

**Aviation Safety Investigation Report  
199400698**

**Britten Norman Ltd  
Islander**

**21 March 1994**

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**Occurrence Number:** 199400698                      **Occurrence Type:** Accident  
**Location:** Weipa  
**State:** QLD                                              **Inv Category:** 3  
**Date:** Monday 21 March 1994  
**Time:** 1754 hours                                      **Time Zone** EST  
**Highest Injury Level:** Fatal  
**Injuries:**

	Fatal	Serious	Minor	None	Total
Crew	1	0	0	0	1
Ground	0	0	0	0	0
Passenger	5	0	0	0	5
<b>Total</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>6</b>

**Aircraft Manufacturer:** Britten Norman Ltd  
**Aircraft Model:** BN-2A-21  
**Aircraft Registration:** VH-JUU                      **Serial Number:** 632  
**Type of Operation:** Charter      Passenger  
**Damage to Aircraft:** Destroyed  
**Departure Point:** Weipa QLD  
**Departure Time:** 1754 EST  
**Destination:** Aurukun QLD

**Crew Details:**

<b>Role</b>	<b>Class of Licence</b>	<b>Hours on Type</b>	<b>Hours Total</b>
Pilot-In-Command	Commercial	6.7	321

**Approved for Release:** Wednesday, January 17, 1996

## 1. FACTUAL INFORMATION

### Sequence of events

On the day before the accident, the aircraft flew from Aurukun to Weipa with the chief pilot occupying the left pilot seat and the pilot involved in the accident occupying the right pilot seat. At Weipa the chief pilot left the aircraft, instructing the other pilot to fly some practice circuits before returning the aircraft to Aurukun. Before commencing the circuits and the return flight to Aurukun, the aircraft's two main tanks each contained 100 L of fuel and the two wing tip tanks each contained about 90 L of fuel.

On the day of the accident the pilot added 200 L of fuel at Aurukun to the aircraft's tanks and then flew the aircraft and the passengers to Weipa. About 50 minutes before sunset, the aircraft taxied for departure from runway 30 for the 25-minute return flight to Aurukun.

When the aircraft was about 300 ft above ground level after takeoff, a witness reported that all engine sounds stopped and that the aircraft attitude changed from a nose-high climb to a more level attitude. A short time later, the noise of engine power surging was heard. The aircraft rolled left and entered a spiral descent. It struck level ground some 350 m beyond the departure end of runway 30 and 175 m to the left of the extended centreline.

### Wreckage examination

The aircraft had impacted the ground in a 30-degree nose-down attitude with 45 degrees of left bank. The left wing was broken at mid-span. The cockpit and forward cabin were totally crushed back to the leading edges of the wings.

The right propeller had gouged a deep hole in the soil and the propeller blades were bent both against the direction of rotation and rearwards toward the engine, indicating that this engine was producing considerable power at impact. The right fuel distributor valve contained fuel.

The left propeller was in fine pitch. One blade was bent rearwards toward the engine and the other blade was undamaged. Part of the spinner was crushed and part of it was almost intact. This damage pattern indicates that the left engine had stopped before impact. The left fuel distributor valve contained little fuel.

The left engine was removed from the aircraft and dismantled. No pre-impact damage that would have prevented the engine from operating was found.

Inspection of the airframe and other systems did not reveal any faults which might have contributed to the accident.

### Fuel system

The aircraft had been fitted with the manufacturer's wing tip tank modification. Each tip tank had a useable capacity of 104.5 L and each main tank a useable capacity of 240 L. A flight manual supplement detailing the operation of this fuel system had been issued and incorporated in the flight manual. The fuel management section of this supplement indicates that, for structural reasons, fuel from the tip tanks must be used last, and that 50 L should be retained in each tip tank unless the fuel is needed for holding or diversion to another airfield. There is a warning in the flight manual supplement that takeoffs and landings on main tanks are prohibited when the gauges read less than three gallons (about 14 L). There is no corresponding warning for the tip tanks.

Examination of the tip tanks showed that the fuel feed line was located centrally at the inboard tank baffle/outer wing rib near the bottom of the tank. The two main fuel selectors in the cockpit had moved from main fuel cock selection when the cockpit area was crushed during the main impact. However, examination of the fuel system confirmed that the main fuel cocks were open.

Toggle switches which control the main/tip tank selection were destroyed during impact. However, the light globes from the fuel tank indicators were examined and these indicated that the tip tanks were selected at the time of impact. Further inspection of the fuel supply system confirmed that the electrically actuated tip tanks fuel cocks were selected to draw fuel from the tip tanks.

