

1. FACTUAL INFORMATION

1.1 History of flight

1.1.1 The pilot flew DQ-FBO on Fiji Air flights PC31 and PC32 from Nausori to Ba and return on a visual flight rules (VFR) local flight plan. Flight PC31 departed from Nausori at 0758 hours Fiji standard time* and arrived at Ba at 0836 hours. The aircraft departed from Ba 12 minutes later at 0848 hours and arrived at Nausori at 0926 hours.

1.1.2 While the aircraft was being refuelled and loaded the pilot went to the control tower to obtain the latest weather information before departing on Fiji Air flight PC71 from Nausori to Bua. The fuel load carried was 202kg (447 lbs) which was the company standard minimum fuel for a return flight from Nausori to Bua and provided a fuel endurance of 3 hours. The flight was operating on a standard VFR local flight plan and commenced taxiing at 0942 hours with 8 passengers on board.

1.1.3 DQ-FBO became airborne on runway 10 at 0946 hours. At 0949 hours the pilot advised Nausori air traffic control (ATC) "Bravo oscar departed 49." ATC replied, "Bravo oscar airborne time 46, report arrival Bua". The pilot acknowledged this message. No further communication was received from the aircraft.

1.1.4 Bua aerodrome is 71 nautical miles north of Nausori airport on a track of 003°T (350°M). The standard flight plan time from Nausori to Bua was 35 minutes and when no message had been received from DQ-FBO by 1023 hours Nausori ATC endeavoured to contact the aircraft on both very high frequency (VHF) and high frequency (HF) channels. In addition aircraft operating in the area north of Nausori were asked to call DQ-FBO.

1.1.5 An Air Pacific flight enroute from Nausori to Labasa at 7000 feet on an instrument flight rules (IFR) local flight plan descended to the west of track below cloud and proceeded to Bua. The flight was overhead Bua airstrip at about 1120 hours and the pilots observed that DQ-FBO was not on the ground at Bua.

1.1.6 The rescue co-ordination centre at Nadi was activated at 1215 hours and an extensive air and ground search was initiated.

1.1.7 The wreckage of the aircraft was located by a ground party about 1315 hours on 14 July 1979 5½ nautical miles east-north-east of Bua airstrip at an elevation of 1450 feet AMSL. The accident site was in steep terrain covered with tropical rain forest.

1.1.8 The accident occurred in daylight at about 1020 hours on 12 July 1979. The accident site was at 16° 49' 21" S. latitude, 178° 42' 45" E. longitude.

1.2 Injuries to persons

1.2.1			Crew	Passengers	Others
Fatal	...	...	1	8	—
Serious	...	...	—	—	—
Minor/none	...	...	—	—	—

*All times in this report are Fiji standard time.

1.3 Damage to aircraft

1.3.1 The aircraft was destroyed by impact forces.

1.4 Damage to property

1.4.1 Nil.

1.5 Personnel information

1.5.1 Pilot in command held Australian commercial pilot licence No. 116515 issued on 23 September 1976 and valid until 31 August 1979. Single engine group endorsements and twin engine endorsements for PA23 and BN-2 aircraft were entered on the licence. He held also a class one instrument rating and a C grade instructor rating both valid to 31 October 1979.

1.5.2 On 27 June 1979 the Fiji Department of Civil Aviation issued a certificate of validation No. 92 valid until 26 July 1979, authorising Captain "to exercise the privileges" of his commercial pilot licence whilst flying aircraft operated by Fiji Air Limited.

1.5.3 Captain's total flying experience was 1074 hours including 139 hours on BN-2 aircraft and 65 hours actual instrument flight time. During the 90 days preceding the accident he had flown 90 hours including 26 hours on BN-2 aircraft and 41 hours instrument flight time.

1.5.4 He commenced route training with Fiji Air Limited on 28 June 1979 and up to 5 July 1979 had completed 15 hours 20 minutes command training under supervision. This training included route flying on 27 sectors under VFR conditions with circuits and landings at Bua and 9 other airstrips. On 11 July he flew 2 hours 8 minutes under supervision on 4 sectors in VFR conditions with circuits and landings at 2 other airstrips. He had received no training in the IFR procedures applicable to routes operated by Fiji Air Limited.

