where the aircraft broke apart. Although they were seated in an area of severe disintegration, they were thrown clear of the wreckage still strapped in their seats.

Extensive pathological investigation of the fatally injured crew members disclosed no evidence of any in-flight incapacitation.

Stewardess Huebner stated that she had gone to the flight deck shortly after takeoff and again just prior to the aircraft's descent. On both

occasions she observed Captain Jennings in the left seat, First Officer Norton in the right seat, Second Officer Farr in the middle seat, and Navigator Hill in the navigator's seat. Check Captain Giguere, First Officer Eldred, and Navigator McLennan were seated in the club compartment located behind the flight deck.

The weather observation made by the U. S. Weather Bureau at Honolulu International Airport immediately after the accident was as follows: local 2320, 2,600 feet scattered, measured 4,800 feet broken, 10,000 feet broken, high overcast, visibility more than 15 miles, temperature 76F, dewpoint 67F, wind east-northeast 7 knots, altimeter setting 30.01 inches, rain showers of unknown intensity west to north.

Runway 8 has a U. S. standard configuration "A" approach lighting system with sequenced flashing (strobe) lights. This system includes a row of green threshold lights and white, high-intensity runway lights. All lights, with the exception of the strobes, were on and operating throughout the approach of CF-CZB.

The landing gear unsafe warning system installed in the Britannia was examined to determine its possible involvement in the attempted go-around of Empress 301. Two separate systems, visual and audio, operate through independent electrical circuits so as to provide warning to the crew in the event of an unsafe gear condition. The visual system utilizes strut and bogie position switches, depending on the selector and gear position, to activate red or green indicator lights located in the cockpit. The audio system receives its information from strut, bogie, and throttle position

switches and responds with a horn warning when any one of the throttles is retarded and the gear is not in the extended and locked position. Since these are separate systems with independent position switches it is possible for contradictory indications to be received in the cockpit in the event of failure of certain position switches.

A review of Mechanical Irregularity Reports revealed that on January 5, 1962, a discrepancy of this nature was noted for this aircraft. The report stated that when the throttles were pulled back with the gear down and locked the horn sounded. In addition, both the red warning light and the green safe light were on for the port gear. The discrepancy was explained on the work report as having been caused by a short in the bogie rotation position switches for the audio and the visual warning systems. Records indicate that these switches were replaced on January 14, 1962.

The CPA Britannia Flight Manual does not contain specific instructions regarding three-engine go-around procedures when the aircraft is at low altitude and in a full landing configuration (landing gear extended and flaps full down at 45 degrees). However, Board investigators were advised by the CPA chief pilot that flight crews are verbally instructed that after full flap extension on a three-engine approach they are committed to land. Any attempt to go around on three-engines with flaps fully extended must be initiated at a safe altitude and speed to insure that flaps can be retracted to 30 degrees and control of the aircraft maintained.

Analysis

As far as could be determined, approximately 35,000 pounds of fuel was jettisoned in the prescribed manner. Following the completion of this operation the aircraft was in flight for approximately 13 minutes before the accident occurred. It can be assumed that during this time the crew had sufficient opportunity to insure that the remaining fuel load was symmetrically distributed and that the aircraft trim was set accordingly.

The gross landing weight of the aircraft at the time of the attempted landing has been estimated at 134,005 pounds. This was computed by subtracting both the 35,000 pounds of jettisoned fuel and the 5,000 pounds of fuel estimated to have been consumed in flight from the recomputed ramp gross weight of 174,005 pounds. At the estimated landing weight the c.g. during approach would have been 18.2 percent MAC which is within the approved aircraft landing limits.

All available evidence indicates that the three-engine approach was conducted under visual flight conditions and in a satisfactory manner up to the time the aircraft crossed the threshold of runway 8.

From the probable approach flightpath, based on observations of survivors and witnesses, in conjunction with the wreckage distribution pattern, it was determined the go-around was initiated at a point approximately 600 feet beyond the runway threshold and at an altitude of between 20 and 40 feet above the runway centerline. This was further substantiated by the fact that the landing gear was observed in the extended position as the aircraft crossed over the runway threshold but was found in the retract position in the wreckage area.

