ACCIDENT

Aircraft Type and Registration:	Skyranger 912(2), G-CCKF
No & type of Engines:	1 Rotax 912-UL piston engine
Year of Manufacture:	2003
Date & Time (UTC):	18 July 2006 at 1344 hrs
Location:	Near Eshott Airfield, Northumberland
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Minor) Passengers - N/A
Nature of Damage:	Engine seized, propeller damaged, moderate damage to airframe
Commander's Licence:	Private Pilot's Licence
Commander's Age:	73 years
Commander's Flying Experience:	585 hours (of which 196 were on type) Last 90 days - 43 hours Last 28 days - 25 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and subsequent enquiries by the AAIB

Synopsis

The engine failed shortly after takeoff and, in the ensuing forced landing, the aircraft stuck a fence and pitched inverted, causing minor injuries to the pilot and moderate damage to the aircraft. It was quickly established that the engine oil filter had become detached, allowing oil to escape and the engine to seize from oil starvation.

The oil filter had been replaced the previous day with a 'FRAM' automotive oil filter, instead of the Rotax-approved part. The FRAM filter has a slightly larger diameter thread which makes it incompatible for use on this type of engine.

Two safety recommendations were made, with the intention of preventing similar accidents in the future.

History of the flight

On the day of the accident the pilot decided to conduct a short flight, given the favourable weather conditions: fine and sunny, with an easterly wind at 4 kt. Mindful that the engine oil and filter had been changed the previous day, she pulled the propeller through several times to prime the engine with oil before starting. As a further precaution, after starting, the engine was run at 3,000 rpm for several minutes. The aircraft was then taxied to the run-up area where the power checks were

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completed. All engine indications were normal and the aircraft departed on Runway 08. The takeoff and initial part of the climb were uneventful and, at about 800 ft agl, the pilot retracted the flaps and commenced a right turn to enter the circuit to land. At this point the engine made a 'clattering' sound and the propeller stopped. Given the limited height, the pilot was forced to select a small field of cut crop in which to make a forced landing, as all the other fields within gliding distance contained standing crops. She initially tried to contact Eshott Radio on 112.85 Mhz but, on receiving no reply, changed to Newcastle on 124.37 MHz and transmitted a 'MAYDAY'.

The aircraft landed long and was unable to stop within the boundary of the field. It struck a fence at the edge of the field, causing the nosewheel to detach and the aircraft to pitch upside down. The pilot was wearing a full harness and sustained only minor injuries.

Attendees to the scene observed that the engine oil filter had come adrift from its mounting spigot and was only being held on by the exhaust stub, Figure 1. Also, the inside of the engine cowl was coated in oil and, later, trails of oil were found on the ground coinciding with the aircraft's movements and at the engine run-up area.

Figure 1

View on front of engine showing detached oil filter resting on exhaust pipe

Oil filter replacement

The pilot, who was also the aircraft owner, had performed an oil and filter change on the engine the day before the accident. She had obtained a FRAM PH 5911 filter from the owner of another Rotax-powered aircraft, who stated that the filter was suitable for use on the engine.

However, when the pilot proceeded to install the filter, she experienced some difficulty in placing it onto its mounting spigot, because of the proximity of the exhaust stub and the fact that the new filter was slightly longer than the Rotax filter which had been removed. She eventually succeeded and began threading it onto the spigot, but had difficulty in turning the filter. She sought assistance from an acquaintance, who noted that the filter seemed to be an abnormally loose fit on the spigot. He queried this, but the pilot assured him that the part was suitable. He continued to thread the filter onto the spigot, noting that it only tightened up appreciably at the very end. He gave the filter a final tighten with a strap wrench.

Oil filter examination

The PH5911 filter was examined by the AAIB. The thread on the filter was found to be severely damaged, with the majority of the threads having been stripped. It was also evident that the filter had been cross-threaded during installation. The thread damage is shown in Figure 2.