1.5.5 He was authorised as a pilot in command with Fiji Air Limited on 5 July 1979 and at the time of the accident had flown 13 hours with the Company as a pilot in command.

1.5.6 During the 7 days prior to the accident he had flown for 14 hours 26 minutes and had been on duty for 36 hours 25 minutes. He had a rest period of 12 hours 55 minutes prior to reporting for duty on 12 July 1979.

1.5.7 The pilot in command had not flown in Fiji prior to the 28 June 1979. He had flown the Nausori-Bua route twice prior to the accident, once under supervision and once as pilot in command. During the flight to Bua under supervision the check captain advised Captain that the approach to Bua was normally made by tracking seaward of the coast. The check captain also drew his attention to the need for caution when approaching Bua, if to the east of track, in view of the terrain immediately to the east.

1.5.8 The Operator had instructed Captain verbally not to fly in Instrument Flight Conditions until he had passed an instrument rating flight test in Fiji. In addition the Operator "had stressed that the pilot in command was not expected to push on into bad weather and he was not to hesitate to abort a flight if he was at all unhappy with the conditions".

1.6 Aircraft information

1.6.1 Britten Norman BN-2A-9 Islander aircraft, DQ-FBO, Serial No. 195 was manufactured in 1970 and had flown a total time of 8835 hours and 510 hours since the last Certificate of Airworthiness renewal inspection.

1.6.2 Two Lycoming O-540-E4CB engines were installed. No. 1 engine, Serial No. L-18977-40, had run 2154 hours since new. No. 2 engine, Serial No. L-18164-40, had run 2182 hours since new and 190 hours since overhaul. Hartzell constant speed full feathering propellers type HC-C2YK-2C/8477A-4 were fitted. No. 1 propeller, Serial No. AU490 had run 6631 hours since new and 1289 hours since overhaul. No. 2 propeller, Serial No. AU5372 had run 1352 hours since new.

1.6.3 The aircraft was fitted with dual flying controls and was instrumented and equipped in accordance with current regulations for IFR operation. It was equipped with one Narco mk 12A VHF communications transceiver and a VHF Omni-Directional Radio Range (VOR) receiver. One AWA HF communications transceiver was also installed. Two Bendix T12C medium frequency automatic direction finding (ADF) receivers were fitted.

1.6.4 Integral wing tip fuel tanks with a usable capacity of 104 litres (23 Imp gallons) per side were installed. The fuel from each tip tank was led to an electrically actuated two-way fuel cock interposed between the inner wing tank and the auxiliary fuel pumps. These fuel cocks were actuated by switches mounted on an auxiliary panel fitted to the windscreen dividing panel.

1.6.5 All mandatory modifications required to the airframe, engines, propellers and equipment had been embodied and all required special inspections had been carried out.

1.6.6 The Fiji Certificate of Airworthiness No. 53 in the Transport Category Passenger had last been renewed on 25 March 1979 and was valid until 24 March 1980.

1.6.7 The Certificate of Maintenance No. 676 had been issued on 4 July 1979 and was valid to 18th August 1979 or attainment of 8850 flying hours whichever occurred the earlier.

1.6.8 The total fuel on board DQ-FBO at the time of departure from Nausori was 202 kg (447 lbs) of 100/130 octane Avgas. Both tip tanks were full (74 kg each) and there was 27 kg of fuel in each main tank. All the aircraft equipment was serviceable with no recorded defects.

1.6.9 The right hand front seat next to the pilot was not occupied on the accident flight.

1.6.10 The maximum zero fuel weight was 2766 kg (6100 lbs) and the maximum take-off and landing weights were 2857 kg (6300 lbs). The load-sheet for the flight recorded a zero fuel weight of 2550 kg (5622 lbs) and a take-off weight of 2752 kg (6069 lbs). The passengers' actual weight had been used in compiling the loadsheet. Although the centre of gravity (C of G) position was recorded as "WIL" (within limits) no calculation had been made to ascertain the actual C of G.

1.6.11 During the investigation following the accident the C of G was calculated to have been 65.76 cm (25.893 inches) aft of the datum point at the wing leading edge. The aft C of G limit was specified as 65.02 cm (25.6 inches) aft of the datum point.