The average landing gear retraction time for the Britannia is 8-1/2 seconds. Thus, using a target threshold speed of 115 knots it would require 8 seconds to cover the distance of 1,600 feet from the go-around initiation point to the general wreckage area. The minimum threshold speed of 115 knots used in this computation is undoubtedly high considering that the pilot had most likely reduced power below that necessary for approach and was in the process of flaring the aircraft prior to initiating the go-around. However, it does sustain the conclusion that the landing gear retract position had been selected at the initiation of the go-around and that sufficient time was available to attain retraction prior to impact.

The Board is unable to determine the reason why a go-around would have been attempted at so late a stage in the approach and with the aircraft still in the full landing configuration. There was no evidence to indicate a go-around was required in order to avoid any obstacles, vehicles or pedestrians that may have been on the runway.

The possibility of a fuel imbalance condition resulting from a fuel jettison system malfunction was presented by one of the Parties to the Investigation for consideration by the Board. It was theorized that a fuel jettison valve on the right wing did not close following the fuel jettisoning operation resulting in an asymmetrical fuel loading condition. It was stated that this condition presented a control problem at flareout which necessitated a go-around. The Board thoroughly reviewed this report and has concluded that the effects of fuel imbalance resulting from the described system failure would not have resulted in the sequence of events that were evidenced in the investigation of this accident.

Statements of surviving passengers recalled the application of engine power prior to the bank to the left. This implies that power was not applied because of an uncontrollable left wing down condition, but rather that power application caused this condition.

Additionally, ground evidence indicated that the abrupt deviation of CF-CZB from the runway was accompanied by a shallow bank angle, indicating a predominance of yaw without the influence of an asymmetrical wing loading condition. The slight bank angle which was present at impact would be that which was induced by the yaw.

These facts, along with other evidence detailed in this report, offer no substantiation to a fuel imbalance problem relative to this accident.

The remaining most obvious and compelling reason for a go-around under the pre-described circumstances would be the receipt of an unsafe landing gear warning horn and/or light in the cockpit when the throttles were retarded. However, there was no physical evidence found to substantiate this possibility.

The investigation revealed no evidence of an actual fire in the No. 1 engine, nor was there any indication of power failure, or operational distress. Furthermore, there was no evidence to indicate that any fire extinguishing agent had been discharged.

It was determined that engines Nos. 2, 3, and 4 were developing takeoff power at impact. Additionally, it was ascertained that a takeoff propeller speed of 1,000 r.p.m. had been selected and attained on all operating propellers prior to impact.

The most reliable blade angle evidence, from an accuracy tolerance standpoint, was obtained from the No. 3 propeller which was at an angle of 25 degrees. Subsequent analysis indicated that the Nos. 2 and 4 propellers actually were in consonance with No. 3 at blade angles of 25 degrees.

From the appropriate propeller performance curve it was determined that a 1,000 r.p.m. and 25-degree blade angle combination would have absorbed the engine takeoff power at a true airspeed of 90 knots. This aircraft speed is considered valid in view of the operational conditions at impact.

Information was obtained from the Bristol Aeroplane Company through the British Air Registration Board concerning the minimum control speed at landing (V_{mc1}) for Britannia aircraft. This information was based on an aircraft gross weight of 130,000 pounds, a temperature of 50°F, flaps at 45 degrees, landing gear extended, and a threshold speed of 115 knots indicated airspeed. It was found that, under the above conditions, and with an outboard engine shut down and its propeller feathered, a climb gradient of only 0.51 percent or approximately 1/3 of one degree, could be attained after maximum takeoff power has been applied to the operating engines. The report stated that at airspeeds below 100 knots (V_{mc1}), and under the same conditions, it is highly improbable that directional control could be maintained. According to the factory data, Britannia aircraft operating under similar conditions should be capable of maintaining directional control and positive acceleration on three engines if a go-around is attempted at an airspeed in excess of 100 knots.

