DATA SUMMARY

LOCATION

Date and time	**Saturday, 6 August 2005; 12:30 local time**[1]
Site	**Aeródromo de Ocaña (Toledo)**

AIRCRAFT

Registration	**F-GZDO**
Type and model	**PILATUS PC6/B1H2**
Operator	**Aerobalas**

Engines

Type and model	**PRATT & WHITNEY CANADA PT6A-20B**
Number	**1**

CREW

Pilot in command

Age	**28 years old**
Licence	**Commercial pilot (aircraft)**
Total flight hours	**1,080 h**
Flight hours on the type	**184 h**

INJURIES

	Fatal	Serious	Minor/None
Crew			**1**
Passengers			**4**
Third persons			

DAMAGE

Aircraft	**Major**
Third parties	**None**

FLIGHT DATA

Operation	**Aerial work – Commercial – Parachute drop**
Phase of flight	**Climb**

REPORT

Date of approval	**19 November 2008**

[1] Time references in this report are local. In order to obtain UTC it is necessary to deduct 2 hours from local time.

1. FACTUAL INFORMATION

1.1. History of the flight

The aircraft took off from the Ocaña Aerodrome on a parachuting flight that was to take place over the aerodrome. Aboard there were the pilot and four parachutists. It was the third flight of the day and, like the previous ones, it was scheduled to last around 20 minutes.

With the aircraft at an altitude of some 14,000 ft and ascending, a loud noise was heard, followed by a complete loss of power. After the parachutists jumped out, the pilot was able to glide the aircraft to the departure aerodrome and make an emergency landing without further incident.

The pilot was not injured and was able to leave the aircraft under his own power. None of the parachutists was injured during the jump.

The aircraft suffered significant damage, though it was limited to the engine.

The pilot held a valid license and medical certificate. The aircraft also had a valid airworthiness certificate.

1.2. Aircraft inspection

An initial visual inspection of the engine revealed substantial damage to the power turbine blades and the stator. The compressor blades were only slightly damaged.

The affected pieces were subsequently replaced in the workshop, including:

- Compressor turbine blades.
- Power turbine blades.
- Power turbine stator.
- ITT thermocouple harness.
- Compressor first stage stator.
- Fuel injectors.
- Various bearings, seals and minor components.

During the inspection there were no findings of strange elements ingestion in the engine.

1.3. Statement from the pilot

While at an altitude of 14,000 ft and ascending, he heard a loud noise, followed by a complete loss of power. He immediately saw that the ITT (Inter-Turbine Temperature)

value was above 1,000 °C, when the normal reading in that phase of the flight should have been around 680 °C.

Once the parachutists jumped out, he carried out the emergency procedure for an engine fire, since initially he thought that was precisely what was happening. After landing, however, it became apparent that at no time had a fire broken out. Once the fuel was cut off as part of the fire procedure, the ITT reading returned to a normal value.

It was the third flight of the day and the pilot stated that the recommended ITT value had not been exceeded during any phase on the previous flights.

The flights had taken place some fifteen minutes apart, during which time the engine was stopped. The aircraft had been refueled after the first flight.

1.4. Meteorological information

The temperature at the aerodrome, whose reference point is at an elevation of 620 m, was high, between 29 and 30 °C.

1.5. Engine operating conditions during parachuting operations

As a result of the parachuting operations to which this type of aircraft is routinely subjected, the engine is severely strained. The recommended ITT is frequently exceeded during start-up and taxiing as a consequence of the continuous operations. Flight cycles are completed in short periods of time with complete engine shutdowns between takeoffs, which keeps the engine temperature from decreasing to the prescribed values before each start-up. Statements have also been provided informing of calibration problems with the ITT thermocouple harness which would aggravate engine conditions should the temperatures reached be in excess of those observed.

Warm start-ups are also produced when the battery has been subjected to multiple discharges, allowing no time to recover. This way, either because the minimum turns cannot be reached due to the aforementioned battery exhaust or because the time lapse to achieve them is longer than the usually expected by the pilot, the aircraft is refuelled before reaching the minimum turns needed for that, resulting in a warm start-up and thus at warmer temperatures than in a standard operation.

1.6. Information from the engine Maintenance Manual (MM)

The maintenance manual outlines the actions to take in case of a turbine high temperature.

The tasks to be carried out involving the engine depend on the magnitude of the temperature excess, its duration and the phase of flight (whether taking off or any other phase). The tasks range from taking no action at all or making a simple entry of the event in the engine log book, to performing various visual and hot section inspections. The most serious cases call for overhauling the engine and replacing specific parts.

Although the maintenance manual states that several temporary high temperature conditions can impact the service life of the engine as much as one of lesser temperature but longer occurrence, it does not specify any procedures for evaluating the effect of repeated high temperatures which, by themselves, may require to adopt maintenance actions.

2. ANALYSIS AND CONCLUSIONS

Constant operations with complete engine cycles, high ambient temperatures and under demanding engine conditions are typical of the parachuting activities performed by this aircraft, which induced turbine temperatures that could, on some occasions, exceed established values. Even if such temperature excesses were of limited duration or value, their repetitive nature could have led to the failure of the blade after a relatively low number of cycles.

It is considered that the most likely cause of the incident was a series of cycles during which ITT values in excess of those prescribed were reached, which could lead to the failure of some power turbine blades and next to all the other damage observed in the engine.