1.7 Meteorological information

1.7.1 On the morning of 12 July 1979 Fiji lay in a broad area of light variable winds between anticyclonic systems to the east and west, the equatorial trough well to the north and a depression to the south near northern New Zealand. Several bands of cloud, oriented northwest-southeast, were drifting slowly eastward across the Fiji area.

1.7.2 A copy of the Fiji area forecast, valid from 0500 hours to 1200 hours on 12 July 1979 and the terminal area forecasts for Nausori and Nadi up to 1800 hours were issued to the pilot prior to departure from Nausori.

1.7.3 The area forecast was for scattered to broken stratocumulus (Sc) and cumulus (Cu) cloud with a base between 2500 feet and 5000 feet and visibility 35 km reducing to 8 km in rain showers. The wind velocity at 3000 feet was forecast to be variable at 10 knots.

1.7.4 The actual weather at Nausori when flight PC71 departed for Bua was overcast with a main cloud base of 5000 feet, $\frac{1}{8}$ Cu cloud at 2500 feet, visibility 60 km, temperature 23°C and dew point 21°C. ATC gave the surface wind velocity as 270°M less than 5 knots and the QNH as 1015 mbs. The Nausori terminal area forecast indicated that conditions would remain similar with the cloud becoming temporarily 4/8 Cu at 2000 feet in rain showers.

1.7.5 During the day, as an anticyclone over eastern Australia advanced eastward, westerly or southwesterly winds developed over the Fiji island group. The upper winds at Nadi measured from a balloon released at 1115 hours, were 225°T, 12 knots at 1000 feet increasing to 225°T, 18 knots at 3000 feet. The main low cloud over Fiji was a broad band of Sc at a height estimated at most stations as around 4000 to 6000 feet, with scattered Cu beneath at 2000 feet or higher but reported as between 1000 and 2000 feet at Savu Savu and Labasa. A few scattered showers, generally light, were reported during the day but visibilities were in the range of 20 to 50 km or better.

1.7.6 There was no weather reporting station at Bua. The nearest reporting station was at Nabouwalu, on the coast 12 miles south of Bua. At 0600 hours Nabouwalu reported 4/8 of Cu and Sc cloud between 2000 and 3000 feet with an overcast above. Visibility was given as 50 km and the surface wind was calm. At 0900 hours the cloud conditions were unchanged but visibility was stated as 20 km with light showers and the surface wind was variable at 2 knots. These actual reports were not available to the pilot before flight PC71 departed from Nausori.

1.7.7 The pilot of an aircraft which departed from Nausori at 0935 hours reported that as he proceeded north along the coast of Viti Levu to Tailevu Point conditions were showery and Ovalau Island was totally obscured in heavy rain-showers. At 1000 hours the aircraft was at Viti Levu Bay some 35 nautical miles south-southwest of Bua. Heavy rain shower activity could be seen about 20 miles to the north-east and the island of Vanua Levu was not visible. Thirty minutes later the aircraft was 10 miles north of Ba at an altitude of 3000 feet. The pilot stated that "the wind in this area was quite strong, blowing at 25 to 30 knots from 220°M".

1.7.8 A Fiji Air Limited aircraft departed from Nadi at 1002 hours and proceeded VFR at an altitude of 1500 feet via the south coast of Viti Levu to

Pacific Harbour. After a brief stopover the flight continued VFR to Nausori where it landed at 1102 hours. The pilot reported that he had experienced a strong south-westerly wind from Nadi until he reached the vicinity of Nausori, where the wind became light and variable.

1.7.9 The two caretakers employed at Bua aerodrome stated that when they left Ndama village $1\frac{1}{2}$ miles south-east of Bua before seven o'clock, "it was just coming on to rain". When they arrived at the aerodrome about seven o'clock "it was raining heavily and was very dark". Steady rain fell until after ten o'clock. Some time after ten o'clock they heard the sound of an aircraft for a very short time to the south-east of the airstrip. They could not see the aircraft as "it was foggy". The wind was blowing from the south-east at about 20 knots.

1.7.10 Two men who were on the top of a ridge at an elevation of about 1000 feet and 4 miles east-north east of Bua aerodrome heard the sound of an aircraft approaching from the south and flying toward the hills. The aircraft passed very close to them and was "not very high" or "about on the same level" as where they were standing. They did not see the aircraft as they were in cloud and light rain was falling. A short time later they heard a bang followed by sounds of rushing air before the noise ceased. They were not sure what the time was when this occurred.