The left tip tank was ruptured and separated from the wing. It contained about 5 L of fuel. The right tip tank was partially separated and did not contain any fuel. Reports from people at the scene immediately after the accident indicated that a large amount of fuel from the ruptured main tanks was present at the site.

#### The pilot

Six weeks before the accident, the pilot completed his endorsement training on an Islander aircraft which was not fitted with the tip tank modification. However, the endorsing instructor had briefed the pilot on the various fuel systems encountered in the Islander family of aircraft, including the particular wing tip tank modification fitted to VH-JUU. After his endorsement the pilot flew VH-JUU for a total of 3.6 hours until the day before the accident. The duration of the flight on the day before the accident, together with that of the passenger flight to Weipa on the day of the accident, was approximately one hour and twenty minutes. Therefore, at the time of the accident, the pilot had a total of 6.7 hours on the aircraft type.

#### Passengers and freight

The purpose of the flight was to collect cartons of beer from Weipa. The Aurukun Community had a policy of allowing a maximum of ten cartons to be carried on any one charter flight. However, sometimes passengers would insist on carrying more. The aircraft wreckage contained 30 cartons of beer and two bottles of rum, the latter being totally prohibited by the community. The cartons had been packed on and around seat rows four and five. The load had not been tied down. The aircraft gross weight was calculated to have been 47 kg below the limit for this takeoff. The centre of gravity was within limits.

#### Checklist

The endorsing instructor had given the pilot an Islander checklist. The aircraft usually carried a normal procedures checklist on a clipboard but this was inadvertently left at Aurukun. A checklist for normal procedures was not found in the wreckage although an emergency procedures checklist was found incorporated in the flight manual carried on board.

#### Fuel management

For planning purposes on this flight, the flight manual indicated a fuel consumption rate of 135 L per hour. The chief pilot reported that when he handed the aircraft over to the pilot at Weipa on the day before the accident there was about 90 L in each tip tank and that the tip tanks were probably selected to provide fuel to each engine.

## 2. ANALYSIS

If the tip tanks were selected since the previous day, the tip tank fuel contents should have been exhausted at about the time of the final takeoff from Weipa. With a low quantity of fuel in each tip tank, the fuel lines from each tank probably became unported as the aircraft climbed after takeoff, resulting in engines losing power from fuel starvation. When the pilot changed the attitude of the aircraft after the loss of power, some fuel probably became available to the right engine which then regained power.

Other factors include the pilot's low level of experience in the aircraft type, the absence of a normal procedures checklist and pressure from the passengers to complete the return flight with the excess alcohol. This pressure may also have accounted for the freight not being correctly secured.

A double, simultaneous engine failure was probably outside the pilot's experience level. A forced landing option was available which would have necessitated the closing of both throttles and landing on the Weipa - Coen road, which cut across the extended centreline of the runway at an angle of about 30 degrees. However, once the aircraft entered a spiral descent at low speed and with asymmetric power, recovery was not possible in the height available.

## 3. CONCLUSIONS

### Findings

The aircraft was being operated within weight and centre-of-gravity limits.

No defects that were likely to have contributed to the occurrence were found with the aircraft.

The aircraft's wing tip tanks were selected to feed fuel to the engines.

The right engine was producing considerable power at impact.

The left engine had stopped before ground impact and the propeller was not feathered.

The pilot did not operate the aircraft fuel system in accordance with flight manual instructions.

Both engines were starved of fuel during the initial climb after takeoff.

The pilot had probably operated the aircraft exclusively on fuel from the wing tip tanks, which were near empty at takeoff.

A suitable forced landing option was available.

There was no warning in the aircraft flight manual to alert the pilot to the danger of operating with near empty wing tip tanks.

Following the entry into the spiral there was insufficient height available for a recovery to controlled flight.

Significant factors

The pilot mismanaged the aircraft fuel system.

Both engines suffered a total power loss due to fuel starvation.

The right engine regained power probably as a result of a change in aircraft attitude.

The pilot lost control of the aircraft.

Recovery was not possible in the height available.

#### 4. SAFETY ACTION

During the course of this investigation Interim Recommendation IR 940193 was issued. It stated:

The Bureau of Air Safety Investigation recommends that the Civil Aviation Authority review the approval for the Flight Manual Supplement pertaining to wingtip fuel tanks on BA-2A-21 aircraft. Consideration should be given to adding suitable warnings that the use of partially filled wingtip tanks during take-off, landing and manoeuvring may lead to fuel starvation.

The following response, dated 8 November 1994, was received from the CAA:

"The Interim Recommendation on the aircraft has been reviewed and action in line with the BASI recommendation is being taken to update the aircraft flight manual."