ACCIDENT

Aircraft Type and Registration:	Rotorsport UK MT-03, G-TATA
No & Type of Engines:	1 Rotax 914-UL piston engine
Year of Manufacture:	2008
Date & Time (UTC):	9 October 2008 at 1408 hrs
Location:	¼ nm east of Manchester (Barton) Airport
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - 1 (Serious) Passengers - 1 (Serious)
Nature of Damage:	Substantial damage
Commander's Licence:	Private Pilot's Licence
Commander's Age:	52 years
Commander's Flying Experience:	316 hours (of which 78 were on type) Last 90 days - 82 hours Last 28 days - 21 hours
Information Source:	AAIB Field Investigation

Synopsis

The aircraft had insufficient usable fuel for the intended flight. When a nose-down attitude for descent was selected on final approach, the engine was starved of fuel and stopped. The pilot realised that the aircraft could not reach the aerodrome and elected to carry out a forced landing in the nearest suitable field. After manoeuvring to avoid some houses he was left with insufficient airspeed to arrest the rate of descent. During the subsequent hard landing the pilot and his passenger suffered serious back injuries. The aircraft sustained significant damage but there was no fire.

Two Safety Recommendations are made.

History of the flight

The aircraft departed from Sleap Airfield, Shropshire at 1330 hrs with the pilot, a passenger and 14 litres of fuel on board. The weather was reported as being good and the pilot had planned on a 20 kt tailwind. He calculated that the aircraft had an endurance of one hour and the flight to City Airport Manchester (Barton) would take about 30 minutes. During the flight the pilot experienced some problems with his radio and had to extend the planned route further to the west to avoid a Military Air Traffic Zone (MATZ). To make up time, he increased speed. Ten minutes from his destination, the pilot noted that there was 'nearly 10 litres' of fuel remaining. The aircraft joined the circuit at City Airport Manchester (Barton) at 1405 hrs and during the downwind checks the passenger confirmed that the fuel

was 'OK'. The surface wind was from 200° at 10 kt, and Runway 27R was in use.

The pilot turned the aircraft onto final approach and selected a nose-down attitude that would give an approach speed of 70 mph. He noticed that the aircraft was descending below the normal approach profile and, when he attempted to increase power, realised that the engine had stopped. With the aircraft at a height of approximately 200 ft agl the pilot decelerated to the best glide speed, 45 mph, and turned the aircraft to the right to avoid some houses ahead. Having cleared the houses the pilot lowered the nose of the aircraft to increase speed. The aircraft descended rapidly from a height of about 50 ft agl and 'at the last second' the pilot flared the aircraft to cushion the touchdown. The aircraft landed heavily, the landing gear collapsed and G-TATA suffered significant damage to the airframe, enclosure, rotor head and rotors. There was no fire.

The pilot exited the aircraft unaided and assisted his passenger to vacate his seat; they then awaited the arrival of the emergency services. Both the pilot and passenger were later diagnosed with fractured vertebrae.

The pilot considered that the accident was caused by the engine being starved of fuel. The fuel supply is taken from the rear of the fuel tanks but during final approach to land the aircraft has a steep nose down attitude. The pilot was unaware of any limitations or information about unusable fuel.

Following the accident, approximately 6 ltr of fuel were found in the fuel tank.

Additional information

The Civil Aviation Authority (CAA) Gyroplane Type Approval Data Sheet for the MT-03, BG01 Issue 1 includes the limitations for operating the MT-03. It contains the information that, with a 70 ltr fuel tank, 6.8 ltr should be considered unusable.

On the same subject, the Pilot's Handbook for the MT-03 states:

> *'the fuel tanks retain an increasing amount of unusable fuel depending on the nose down*
>
> *(descent) angle. At a 5 degree descent there is approximately 1.1ltr of unusable fuel per tank.*
>
> *At 10 degrees nose down this increases to 3.4ltrs per tank. Be careful that you do not descend*
>
> *at a steep attitude with low fuel! The engine may stop from fuel starvation!'*

It also states that the fuel consumption of the aircraft is 12 ltr per hour at 60 mph increasing to 20 ltr per hour at 100 mph.

The CAA Safety Sense Leaflet 1, entitled *Good Airmanship Guide*, provides advice on fuel consumption. It states:

> *'Don't assume that you can achieve handbook fuel consumption. As a rule of thumb, due to service and wear, expect to use 20% more fuel than the 'book' figures'*

It also advises pilots to:

> *'understand the operations and limitations of the fuel system, gauges, unusable fuel etc'*

and

> *'Always plan to land by the time the tanks are down to the greater of ¼ tank or 45 minutes cruise*

flight, but don't rely solely on the gauges which may be unreliable.'

Comment

G-TATA was fitted with glass reinforced plastic (GRP) seats with industrial foam cushions which were not designed to absorb energy from a heavy landing. Research on the beneficial effects of using 'Dynafoam' carried out by the Royal Air Force Institute of Aviation Medicine (RAFIAM) in 1986, and, again, by the Defence Evaluation and Research Agency (DERA), Farnborough in August 1996, indicated that 'dense foam' cushions offer a good level of protection against vertical deceleration forces. The results suggested that flexible domestic foam cushions generally provided little attenuation of spinal loads and in some cases increased them. However, a cushion of highly damped seating foam, between 1 and 2 inches in thickness, was shown to reduce substantially the spinal loads induced by vertical deceleration. Such foam cushions did not seem to suffer significant deterioration in performance due to normal service use.

Civil Aviation Publication (CAP) 643, entitled the *British Civil Airworthiness Requirements (BCAR's), Section T Light Gyroplanes* contains the minimum requirements and constitutes the basis for the issue of Permits and Approvals in accordance with the Air Navigation Order. Gyroplanes which have been shown to comply with BCAR Section T will be eligible for a Permit to Fly. In Section T, Part 2, Acceptable Means of Compliance and Interpretative Material (AMC), AMC T 786 a) (Interpretative material) it states:

'The seat support structure should be designed, as far as is practicable, so as to prevent spinal or other serious injuries to the occupant in a minor crash landing in which the landing gear may have collapsed. It is recommended that rigid structural members are not located in a position likely to cause injury in such a crash landing. The CAA should be consulted concerning the use of energy absorbing material under the seat structure to reduce the impact loads being applied to the occupant's spine, as it has been found that the simplistic use of certain types of foam may result in unacceptable detrimental effects.'

In light of the above research, which demonstrated the beneficial properties of highly damped seating foam in reducing the risk of spinal injuries in minor crash landings, the following Safety Recommendations are made:

Safety Recommendation 2009-082

It is recommended that the Civil Aviation Authority amend the British Civil Airworthiness Requirements, Section T to make optimum use of energy absorbing materials in the construction of gyroplane seat structures, to reduce the possibility of spinal or other serious injuries to an occupant in a minor crash landing.

Safety Recommendation 2009-083

It is recommended that the Civil Aviation Authority promote the benefits of fitting energy absorbing seating foam to microlights and gyroplanes.