1.7.11 The Air Pacific flight which diverted to Bua (see paragraph 1.1.5) descended in the Wainunu Bay area, some 15 miles east-south-east of Bua at about 1115 hours. The cloud base was approximately 4700 feet and the pilot observed that there was a line of stratiform cloud lying northwest-southeast across western Vanua Levu. The base of this cloud was not well defined and light rain and drizzle was falling from it. Flight visibility was more than 30 km to the west and 15 km to the north and east with hazy conditions over the hills and remnants of stratus in the valleys. The surface wind was a light south westerly. After circling Bua at about 1120 hours the flight made a search along the hills at an altitude of 2000 feet to the south to Nabouwalu then proceeded north again inland from Bua and thence north-eastward. The flight experienced light turbulence which became moderate over the ranges to the north-east of Bua. While making an instrument let-down to Labasa between 1150 and 1200 hours a strong south westerly wind was evident during the let-down procedure.

1.8 Aids to navigation

1.8.1 Nausori airport was equipped with a VOR transmitter operating on 112.2 MHz, a distance measuring equipment (DME) beacon operating on channel 59X and a medium frequency non-directional beacon (NDB) operating on 307 kHz. These aids were all serviceable when DQ-FBO departed from Nausori for Bua and at the time of the accident.

1.8.2 No aids to navigation were installed at Bua aerodrome.

1.9 Communications

1.9.1 Communications facilities at Nausori airport consisted of one VHF channel on 119.7 MHz and two HF channels operating on 6533 kHz and 3460 kHz. All these channels were serviceable on the day of the accident.

1.9.2 No communications facilities were installed at Bua aerodrome.

1.10 Aerodrome information

1.10.1 Bua aerodrome is situated on the coast at Bua Bay at an elevation of 60 feet AMSL. It consists of a gravel runway 1000 m long and 18 m wide aligned on a bearing of 298°/118°T. Two windsocks are installed. The only visual aids are white markers at the runway ends and adjacent to the runway sides.

1.11 Flight recorders

1.11.1 No flight recorder was installed in the aircraft nor was one required to be installed.

1.12 Wreckage and impact information

1.12.1 The aircraft wreckage lay in a heavily timbered gully beside a spur on the east side of a large valley. The entire area was covered with tropical rain forest, the forest canopy at the accident site being generally 25m (80 feet) above ground level.

1.12.2 After breaking off several small tree branches the aircraft struck two substantial trees about 8m (24 feet) above the surface. The damage to the port wing indicated that it had impacted heavily against one tree outboard of the port engine causing the outer wing to deflect forward and fracture at that point. This outer wing section had struck the other tree and the wing tip, including the fuel tank, had separated from the wing as it was severed by the second tree. The nose of the aircraft had then yawed to the left as the remaining inboard section of the port wing separated rearward from the fuselage at the wing root. The port propeller had parted from the port engine and the engine had separated from the wing. The aircraft then demolished a number of smaller trees which caused the starboard wing to separate just outboard of the starboard engine. The fuselage and the wing centre section with the starboard engine and propeller attached, came to rest approximately 50 m (164 feet) from the initial impact point.

1.12.3 Both wing tip fuel tanks had ruptured and separated from the wing structure, the port tank being some 20 m along the wreckage trail while the starboard tank had come to rest adjacent to the starboard engine. Both electric actuators for the tip tank fuel cocks were in the "open" position.

1.12.4 The pre-impact integrity of the flight controls in the cockpit area was established. The elevator control push-pull rod had fractured in overload 35 cm (14 inches) aft of the base of the control column. In the tail section the elevator drive lever had separated from the aft end of the elevator push-pull rod also due to an overload failure. The upper section of the fin and rudder was folded over on to the port tailplane. The elevator complete with its trim tab had separated from the tailplane. The extension of the elevator trim tab screw jack was measured at the accident site.

1.12.5 The flaps and ailerons had separated from the wings after impact. The position of the transverse operating rod from the flap actuator was consistent with the flaps being in the fully up (6 degree) position. Fractures observed in the aileron control cables were overload failures.

