Accident

Aircraft Type and Registration:	Pulsar XP, G-CKIS	
No & Type of Engines:	1 Rotax 912-A piston engine	
Year of Manufacture:	2019 (Serial no: PFA 202A-12702)	
Date & Time (UTC):	8 June 2025 at 1900 hrs	
Location:	Field near Stoney Lane Airfield, Worcestershire	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Damage to left wing, fuselage, nose leg, engine cowling, engine frame and propeller	
Commander's Licence:	National Private Pilot's Licence	
Commander's Age:	54 years	
Commander's Flying Experience:	163 hours (of which 1 was on type) Last 90 days - 3 hours Last 28 days - 2 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

During a private flight, a recently purchased Pulsar XP (G-CKIS) suffered loss of engine power while joining the circuit at Stoney Lane Airfield. The pilot had collected the aircraft earlier that day and, following a short familiarisation flight, had departed for his home airfield.

While manoeuvring to join the circuit, the engine began to run roughly before stopping. Although it briefly restarted, it subsequently failed again and could not be restarted. The pilot carried out a forced landing but was unable to reach the runway, touching down in a field approximately 35 m short of the runway. The aircraft sustained significant damage, but the pilot was uninjured.

Recorded engine data showed a rapid and abnormal increase in fuel flow accompanied by a reduction in fuel pressure immediately prior to the engine stoppage. Post-accident examination identified multiple leaks within the fuel hose system, particularly at push-fit joints near the carburettors, but these could have been affected by the six-month period between the accident and testing. Contamination was also found within the fuel system, including debris likely originating from jerrycans and degradation of internal tank coatings, although this was not considered causal to the power loss.

The investigation concluded that the loss of engine power was most likely due to fuel starvation caused by either a fuel leak between the fuel flow sensor and the carburettors,

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or air entering the fuel lines upstream of the fuel flow sensor. This accident highlights the importance of checking fuel hose security, inspecting fuel filters and fuel tank liners.

History of the flight

The pilot had been flown to Newton Peveril Airfield, near Bournemouth, to collect the Pulsar XP aircraft (G-CKIS) which he had already purchased. After inspecting the aircraft and checking the aircraft's documents he went for a 20-minute familiarisation flight with the previous owner. The aircraft was refuelled with E5 petrol from jerrycans until there was 20 litres in the left tank and 20 litres in the right tank. The pilot then departed in G-CKIS for Stoney Lane Airfield, Worcestershire, where he was based. During the cruise the pilot activated the fuel transfer pump on two occasions to transfer fuel from the left tank to the right tank, because the fuel system was configured in a way that the engine only drew fuel from the right tank.

Nearing Stoney Lane Airfield he positioned for a left base join. Turning out on final he realised he was not lined up correctly, so he flew a left orbit. During the orbit the engine started running rough, "shuddering and shaking", and the pilot declared a MAYDAY. The engine stopped but the pilot was able to restart it, and it appeared to operate normally. He was now too low to make the runway, so he added power and began a second orbit. After lining up with the runway the engine ran rough again and stopped. He tried to restart the engine, but it would not start. He committed to a glide approach to the runway and selected flaps. Upon realising that he would not make the runway he retracted the flaps to try and extend the glide, but the aircraft clipped the fence boundary of a field preceding the runway and touched down in the field about 35 m short of the runway. The field was soft with long grass and on touchdown the aircraft spun round causing damage to the wing, fuselage and propeller (Figure 1).



Figure 1
Accident site

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Recorded information

The aircraft was fitted with a Flybox Eclipse combined primary flight display and engine display instrument. No SD memory card had been fitted, but four months after the accident it was discovered that there was a recording of the accident flight in the unit's internal memory. It contained the aircraft's flight track up until the first time the engine stopped (Figure 2). The aircraft was at an altitude of 1,040 ft amsl (615 ft aal), an indicated airspeed of 57 kt, and 0.85 nm from the Runway 23 threshold when this occurred.