Subsequent to the accident a flight test was performed by CPA regarding the go-around performance and characteristics of the Britannia in the full

landing configuration with the No. 1 engine inoperative and its propeller feathered. The test was carried out at 5,000 feet m.s.l. with the aircraft's weight at approximately 130,000 pounds. A simulated final approach was performed using a threshold speed of 112 knots. Under these conditions, a go-around was attempted without raising the flaps from the 45-degree position. Maximum power and gear up were selected while holding the airspeed at 112 knots. Corrective action for the loss of directional control was attempted by the use of rudder and aileron but a slow left turn developed and a loss of 120 feet was noted. Any attempt to increase aileron and reduce rudder to cut down the rudder drag effect resulted in a loss of airspeed. When the flaps were reduced to 30 degrees the aircraft climbed out under full control. However, a loss of about 40 feet of altitude was noted during flap retraction.

The test flight did not exactly duplicate the conditions under which CF-CZB was operating, in that it was conducted at 5,000 feet m.s.l., rather than sea level, without the added help of ground effect and visual reference.

From all the evidence available, the Board concludes that a go-around was attempted shortly after the aircraft had crossed the runway threshold and while it was still in a full landing configuration. The abruptness of the aircraft's veering from the runway, in conjunction with the evidence of a shallow angle of bank at impact, confines the responsible factors necessary for this maneuver to those which would produce a condition of asymmetry about its vertical axis. It can be assumed that an airspeed of 115 knots (target threshold speed) or above was maintained until the aircraft crossed over the threshold. From this point and until the go-around was initiated, engine

power was reduced and the aircraft was flared in preparation for landing thus decreasing the airspeed to or below V_{mc1} . Because the aircraft was operating at a speed below V_{mc1} , it could not have responded to the application of primary flight control so as to accomplish the described maneuver. The existence of a split-flap condition was ruled out by the position of the flap jackscrews which evidenced a symmetrical full down flap configuration. However, an asymmetric thrust condition could have produced the necessary yawing moment the maneuver required. The Board believes that this condition was developed by the sudden application of takeoff power on the three operating engines.

Probable Cause

The Board determines that the probable cause of this accident was the attempted three-engine go-around, when the aircraft was in a full landing configuration, at insufficient airspeed and altitude to maintain control.

BY THE CIVIL AERONAUTICS BOARD:

/s/ ALAN S. BOYD
Chairman

/s/ ROBERT T. MURPHY
Vice Chairman

/s/ CHAN GURNEY
Member

/s/ G. JOSEPH MINETTI
Member

/s/ WHITNEY GILLILLAND
Member

S U P P L E M E N T A L D A T A

Investigation

The Civil Aeronautics Board was notified of this accident at 0102 on July 23, 1962. Board investigators were immediately dispatched to the scene and an investigation was initiated and conducted in accordance with the provisions of the Convention on International Civil Aviation dated December 7, 1944, and the provisions of Title VII of the Federal Aviation Act of 1958, as amended.

Air Carrier

Canadian Pacific Air Lines/^{T.A.B.} holds an Air Transport Board license and a valid operating certificate issued by the Canadian Department of Transport. The carrier also holds a permit issued by the Civil Aeronautics Board to engage in foreign air transportation between a terminal point or points in Canada, the intermediate points Honolulu, Hawaii, Canton Island and Fiji, and co-terminal points in Australia and New Zealand.

Flight Personnel

Captain Welland T. Jennings, age 45, held a valid Canadian airline transport certificate, No. 428, with a Britannia aircraft endorsement which was dated May 25, 1962. His medical certificate was renewed on February 9, 1962, with no waivers and his last proficiency check was conducted on February 9, 1962. Captain Jennings had a total of 13,250 flying hours of which 920 hours were in Britannia aircraft. In addition to his training flights he had, as captain, performed two prior three-engine landings in the Britannia under actual conditions.

