SERIOUS INCIDENT

Aircraft Type and Registration:	BN2T Islander, G-LEAP
No & Type of Engines:	2 Allison 250-B17C turboprop engines
Year of Manufacture:	1987
Date & Time (UTC):	27 August 2011 at 1130 hrs
Location:	5 nm south of Swansea Airport
Type of Flight:	Aerial Work (Parachuting)
Persons on Board:	Crew - 1 Passengers - 8
Injuries:	Crew - None Passengers - None
Nature of Damage:	None reported
Commander's Licence:	Commercial Pilot's Licence
Commander's Age:	61 years
Commander's Flying Experience:	2,882 hours (of which 440 were on type) Last 90 days - 51 hours Last 28 days - 20 hours
Information Source:	AAIB Field Investigation

Synopsis

Engine anti-icing was not selected ON prior to the aircraft entering engine icing conditions and both engines flamed out. After the aircraft exited these icing conditions, both engines were successfully relit and the aircraft landed without further incident.

History of the flight

The pilot was conducting his fifth lift[1] of the day in the incident aircraft. The weather conditions had been similar throughout the previous lifts, with about four oktas of cloud cover, the cloud being organised in lines with clear air in between.

The aircraft had been climbing, in the clear air, between two cloud lines. In order to position overhead the airfield for the parachute drop, the pilot commenced a wide turn which took the aircraft through the side of a cloud at about FL080.

The outside air temperature was about 0°C and, as the aircraft penetrated the cloud, the pilot reached down to select the engine anti-ice ON. Before he could do so, the aircraft was enveloped in what the pilot described as a "sleet storm". Almost immediately, both engines ran down. The pilot noticed the engine torque and fuel flow decreasing, the Turbine Gas Temperature (TGT) increasing by about 40°C from the climb setting of 700°C, and the turbine rpm (N_1) decreasing.

Footnote

[1] In skydiving each flight is generally referred to as a 'lift'.

The pilot established the aircraft in a glide, at 120 kt, and completed the turn towards the airfield. The aircraft descended out of the cloud at about FL070 and the pilot selected the igniters ON and the power levers to idle. Both engines relit immediately. The pilot left both engines at idle power, to stabilise, while the aircraft descended a further 500 ft. He then slowly increased the power on both engines, noting no anomalies.

The parachuting lift was aborted and the aircraft returned to Swansea without further incident.

Met Office aftercast

The Met Office provided an aftercast for the weather in the area of the incident. They compared this with the forecast conditions provided on the Metform 215 (low level forecast) valid between 0800 hrs and 1700 hrs. They commented that:

> *'Reviewing the above information, the weather in the vicinity of the incident site was a showery north-westerly flow with good visibility and SCT/BKN cloud layers between 6000 FT and 10000 FT. The freezing level for the site is estimated to have been around 6500 FT based on the sonde data. The cloud layers were thick in places, indicated by the radio sonde balloon ascent, and capable of causing significant, moderate engine and airframe icing. The F214/F215 forecast charts issued were consistent with the actual information extracted for the time of the incident. '*

Power plant anti-icing system

The Turbine Islander Flight Manual describes the power plant anti-icing system as:

> *'An electrically heated engine air intake and application of compressor bleed air to the first stage of the compressor protects the engine intake system. The air intake, compressor bleed and propeller de-icing systems are operated by a single lever, for each engine, on the lower part of the centre pedestal.'*

Flight Manual operating procedure

The Turbine Islander Flight Manual states:

> *'At outside air temperatures of less than 5 deg C, in conditions where visible moisture exists, select Power Plant Anti-Icing ON for both engines and ensure that these services remain on during flight in such conditions. Caution ...The formation of intake ice may cause rapid power loss.*
>
> *CAUTION*
>
> *Due to thermal changes within the turbine, the gas producer section of the engine may lock up after inflight shutdown. This is a temporary condition which exists after the engine has been shut down for approximately one minute and which may continue for up to ten minutes... air starts may be attempted during the time period...but restart cannot be guaranteed.'*

Section 3 of the Flight Manual *Emergency Procedures* includes a procedure for the *Failure of both engines en-route*. It provides an immediate action to attempt a quick restart and a longer procedure should this be unsuccessful. This procedure also identifies the recommended gliding speed as 75 kt IAS.

Previous Occurrence

In August 2007, a GAF Nomad N22B, N6302W, equipped with two Allison 250-B17 engines was engaged on parachuting operations. At an altitude of 8,500 ft, the aircraft entered icing conditions with the engine anti-ice selected OFF and the left engine ran down before the pilot was able to select anti-icing ON. He was unable to restart the engine and the aircraft was damaged in the subsequent single-engine landing.[2]

Analysis

The aircraft entered engine icing conditions, which were forecast, with the Power Plant Anti-Icing OFF. As the pilot was about to select the Anti-Icing ON, the engines flamed out. The Flight Manual states that engine anti-icing should be ON at any time the aircraft is in conditions of visible moisture and a temperature of less than 5°C. It also cautions that the formation of intake ice may cause rapid power loss. This incident illustrates the speed with which such a power loss can occur and that it can be total if Power Plant Anti-Icing is not selected ON before such icing conditions are entered.

Engine relight may be dependent on the removal of the condition which caused the failure. If the engine stopped due to an ice build up within the air intake, then a restart could require this blockage to be removed by descent to warmer conditions. This may take longer than one minute and could result in a restart being attempted during the period of time when a restart is not assured.

Conclusion

Power plant anti-icing was not selected ON before the aircraft entered engine icing conditions, resulting in the failure of both engines. In-flight restart is not assured on this engine type between one and ten minutes after shutdown. Once the aircraft had exited engine icing conditions, both engines were relit and operated normally.

Footnote

[2] Reported in AAIB Bulletin 8/2008