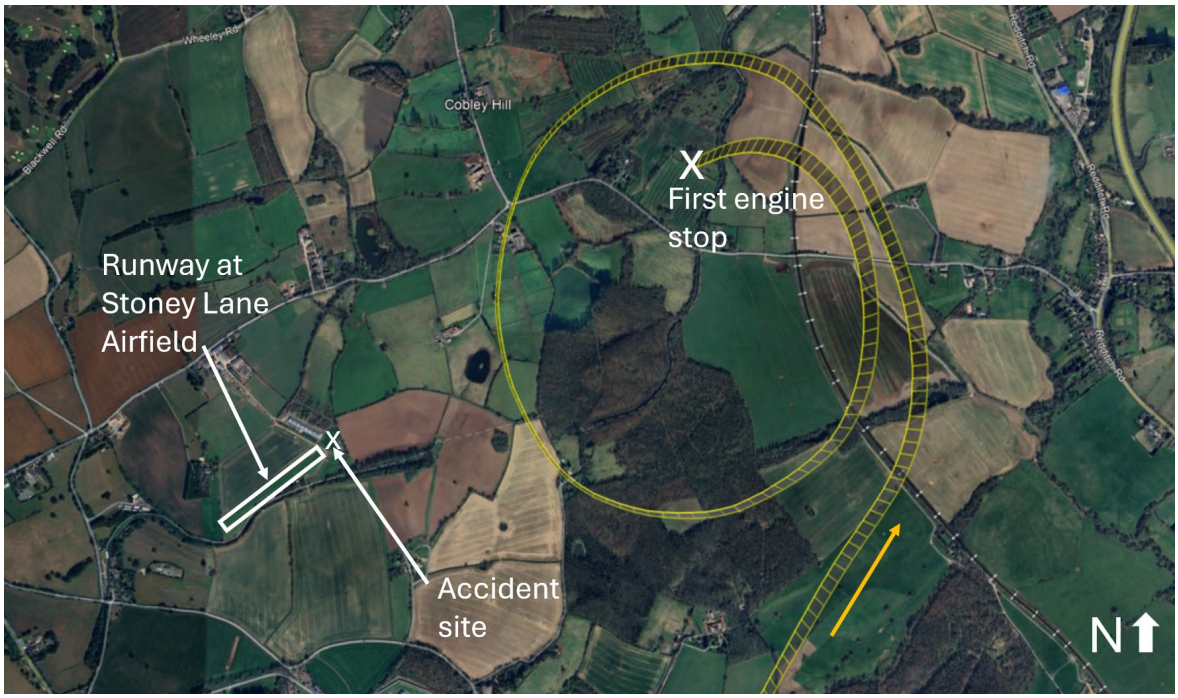


Figure 2

Final flight path until first engine stoppage
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The engine data showed that the drop in engine rpm was preceded by a large increase in fuel flow and decrease in fuel pressure (Figure 3). The fuel flow increased from 10 litres per hour (L/hr) to 55 L/hr in 11 seconds. This coincided with the fuel pressure reducing from 0.27 bar to 0.13 bar. The engine rpm subsequently reduced from 4,400 rpm to 640 rpm in 31 seconds before the recording stopped, while the fuel pressure remained low and reduced to zero, and the fuel flow remained high.

The maximum recorded fuel flow during the takeoff from Newton Peveril was 23.7 L/hr, and during the cruise portion of the flight it was around 12 L/hr. Prior to the incident, the minimum recorded fuel pressure was 0.22 bar which occurred during the takeoff. The fuel pressure was around 0.3 bar during the cruise. The data showed that whenever the fuel flow increased there was a corresponding reduction in fuel pressure – this indicated that the high fuel flow was unlikely due to a faulty sensor.