Captain Alfred A. Giguere, age 44, the check captain on this flight, held a valid Canadian airline transport certificate, No. 550, with a Britannia aircraft endorsement which was dated April 7, 1960. His medical certificate was renewed on May 17, 1962, with no waivers and his last proficiency check was conducted on June 21, 1962. Captain Giguere had a total of 16,073 flying hours of which 1,628 hours were in Britannia aircraft. He had signed the flight clearance for this flight inasmuch as this was Captain Jennings first check over this route on Britannia aircraft. This was in accordance with company procedures.

First Officer Charles J. Norton, age 33, held a valid commercial pilot certificate, No. 6140, with Britannia aircraft endorsement which was dated April 18, 1960. His medical certificate was renewed on June 25, 1962, with no waivers and his last proficiency check was satisfactorily conducted on April 5, 1962. First Officer Norton had a total of 5,688 flying hours, of which 1,527 hours were in Britannia aircraft. In addition to his training flights he had, as first officer, made five prior three-engine landings under actual conditions.

First Officer Donald A. Eldred, age 30, on a familiarization training flight, held a valid Canadian airline transport certificate, No. XDA 785, with a Britannia aircraft endorsement which was dated May 7, 1962. His medical certificate was renewed on April 2, 1962, with no waivers and his last proficiency check was conducted on April 11, 1962. First Officer Eldred had a total of 5,724 flying hours, of which 1,506 hours were in Britannia aircraft.

Second Officer, Gerald E. Farr, age 28, held a valid airline transport rating, No. VFA 830, with a Britannia aircraft endorsement which was dated April 25, 1960. His medical certificate was renewed on May 28, 1962, with no waivers. Second Officer Farr had a total of 4,234 hours, of which 956 hours were in Britannia aircraft.

Navigator Roy D. McLennan, age 34, held a valid Canadian flight navigator certificate, No. 83, dated December 5, 1956. His medical certificate was renewed on March 14, 1962, with no waivers and his annual flight check was satisfactorily conducted on April 1, 1962.

Navigator Ronald G. Hill, age 35, held a valid Canadian flight navigator certificate, No. 64. His medical certificate was renewed on June 14, 1962, with no waivers and his annual flight check was satisfactorily conducted on November 14, 1961.

*Purser Harry Soukop, age 36, was qualified as a purser on May 8, 1956, and his last Britannia emergency examination was passed on October 17, 1961. His medical certificate was renewed on April 24, 1962, with no waivers.

*Stewardess Andrea L. Johnston, age 28, was qualified as a stewardess on November 17, 1958, and her last Britannia emergency examination was passed on March 30, 1962. Her medical certificate was renewed on June 28, 1961, with no waivers.

*Stewardess Ursula C. Huebner, age 25, was qualified as a stewardess on January 16, 1958, and her last Britannia emergency examination was passed on October 31, 1961. Her medical certificate was renewed on April 19, 1961, with no waivers.

*Stewardess Nancy Chalmers, age 29, was qualified as a stewardess on April 1, 1958, and her last Britannia emergency examination was passed on October 24, 1961. Her medical certificate was renewed on May 3, 1961, with no waivers.

The entire crew received 34:30 hours rest prior to this flight.

The Aircraft

The aircraft was a Bristol Britannia, model 314, Canadian Registry CF-CZB, owned and operated by Canadian Pacific Air Lines as aircraft No. 522. It was manufactured on May 1, 1958, serial No. 13394. The total time on the airframe was 9289:52 hours.

The aircraft was equipped with Bristol Proteus 765 engines and DeHavilland propellers. No. 1 engine had a total time of approximately 6,685 hours, 1,105 hours since overhaul; No. 2 - approximately 6,515 hours, 1,560 hours since overhaul; No. 3 - approximately 5,866 hours, 912 hours since overhaul; No. 4 - approximately 6,930 hours, 1,130 hours since overhaul.

The flight times on the propellers were as follows: No. 1 had a total time of approximately 7,894 hours, 1,498 hours since overhaul; No. 2 - 7,759 hours, 2,856 hours since overhaul; No. 3 - approximately 1,498 hours since installation; and No. 4 - a total of approximately 6,843 hours, 1,497 hours since overhaul.

*Denotes surviving crew members.