1.12.6 The twin heading bars on the Magnesyn compass indicator were set on 352°. However, the heading indicator needle was missing and there were no marks on the dial of the instrument to show what the position of the needle may have been at impact.

1.12.7 The millibar sub-scale on the altimeter from the pilots instrument panel was set at 1015 mbs and the sub-scale on the second altimeter was set at 1013 mbs. The mechanism of both altimeters was broken.

1.12.8 The microphone selector on the audio panel was in the "HF" position while the HF selector switch was "off". However the switch toggle had been damaged so the "off" indication was considered to be unreliable. The ADF control boxes and ADF indicators were not identified in the wreckage.

1.12.9 The aircraft clock had stopped at seventeen minutes past ten.

1.12.10 The damage to the blades of both propellers was typical of an impact with power on the engines.

1.12.11 The wings of the aircraft had been approximately level at first impact with the trees and from this point the trajectory of the fuselage was horizontal and on a track of 006°T.

1.13 Medical and pathological

1.13.1 The pilot in command had undergone a full medical examination including a chest x-ray, electrocardiogram and audiogram examinations on 28 June 1979 and had been assessed as medically fit to hold a commercial pilot licence.

1.13.2 An autopsy and toxicology analyses were carried out and revealed no abnormalities. There was no evidence to suggest or show that the pilot in command was not in a normal state of health when he departed on the accident flight.

1.14 Fire

1.14.1 Fire did not occur.

1.15 Survival aspects

1.15.1 The accident was not survivable as the cabin area of the aircraft was virtually destroyed.

1.15.2 No Emergency Locator Transmitter was installed in the aircraft nor was one required to be installed.

1.15.3 The aircraft had penetrated beneath the forest canopy without leaving any marks on the trees which would have been readily discernible from the air. Intensive searches were conducted in the hills east of Bua by both fixed wing aircraft and helicopters but the wreckage was finally located by a ground party.

1.16 Tests and research

1.16.1 A flight test was conducted with an Islander aircraft at an all up weight of 2736 kg (6032 lbs) and the C of G at 58.9 cm (23.2 inches) aft of the datum. The elevator trim handwheel was set to a position at which the extension of the elevator trim tab screw jack was the same as that measured on DQ-FBO at the accident site. At this elevator trim setting the "in trim" airspeed was found to be 132 knots.

1.17 Additional information

1.17.1 Fiji Air Limited held approval from the Fiji Air Transport Licensing Board to operate two scheduled air services per week on the Nausori-Bua-Nausori route.

1.17.2 The following sections of Article 22 of the Colonial Air Navigation Order 1961 specified the requirements which were relevant to the route qualifications of the pilot of DQ-FBO :

(5) (a) The pilot designated as commander of the aircraft for the flight shall -

- (i) have demonstrated to the satisfaction of the operator that he has adequate knowledge of the route to be taken, the aerodromes of take-off and landing, and any alternate aerodromes, including in particular his knowledge of—
 - the terrain,
 - the seasonal meteorological conditions,
 - the meteorological, communications, and air traffic facilities, services and procedures,
 - the search and rescue procedures, and the navigational facilities,
 - relevant to the route ;

(ii) ;

- (iii) have carried out as pilot in command not less than three take-offs and three landings in aircraft of the type to be used on the flight.

(b) In determining whether a pilot's knowledge of the matters referred to in sub-paragraph (a) (i) is sufficient to render him competent to perform the duties of aircraft commander on the flight, the operator shall take into account the pilot's flying experience in conjunction with the following—

- (i) ;
- (ii) the influence of terrain and obstructions on departure and approach procedures at the aerodromes of take-off and intended landing and at alternate aerodromes ;
- (iii) the similarity of the instrument approach procedures and let-down aids to those with which the pilot is familiar ;
- (iv) the dimensions of runways which may be used in the course of the flight in relation to the performance limits of aircraft of the type to be used on the flight ;
- (v) the reliability of meteorological forecasts and the probability of difficult meteorological conditions in the areas to be traversed ;
- (vi) the adequacy of the information available regarding the aerodrome of intended landing and any alternate aerodromes ;
- (vii) the nature of air traffic control procedures and familiarity of the pilot with such procedures ;
- (viii) the influence of terrain on route conditions and the extent of the assistance obtainable en route from navigational aids and air-to-ground communication facilities ;

- (ix) the extent to which it is possible for the pilot to become familiar with unusual aerodrome procedures and features of the route by means of ground instruction and training devices.

