INCIDENT

Aircraft Type and Registration:	BN2A MK III-2 Trislander, G-FTSE
No & Type of Engines:	3 x Lycoming O-540-E4C5
Year of Manufacture:	1977
Date & Time (UTC):	17 January 2011at 0956 hrs
Location:	Alderney Aerodrome, Alderney, Channel Islands
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 1 Passengers - 5
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to the right navigation light
Commander's Licence:	Commercial Pilot's Licence
Commander's Age:	51 years
Commander's Flying Experience:	5,850 hours (of which 1,450 were on type) Last 90 days - 128 hours Last 28 days - 34 hours
Information Source:	AAIB Field Investigation

Synopsis

Following a non-precision approach, the aircraft manoeuvred to land on the runway and its wingtip touched the ground. During a go-around after touchdown, the aircraft departed the runway prior to getting airborne. This report discusses the use of instrument approach minima following a visual cruise segment, and the availability of GPS as an alternative to conventional non-precision approaches.

History of the flight

The pilot reported at 0700 hrs to fly several sectors between the Channel Islands. Weather forecasts indicated this would involve flying in a mix of VFR and IFR conditions. The first three sectors, from Alderney to Guernsey, Guernsey to Jersey and Jersey to Guernsey, were uneventful. Five passengers boarded for the fourth sector, from Guernsey to Alderney. While the aircraft was at the holding point prior to departure, ATC advised the pilot that the latest weather report from Alderney reported visibility of 3 km, with broken cloud at 300 ft. This was below the minimum descent height of 390 ft agl (680 ft AMSL) for an NDB approach at Alderney but more than the required visibility of 1,200 m for that approach. Also, because the weather at both Guernsey and Jersey was above applicable minima and the pilot had plenty of fuel, he decided he would attempt an approach to assess the conditions himself.

The aircraft took off at 0939 hrs and was vectored under radar control towards the NDB approach for

Runway 26 at Alderney. The pilot used the autopilot to hold heading and altitude. Approximately ten minutes before touchdown, he requested the most recent Alderney weather. ATC reported 3 km visibility with broken cloud at 200 ft and few clouds below 100 ft.

As the aircraft positioned onto the approach, it was cleared to descend to 1,500 ft and approximately 4.5 nm from the runway, cleared to "DESCEND WITH THE PROCEDURE" and contact Alderney Tower, which the commander acknowledged. The pilot turned "late" to intercept the inbound course, so re-intercepted it from the north and commenced a descent using the AP to maintain the aircraft attitude. Approximately 4 nm from the ALD NDB, the aircraft was on the correct vertical profile for the NDB approach at 1,420 ft. The aircraft then started to descend at an average rate of approximately 900 ft/min (see Figure 1).

Approximately 3 nm from the runway, whilst descending through an altitude of approximately 1,000 ft, the pilot confirmed that the aircraft was established on the approach. Alderney Tower cleared the aircraft to land, advising that the surface wind was from 200° at 11 kt, runway surface was 'WET, WET, WET' with few clouds at less than 100 ft, broken clouds at 200 ft and that there was an area of fog near to the cliffs adjacent to the thresholds of Runway 03 and 32.

The pilot stated that he could by then see the island clearly. There was, however, some cloud over the south west of the island and he could not see the aerodrome or any of the visual references required to continue the approach below the minimum descent height specified for the NDB procedure. In sight of the ground and clear of cloud he decided he could apply the minimum visibility for a visual approach of 800 m and, using the NDB to assist with navigation, continued descending towards the aerodrome.

Shortly over one minute from touchdown and approximately 2 nm from the runway, the aircraft levelled off at 520 ft amsl. Approximately 35 seconds from touchdown, and approximately 1,300 m from the runway, Alderney Tower advised that the visibility had reduced to about 1,200 m. The pilot responded "I HAVEN'T GOT ANYTHING YET, VERY BROKEN". The aircraft remained at an altitude of 520 ft, approximately 230 ft agl. Several seconds later, the aircraft started to descend and with the aircraft almost abeam the ALD NDB, 680 m from the threshold of Runway 26, the pilot advised Alderney Tower "GOT THE LIGHTS". The track indicated by radar was then approximately 160 m north of the runway centre line.