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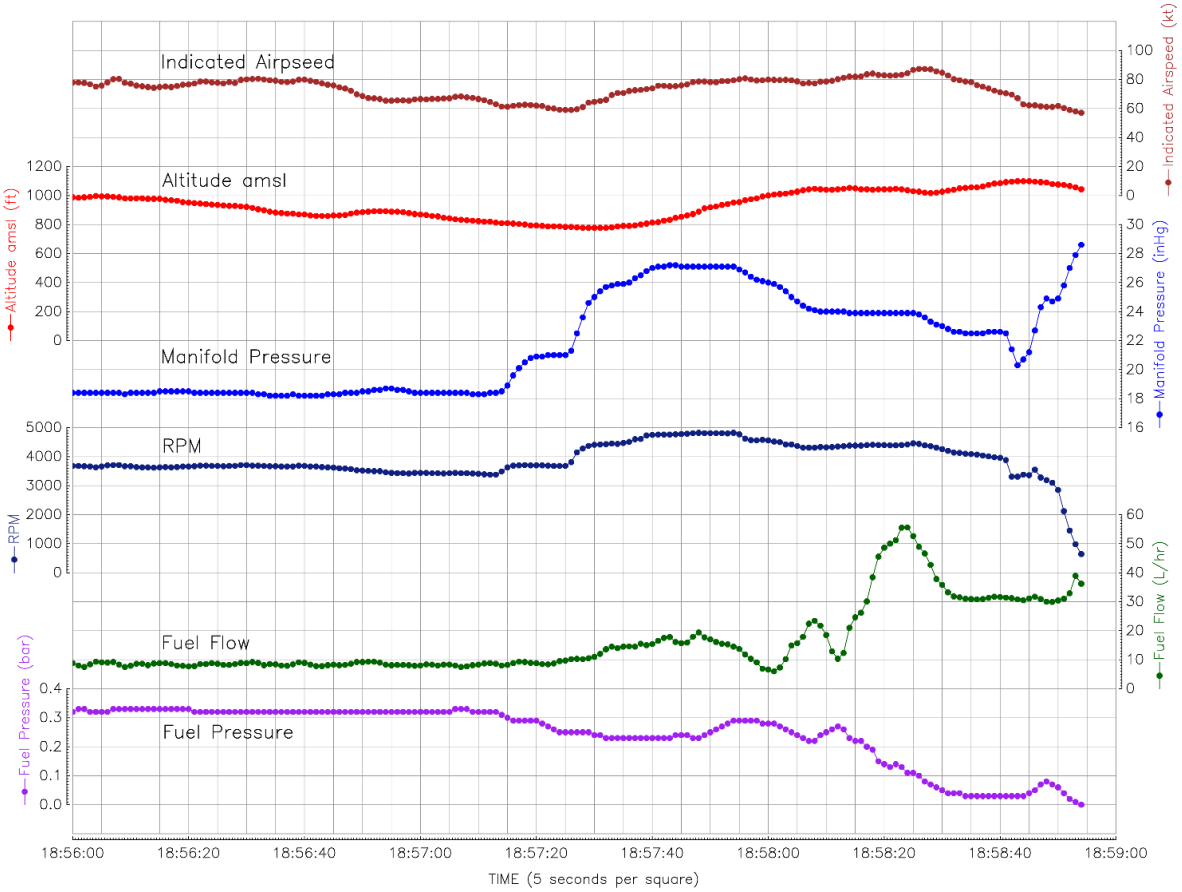


Figure 3

Recorded parameters until the first engine stoppage

Aircraft information

The Pulsar XP is a two-seat kit-built aircraft of mixed wood and composite fibreglass construction with a maximum takeoff weight of 481 kg. The kit was produced by Aero Designs which is a company that is no longer in business. G-CKIS was fitted with a Rotax 912-A piston engine and a 3-bladed propeller. The Rotax 912-A operating manual contains a performance chart which shows a fuel flow of 22.6 L/hr at the maximum engine speed of 5,800 rpm.

The aircraft had two builders. The first builder started construction in around 2003 and then sold it as a partially completed kit to the second builder in around 2013. The aircraft first flew in August 2019 and received its first Permit to Fly in February 2022. At the time of the accident, it had accumulated 62 flight hours. The aircraft's last maintenance was an annual inspection which was completed on 10 May 2025.

The first builder had constructed the integral leading edge fibreglass wing fuel tanks. He said that the fuel tank coating he had applied was Kreem fuel tank liner which came with the kit and this was the product specified in the aircraft build manual. He said that it was a "rubberised slosh coating" that was deep grey in colour. He had applied a layer before completing construction of the fuel tanks, and then once they were completed, he poured more into the tanks and sloshed it around. The product description for Kreem Fuel Tank

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Liner[1] states that it is '*designed for use as a preventive maintenance product in metal tanks new and old; containing gasoline, gasohol, or diesel. ... Not for plastic tanks. KREEM is NOT compatible with all fiberglass tanks. You must spot test before use*.' It also contains a caution which states: '*Kreem Tank Liner is not designed for use in aircraft oil tanks or tanks using a plastic component*.' The manufacturer of Kreem was contacted and they stated that using it with fibreglass is normally fine and if there were a compatibility issue it would be apparent within a week of application. They also stated that their Kreem fuel tank liner was white in colour and its colour and formulation had not been changed since they first started manufacturing it about 40 years ago. They also stated that it was compatible with petrol containing ethanol.

The standard fuel system had two wing tanks, each of which could supply the engine directly. The second builder of the aircraft decided to modify the fuel system such that the engine was fed by the right-wing tank, with an electric fuel transfer pump to transfer fuel from the left tank to the right tank. He said that having the fuel feed from one tank made the operation simpler, and it also made the fuel return line plumbing simpler. This modification was approved by the LAA and is depicted in Figure 4.

