Out of Gas!

The Incident

The pilot had refuelled the Walter-powered Fletcher in preparation for a busy day's tandem parachute jump flying.

Later in the day, after completing a substantial number of tandem-jump flights, the aircraft experienced an engine power loss while climbing through 5500 feet amsl. The pilot instructed the parachutists to jump out, which they accomplished safely. The engine stopped approximately one minute later, whereupon the pilot declared an emergency and proceeded to carry out a forced landing onto a nearby aerodrome. This was accomplished successfully.

The engine had failed due to fuel exhaustion.

The high-flow fuel pump system used to refuel the incident aircraft. This system is capable of delivering fuel at a significantly higher rate than the standard fuel pumps found at most aerodromes.

Analysis

Investigation revealed that the aircraft became airborne without sufficient fuel because the pilot inadvertently under-fuelled it. Refuelling had been accomplished via the aircraft's outboard tanks, using a high-flow fuel pump situated at the privately owned airstrip.

This particular model of Fletcher (PAC FU24-950 with a Walter M601D turbine engine) has two interconnected fuel tanks in each wing, each filler neck being located on the outer-most tank. During refuelling, fuel can take some time to transfer from the outboard to the inboard tanks because of the diameter of the interconnecting tubes. A sight glass is located above each inboard tank to allow the pilot to confirm that the tanks are full and have in fact equalised.

At normal fuel pump flow rates, there is usually sufficient time for the tanks to equalise at the same rate as the fuel is being pumped in. With a high-flow fuel pump (such as was used to refuel this aircraft), the tanks can not equalise at the same rate as the fuel is being pumped in. The outboard tanks will consequently fill before the inboards. This can lead the person refuelling to believe that the inboard tanks are also full.

The pilot of the incident aircraft had not been made aware of this problem during his recent type rating training. He therefore assumed that the tanks were full (he sighted the outboard tanks as being full so did not see the need to dip them) and calculated the aircraft's safe endurance accordingly.

Since the operation did not require the pilot to get out of the aircraft between each flight, he was not in the habit of dipping the tanks or checking the sight-glass between each refuelling stop. Because the aircraft fuel gauges were unreliable, endurance was calculated using the cockpit fuel totaliser. This value was of course erroneous. The fuel totaliser showed that there was sufficient fuel onboard for several more flights at the time of the engine failure.

Lesson Learnt

This was a serious incident that could have easily resulted in a bad accident. There are a number of safety lessons that can be learnt from it. Refer to the Fuel Management GAP for additional advice on refuelling:

- Pilots and operators of aircraft with interconnected fuel tanks need to be aware that fuel transfer problems can develop when refuelling with high-flow fuel pumps. We suggest that the fuel be delivered using a medium-flow type fuel pump, or that each tank be given time to settle before being topped up, ie, fuel one side then come back to top it up after having fuelled the other side.
- Avoid refuelling the aircraft when parked on a slope.
- Always dip the tanks (or check other fuel quantity indicators like the glass sighter) to confirm you have the fuel on board that you think you have. This can be done sometime later, after the fuel has settled, along with a fuel drain.
- Make sure your aircraft's fuel gauges are serviceable, and refer to them.
- For prolonged operations (like parachute jumping or ag-flying where the engine is kept running) where the fuel endurance remaining is determined by deducting a known trip or burn rate, consider occasionally shutting down and dipping the tanks. There is no substitute for knowing exactly how much fuel is in the tanks, as this incident and many other similar accidents have illustrated.
- As a general rule, avoid operations with less than one quarter tanks. For many aircraft types, prolonged climbing, descending, or unbalanced flight, with less than this quantity of fuel, can result in fuel exhaustion and engine failure. Always ensure that you plan to land with at least 30 minutes reserve (taking into account the unusable fuel) on board on every flight. ■