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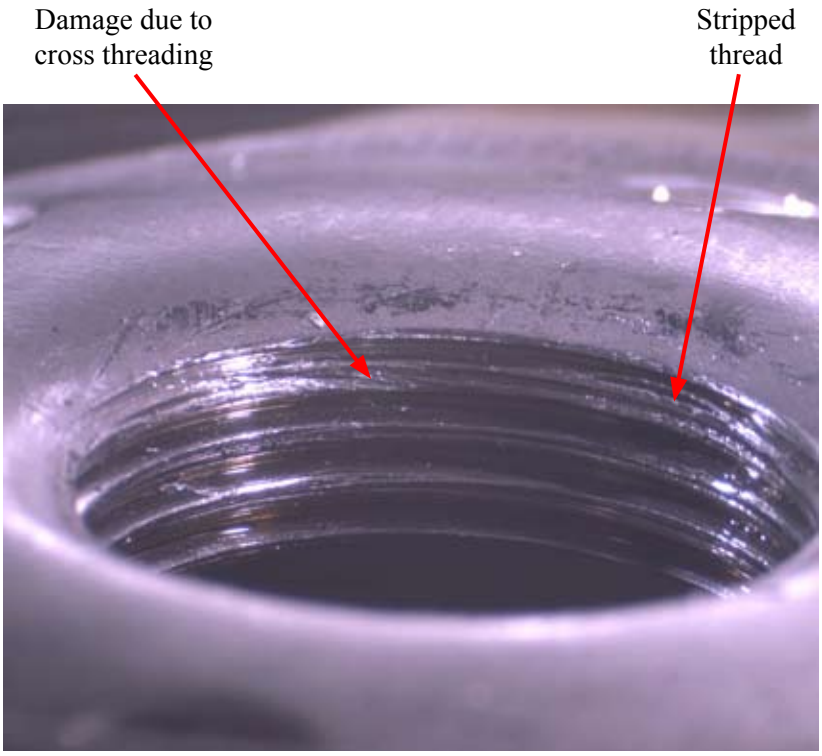

Figure 2

Oil filter thread damage

Oil filter comparison

A dimensional comparison between the FRAM and the Rotax filters revealed two significant differences.

Firstly, the FRAM filter possesses an M20 x 1.5 thread, the 'M20' identifier denoting a metric thread of 20 mm diameter, the '1.5' a thread pitch of 1.5 mm. The thread specification on the approved Rotax filter is ¾ x 16 inches, denoting a thread of ¾ inch diameter (19.05 mm), with 16 threads per inch, giving a thread pitch of 1.59 mm. Whilst the thread pitches are similar, the thread on the FRAM filter is 0.95 mm greater in diameter than that of the Rotax part. When the FRAM filter was trial fitted to a new oil filter mounting spigot, it was found to be a very loose fit.

The second key difference is in the length of the filters, with the FRAM filter being approximately 4 mm longer than the Rotax item.

Engine manufacturer's advice

The Rotax UK distributor advised that there is only one oil filter approved for use on the Rotax 912-UL engine. This oil filter is black in colour and bears the markings: *'ROTAX PART NO. 825701(706)'* and *'FOR ROTAX ENGINE TYPE:912/914'*. There is no approval from the engine manufacturer to use any other filter.

Discussion

The comparison of the two filters showed that whilst the FRAM filter can be made to fit onto the Rotax 912 engine, the larger thread diameter means that the depth of thread engagement is much reduced. However, the depth of thread engagement is sufficient to enable the filter to be tightened, giving the impression that it is securely installed.

The fact that the filter was finally tightened using a strap wrench, rather than by hand, as is customary, may be significant, as this would have placed a higher than normal static load across the partly engaged threads. When the filter became pressurised with oil with the engine running, the loading on the threads would have increased even further, probably to the point where the threads stripped. This was confirmed by the trails of oil on the ground coinciding with the aircraft's movements, and at the run-up area, indicating that the threads on the filter failed not long after the engine was started.

Given the already limited clearance between the oil filter mounting spigot and the adjacent exhaust pipe, the additional 4 mm of length of the FRAM filter makes it more difficult to install. This increases the probability of cross-threading, which will damage the threads, making them more likely to fail under load.

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Conclusion

The accident was the result of an in-flight engine failure due to loss of oil and engine seizure, caused by the fitment of an incorrect oil filter.

Safety Recommendations

In order to prevent similar accidents in the future, the following safety recommendations are made:

Safety Recommendation 2006-107

The Popular Flying Association should remind owners of Rotax-powered aircraft that only the engine manufacturer's specified oil filters are approved for installation on their engines.

Safety Recommendation 2006-108

The British Microlight Aircraft Association should remind owners of Rotax-powered aircraft that only the engine manufacturer's specified oil filters are approved for installation on their engines.

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