1.17.3 The rules applicable to VFR flight outside controlled airspace were specified in the Colonial Air Navigation Order 1961 as amended by the Colonial Air Navigation (Amendment) Order 1968 :

“An aircraft flying outside controlled airspace shall remain at least one nautical mile horizontally and 1,000 feet vertically away from cloud and in a flight visibility of at least five nautical miles :

Provided that at or below 3,000 feet above mean sea level or at or below 1,000 feet above the surface, whichever is the higher, this paragraph shall be deemed to be complied with if the aircraft is flown clear of cloud and in sight of the surface”.

1.17.4 The Fiji Air Limited Operations manual did not specify cloud ceiling and visibility minima for operations at Bua airstrip.

1.17.5 A little over one mile south of the accident site there is a peak at an elevation of 2,000 feet AMSL. A ridge extends to the west below this peak and the 1450 feet contour on the ridge is one nautical mile from the accident site on a bearing of 201°T. South of this ridge, on and to the west of this bearing of 201°T, the terrain is all below 1450 feet AMSL.

1.17.6 One submission was received in response to a public notice, in terms of Regulation 7 of the Civil Aviation (Investigation of Accidents) Regulations 1952, inviting any person who may desire to make written representations concerning the circumstances or causes of the accident.

1.17.7 The Fiji Aeronautical Communications Staff Association submitted that, “We are of the opinion that the disaster at Bua could possibly have been avoided if we had qualified (Aeronautical Communications) personnel manning Bua airport”. It was further stated that, “It is evident that the Department of Civil Aviation must adopt a policy of manning most, if not all, of the domestic airports in Fiji by fully trained Flight Service Officers”.

2. ANALYSIS

2.1 The physical evidence at the accident site indicated that the aircraft was in level flight when the accident occurred. Having regard to the “in trim” airspeed determined during the flight test subsequently carried out (see paragraph 1.16.1) it is considered that at impact the aircraft was flying at an airspeed approximating its normal cruise speed of 125 knots.

2.2 In view of the quantity of fuel in the main tanks at departure, the selection of tip tanks during the latter stage of the flight would be normal. The positions of the tanks at the accident site and the impact damage which they had sustained indicated that they had contained fuel at the time of the accident.

2.3 The damage to the blades of both propellers supported the view that both engines had been operating under power at the time of impact.

2.4 When departing from Nausori the pilot had been requested to “report arrival Bua”. In normal circumstances there was no requirement for him to contact ATC during the flight and the lack of communication was not considered to be significant in relation to the accident.

2.5 Under calm conditions, at a true airspeed of 125 knots, the en route time from Nausori to Bua would be 34 minutes. If one minute was allowed to set heading after take-off from runway 10, the estimated time of arrival of DQ-FBO at Bua would have been 1021 hours. To have reached the accident site at 1017 hours the aircraft would need to have experienced an average tailwind component of approximately 22 knots over the entire flight. There was no evidence that a tailwind component of this strength existed over the entire route which suggests that the accident occurred at some time after the seventeen minutes past ten shown on the aircraft clock.

2.6 A review of the meteorological information and reports of actual conditions received after the accident, suggested that the flight would have been operating in light and variable wind conditions over much of the route. However it is probable that a west to south-westerly wind affected the flight in the vicinity of Vanua Levu.

2.7 To approach the accident site in level flight clear of the terrain immediately to the south (see paragraph 1.17.5) the aircraft must have been on a track of not less than 021°T i.e. at least 18° to the east of the direction of the Nausori-Bua track (003°T). The upper winds measured at Nadi and the pilot reports mentioned in paragraphs 1.7.7 and 1.7.11 support the view that a strong west to southwest wind probably drifted the aircraft to the east as it approached Bua. A westerly wind of 30 knots (on the beam) would have given 14° of starboard drift while a wind strength of 40 knots would have given 18° of starboard drift.