The pilot stated that at a height of about 300 ft he saw the approach lights and realised he was to the north of the correct approach path. He disengaged the autopilot to manoeuvre the aircraft visually onto the extended centreline of the runway. This involved a turn of approximately 20º to the left using 15º angle of bank, which was followed by a steep right turn, "quite low to the ground" to align the aircraft with the runway. The aircraft landed on its right main wheels. With a surface wind from the left, the pilot felt uncomfortable and decided to go around. At 0956:29 hrs, ATC advised the pilot "CHECK YOUR WING TIP, I THINK YOU TOUCHED THE RUNWAY". Neither the pilot nor the passengers were aware of any other part of the aircraft contacting the ground.

The pilot positioned the aircraft for a second approach, during which ATC advised that the runway visual range (RVR) for Runway 26 had reduced to 325 m. As the aircraft approached the ALD NDB at approximately 1,400 ft, the pilot requested to enter a holding pattern. ATC then advised that the aircraft operator had requested the aircraft return to Guernsey. The return flight was uneventful and the aircraft landed safely.

Figure 1

Data from approach and rejected landing at Alderney Airport Runway 26

Witness information

The ATCO heard the aircraft before he saw it, to the east of the aerodrome and north of the Alderney (ALD) NDB mast. He watched the aircraft turn first left then steeply right, and saw sparks from the wingtip as it touched the runway. He immediately informed the pilot that the wing had touched the runway. The aircraft then landed briefly before he heard the engine power increase and saw the aircraft go around.

An inspection of the runway revealed broken glass from the navigation light and tyre marks which indicated that after its brief touchdown the aircraft had departed the right edge of the runway before becoming airborne.

Recorded information

No accident protected data or voice recorder was required or fitted. Primary and secondary[1] radar information available from Jersey was recorded approximately once every six seconds and provided a complete record of the approach and go-around on Runway 26 (Figure 2). Radio transmissions during the flight were also recorded.