2.8 It was not practicable to determine the precise aircraft heading at impact or the extent to which the nose of the aircraft had yawed to the left after striking the trees. The subsequent trajectory of the fuselage would have been different from the direction in which the aircraft was tracking prior to the accident.

2.9 The spacing of weather reporting stations and the frequency of observations was such that the conditions over the route from Nausori to Bua could not have been forecast in any greater detail than was stated in the Fiji area forecast. The actual wind conditions experienced by flight PC71 in the vicinity of Vanua Levu, probably were significantly different from the forecast for variable winds at 10 knots. However, had the pilot maintained visual reference to the surface, he would have been able to observe the coastline of the island of Vanua Levu as the aircraft proceeded to the east of the desired track and thus been able to take appropriate action to keep clear of the terrain.

2.10 The actual weather conditions reported by the pilots of other aircraft suggest that flight PC71 would have experienced showery conditions while flying along the coast of Viti Levu to Tailevu Point. From Tailevu Point the flight had a distance of some 38 nautical miles to cover over water before approaching the south-west coast of Vanua Levu in the vicinity of Nabouwalu. While the pilot probably complied with the Visual Flight Rules when he first encountered reduced visibility conditions, it is apparent that in the latter stages he continued the flight with no visual reference to the surface and thus was unaware that the aircraft was over land.

2.11 The regulations concerning route training (see paragraph 1.17.2) did not require a specific number of flights over any particular route and the relevant requirements had been complied with so that the Operator was satisfied that Captain [redacted] was competent to fly VFR in command on the Nausori-Bua-Nausori route. While taking into account Captain's [redacted] flying experience it is nevertheless considered that the training given was not sufficient.

2.12 Captain was authorised as a pilot in command with Fiji Air Limited after 6 days of training and supervised route experience which he received over a period of 8 days. The completion of several circuits and landings at Bua would have familiarised him with the terrain in the area and with the approaches to the aerodrome in VFR conditions. However, one flight under supervision to Bua and 6 days of training on the Company's route network is not considered to have been sufficient to provide an adequate knowledge of the route or of the local meteorological conditions. Moreover, the pilot had received no training in the procedures for IFR operation on the Nausori-Bua-Nausori route. In relation to these particular points the training given was inadequate.

2.13 The section of the Visual Flight Rules applicable to the accident flight required only that the aircraft be flown clear of cloud and in sight of the surface. While it is possible to navigate visually under these conditions when following a well defined landmark such as a reef or a coastline, it is not considered that this minimum visibility criterion provides an acceptable level of safety for VFR public transport operations particularly over water, as the rules permit the pilot to operate with virtually no forward visibility in flight. In addition, no cloud ceiling and visibility minima had been specified for landing at Bua. Despite any instructions given by the Operator to Captain not to "push on into bad weather" (see paragraph 1.5.8) it is probable that this lack of specific operating criteria, both en route and for landing, was a factor in the pilot continuing the flight into deteriorating weather conditions.

2.14 The aircraft was equipped for IFR operation and, although the Operator stated that the Captain had been instructed not to fly in instrument flight conditions, this should not have influenced the pilot against proceeding IFR as a safety measure in the event of losing sight of the surface. There was no evidence at the accident site to suggest that the aircraft was in a climbing attitude or in a turn when it struck the trees.

2.15 It is possible that if a report of the current meteorological conditions at Bua had been available to him, the pilot may have decided not to operate flight PC71 or alternatively to have returned to Nausori. However, as there was no accurate record of the actual weather conditions existing at Bua at the relevant times, or of the actual weather conditions encountered by flight PC71 while en route, this must be a matter of conjecture.

3. CONCLUSIONS

3.1 The Operator held approval from the Fiji Air Transport Licensing Board to operate the air service.

3.2 The Operator had complied with the relevant requirements regarding aircraft equipment for the conduct of a scheduled public transport service.

3.3 Appropriate steps were taken in making enquiries when DQ-FBO became overdue and a full scale search and rescue operation was mounted when these enquiries failed to locate the aircraft.

3.4 The Millibar sub-scale of the pilot's altimeter was correctly set at the Nausori QNH of 1015 mbs.

3.5 The aircraft all up weight was within limits. The fact that the aircraft C of G was aft of the rear limit was not significant.

3.6 The aircraft certificate of airworthiness and certificate of maintenance were both valid.

3.7 The aircraft was airworthy up to the moment of impact.

3.8 Although the Operator was satisfied that the regulations concerning route training had been complied with, it is considered that Captain had not been given adequate training on the Nausori-Bua-Nausori route before he was authorised as a pilot in command.

3.9 The Visual Flight Rules did not specify a minimum visibility requirement applicable to the flight.

3.10 The Operator had not specified cloud ceiling and visibility minima for landing at Bua.

3.11 The short period of supervised en route experience which the pilot in command received together with the lack of specific guidance on operating criteria to be observed are considered to have been contributory factors in the accident.

3.12 The aerodrome facilities available were satisfactory for VFR operations to and from Bua aerodrome and for VFR and IFR operations to and from Nausori aerodrome.

3.13 While there was no communications facility at Bua aerodrome it cannot be concluded that, if this facility had been available, the accident would have been averted by reason of that fact alone.

3.14 While the weather in the vicinity of Bua at the time of the accident was apparently worse than the area forecast had indicated, this lack of accuracy of the forecast was not considered to have been a major factor in the accident because the pilot could have elected to return to Nausori either VFR or IFR.

3.15 The pilot in command failed to comply with the Visual Flight Rules and continued the flight without visual reference to the surface.

3.16 Probable cause : The accident was caused by the pilot in command continuing the flight into conditions where he lost visual reference with the surface which resulted in the aircraft colliding with the terrain.

OBSERVATIONS

The circumstances of this accident have been investigated with the object of avoiding similar accidents in the future.

The accident flight was being conducted under the Visual Flight Rules and these observations and recommendations are concerned with maintaining adequate operational safety standards under these Rules.

There are no aspects of airworthiness standards which require consideration as no deficiencies were apparent in relation to aircraft maintenance and airworthiness.

The concept of using an IFR equipped aircraft flown by an instrument rated pilot to operate under the Visual Flight Rules to domestic aerodromes on outlying islands is basically sound. The minimum fuel carried is sufficient to enable the aircraft to return to the aerodrome of departure with normal reserves, including fuel to an alternate aerodrome if necessary, so that under adverse weather conditions the pilot has the option of returning either VFR or IFR, to his departure point or of proceeding to an alternate aerodrome.

Three airports in the Fiji Group are equipped for IFR operation and the level of safety attainable under these conditions is related to the criteria stipulated in the Visual Flight Rules, the aerodrome meteorological minima specified and the accuracy of the terminal weather forecasting for the IFR equipped airports. However the ultimate responsibility for the safety of a flight rests with the pilot in command and the decisions which he makes when planning and operating the flight.

Any improvements which may be made to provide the pilot in command with more accurate or up to date information would be desirable but it is considered that compliance with operational standards and adequate surveillance of these standards are prerequisites in maintaining safety in airline operations.

SAFETY RECOMMENDATIONS

It is recommended that :

1. The Visual Flight Rules be amended to specify a minimum visibility requirement for aircraft operating outside controlled airspace at or below 3000 feet above mean sea level or at or below 1000 feet above the surface, whichever is the higher.
2. For public transport operations under the Visual Flight Rules, cloud ceiling and visibility minima be specified for take-off and landing at each aerodrome or airstrip ; such minima to be appropriate to the flight characteristics of the aircraft type to be operated.
3. A minimum en route altitude be stipulated for VFR flight.
4. Suitable minimum requirements be specified for the training of captains to ensure that they are thoroughly familiar with en route procedures and operations of the aircraft before being cleared as pilots in command. The pilot should have obtained the necessary Fiji flight crew licence and ratings during the training period.
5. In view of the expansion of Fiji airline services, the Director of Civil Aviation review the adequacy of the operational supervision exercised by his Department over airlines conducting public transport flights under Fiji regulatory requirements.
6. Weather reporting stations be on or adjacent to domestic aerodromes. In addition a recent actual weather report from a destination aerodrome be available to the pilot in command before departure, particularly on the first flight of the day.
7. A trim sheet or other suitable quick reference data be used to ascertain the aircraft centre of gravity when completing the loadsheet.
8. Inertia actuated Emergency Locator Transmitters be carried as standard equipment on public transport aircraft.