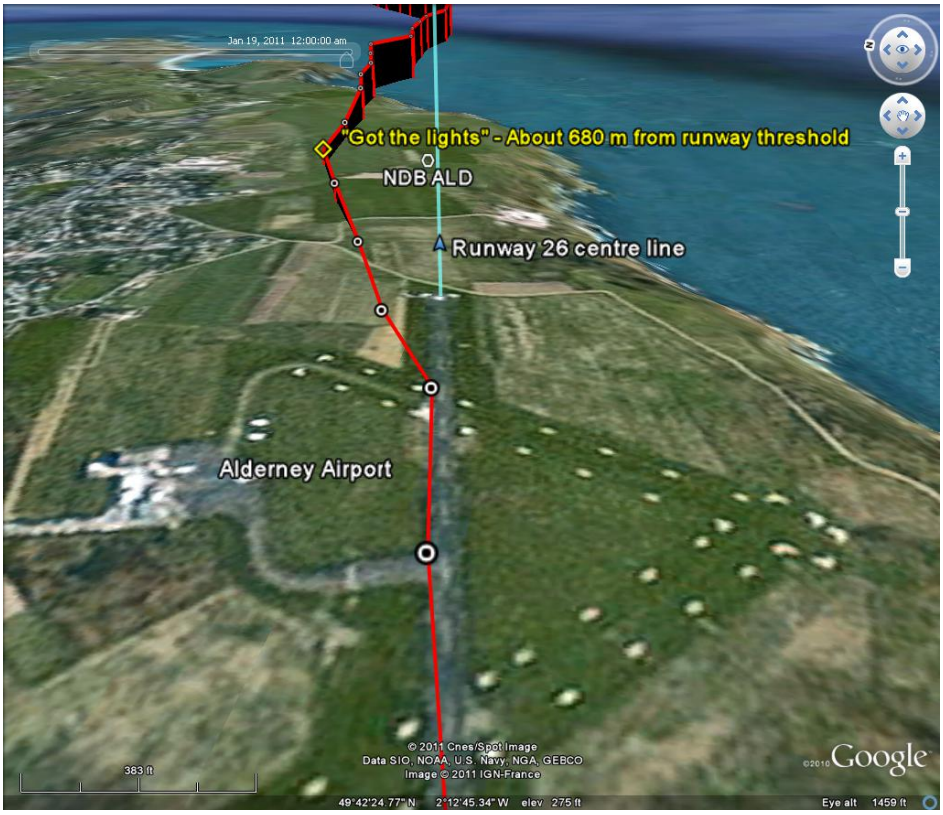

Figure 2

Radar track of final approach to Runway 26

Footnote

[1] Secondary radar information is provided by a transponder fitted to the aircraft. When interrogated by ATC radar, the transponder transmits pressure altitude data (Mode C) quantized to the nearest 100 ft. Pressure altitude is based upon the International Standard Atmosphere (ISA), which assumes a barometric pressure of 1013.25 millibars at sea level. ATC radar then corrects for differences between the ISA and local atmospheric pressure so that altitude is displayed on the radar display.

Aircraft description

The Britten-Norman Trislander is an 18-seat three-engined piston-powered utility aircraft produced in the 1970s and early 1980s, normally flown by a single pilot. G-FTSE was equipped with basic navigation equipment, including a Relative Bearing Indicator (RBI) positioned in the centre of the aircraft instrument panel, separate from the pilot's primary flight instruments (Figure 3).

Figure 3

Instruments

Aircraft damage

The aircraft exhibited damage to the right wingtip and navigation light. An inclinometer was used to measure the angle of the scrape marks, which implied the aircraft was rolled 24º right when it made contact with the runway (Figure 4).

Meteorological information

On the 17 January 2011 the Channel Islands were under an area of relatively low pressure, with a cold front running from Lorient in north west France to Lugo in north west Spain. The weather at Alderney at approximately 1000 hrs was described by the Met Office as *'complex'*, the cold front having cleared recently to the east, and the area under the influence of a moist south-westerly flow.

Alderney Met actual reports (METAR's) were made as follows:

EGJA SPECI 0955 200/10 VRB 180v240 3000 800SW –RADZ FEW 000 BKN 002 9/8 1018

EGJA SPECI 1000 200/11 0600 –RAFG BKN 000 9/8 1018

Aerodrome information

Runway 26 at Alderney is 290 ft amsl, 880 m long and 18 m wide (23 m wide at the threshold), with high intensity approach lighting extending 420 m into

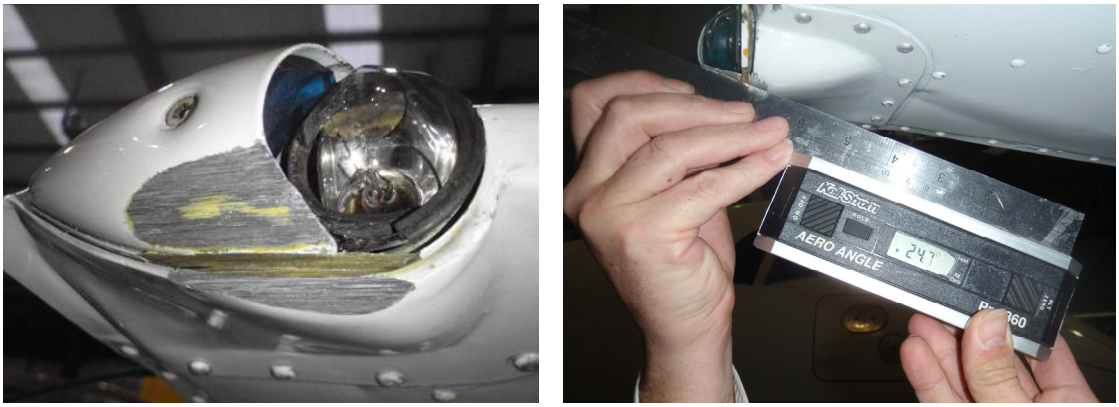

Figure 4

Aircraft damage

the undershoot and a lighted crossbar 300m from the threshold. The PAPI is set to 3º (Figure 5).

Non-precision approaches

Air Operator Certificate holders conducting public transport operations to an aerodrome in IFR conditions require an approved instrument procedure based on an acceptable navigational aid. An aerodrome operator decides what types of approaches it wishes to make available at an aerodrome, and the CAA approves those approaches it assesses as suitable.

An NDB is subject to several sources of error including: night effect, where radio waves reflected back by the ionosphere can cause signal strength fluctuations 30 to 60 nm from the transmitter, especially just before sunrise and just after sunset; terrain effect, where, for example, mountains and cliffs can reflect radio waves, giving

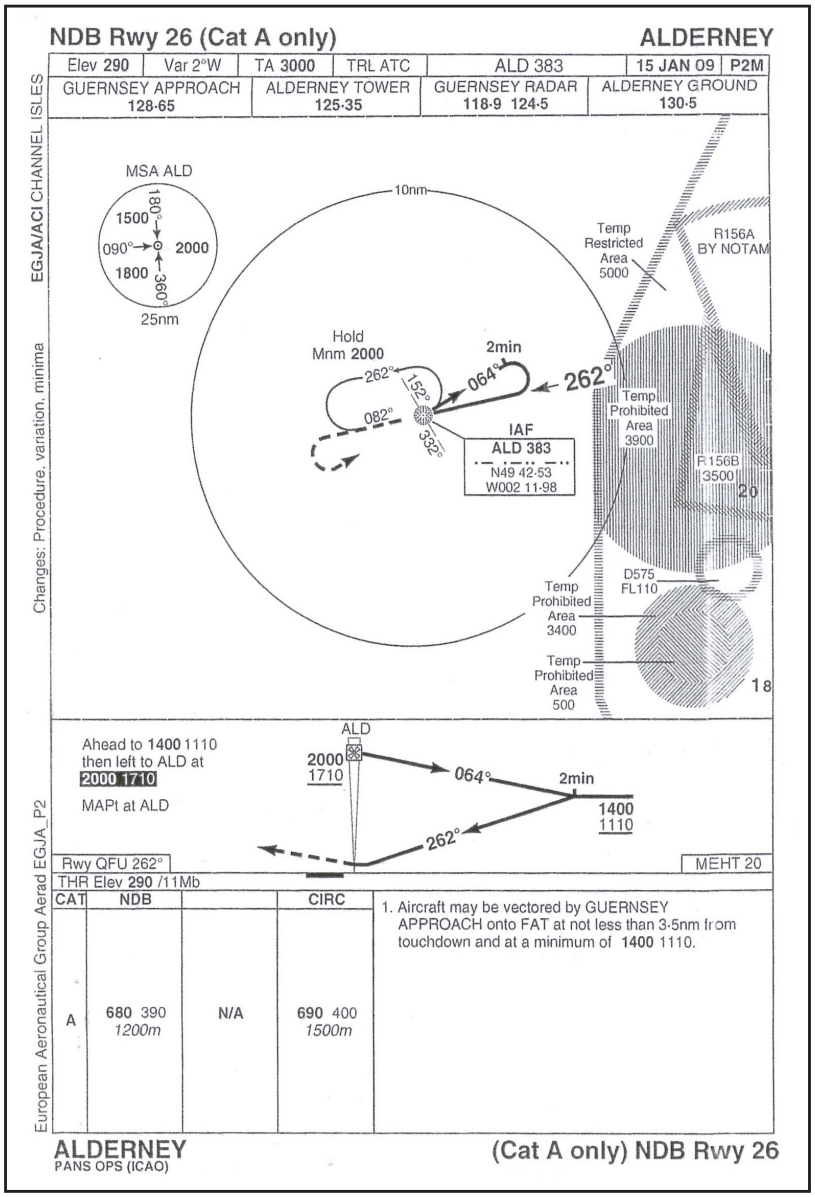

Figure 5

NDB procedure Alderney

erroneous readings; electrical effect, where electrical storms or electrical interference (from a ground-based source or from a source within the aircraft) can cause the ADF needle to deflect towards the electrical source; coastal effect, where low-frequency radio waves will refract or bend near a shoreline, especially if they are nearly parallel to it; and bank effect, by which the needle is deflected when the aircraft is banked. The effects of these errors reduce the accuracy of an NDB, and increase pilot workload.

There are two basic techniques for flying the vertical profile of a non-precision approach such as an NDB. On passing the final descent point the aircraft may descend to a minimum descent altitude and then fly level to the published missed approach point. This technique was more common in helicopter and light aircraft operations. Alternatively the aircraft may perform a continuous descent final approach (CDFA), which is the technique normally used by larger aircraft. Aircraft whose operations are governed by EU Ops will normally be required to use the CDFA technique.

EU OPS 1.430(d)2 – *'Aerodrome operating minima – General*, states:

> *'EU OPS 1.430(d)2. All non-precision approaches shall be flown using the continuous descent final approaches (CDFA) technique unless otherwise approved by the Authority for a particular approach to a particular runway.'*

GPS approaches

Approaches based on GPS provide more accurate guidance than NDBs. GPS approaches have been approved in some states for several years, but at the time of the accident were not widely available for IFR operations in the United Kingdom or the Channel Islands. Alderney did not have an approved GPS approach. The CAA had been assisting the States of Guernsey to develop GPS approaches at Alderney, but were awaiting for the availability of the new European Geostationary Navigation Overlay Service (EGNOS). That occurred on 2 March 2011. At the 37th session of the ICAO assembly ICAO, member states undertook to implement by 2016 GPS[2] approach procedures for all runways to which an instrument approach is to be provided. Whilst the policy of the CAA is to encourage aerodrome operators to achieve this, it does not have responsibility for aerodromes on the Channel Islands, which falls to the Director of Civil Aviation of the States of Jersey and Guernsey.

Stabilised approaches

To improve the chances of an approach ending in a successful landing operators require their aircraft to be stabilised on final approach by a predetermined height on the approach. The relevant section of the Operations Manual for the operator stated:

> *'2.36 STABILISED FINAL APPROACH*
>
> *All Trislander aircraft are to be operated in such a way that they are stabilised on the Final Approach at a minimum of 500 ft AAL.*
>
> *The aircraft is stabilised on final approach when all the following conditions are satisfied:*
>
> 1. *Vital Actions Before Landing are complete*
> 2. *ILS approach, maximum ½ scale deflection*
> 3. *Non precision approach, within 5 degree of the inbound track and +/- 100 ft of published altitude/distance*
> 4. *Visual Approach, PAPI max 3 Reds 3 Whites*
> 5. *Airspeed 90 Kts – 5kts to +15Kts*
> 6. *Approach power set*

Footnote

[2] In this context, ICAO refers to APV – Approach with Vertical Guidance

If an approach is not stabilised at the required height or becomes de-stabilised at any point below stabilisation height, a go-around must be initiated.'

Comment

The operator's Operations Manual listed the minimum visual references required on a non-precision approach for an aircraft to descend below the minimum descent altitude. All the required visual references were based on aerodrome features. The pilot was not visual with the aerodrome when he made the decision to continue visually, but considered that as he was clear of cloud and in sight of the surface, he could apply the minimum visibility for a visual approach. The Operations Manual stated that this was 800 m. However, this minima should only be applied when a pilot is visual with the aerodrome environment. A pilot would have to meet the minimum weather conditions for an aircraft flying at a speed of less than 140 kt in Alderney's class D airspace[3] until he became visual with the aerodrome environment, and he could then continue the approach with minimum visibility of 800 m.

Recorded information indicates that the aircraft was not aligned with the runway when, approximately 700 m from the threshold (less than 400 m from the lights), the pilot saw the runway lights. It is unlikely, therefore that the required visibility was available. The pilot then manoeuvred the aircraft abruptly in an attempt to align it with the runway. This was not in breach of the guidance given in the operations manual for a stabilised approach. However, the pilot agrees that going around would have been preferable:

The operator has issued a Flying Staff Instruction, which will become an amendment to its Operations Manual, such that significant manoeuvres below 300 ft agl will not constitute a stabilised final approach.

Conclusion

The aircraft made an NDB approach to Alderney in conditions of poor visibility. The pilot continued visually towards the aerodrome and reported sighting the runway late in the approach at a distance less than the required minimum visibility. The right wingtip touched the ground following a manoeuvre close to the ground to align the aircraft with the runway. During the subsequent go-around, the aircraft departed the runway. The aircraft operator has issued new instructions for the conduct of stabilised approaches.

Footnote

[3] 5 km visibility clear of cloud and in sight of the surface.