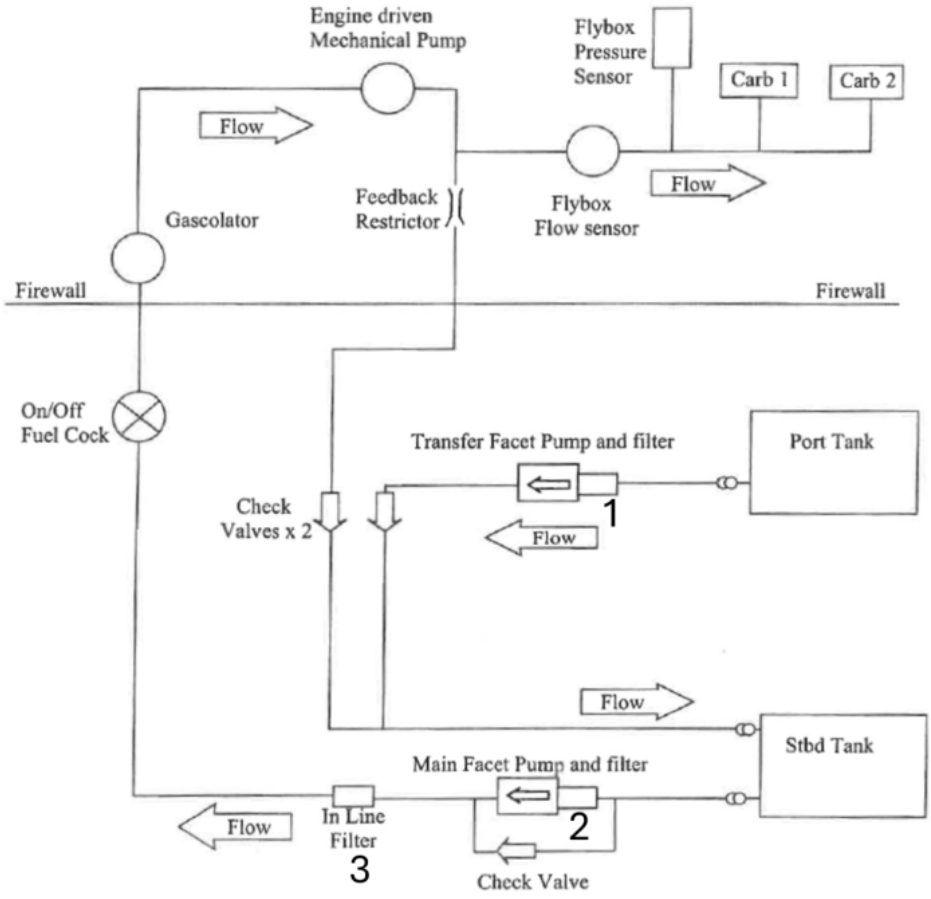


Figure 4

Fuel system diagram provided to the LAA to support the G-CKIS fuel pump modification (filter numbers added for this report)

Footnote

[1] https://www.kreem.com/fueltankliner.html [accessed 20/02/2026].

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Figure 4 shows the transfer pump and an additional electric fuel pump between the right tank and the mechanical engine-driven pump. Three fuel filters are shown, numbered 1 to 3, but according to the pilot, filter number 3 was not fitted. The fuel flow sensor was installed between the mechanical fuel pump and the fuel pressure sensor. The Rotax 912-A engine has twin carburettors which is why the diagram shows 'Carb 1' and 'Carb 2'.

The second builder of the aircraft stated that he used the left fuel tank as a reserve tank and only used it for longer trips. For most of his flights he filled the right tank and left the left tank empty. The wings were removable and he stored the aircraft between flights in a hangar with the wings removed. The engine logbook showed that the fuel and oil hoses had been replaced in September 2018, so they had been installed for 6 years and 9 months at the time of the accident.

The Rotax 912 maintenance manual[2] states: '*The following components and systems must be replaced every 5 years*:' and the list includes '*all rubber hoses of the fuel system (incl. Teflon hoses)*'. According to the LAA this is treated as a recommendation and not a requirement. It stated that life limits of items are only mandatory if they are specified in the Type Acceptance Data Sheet, an Airworthiness Directive or a Mandatory Permit Directive.

Aircraft examination

The pilot examined the aircraft after the accident and supplied the AAIB with photographs. He drained 20 litres of fuel from the right-wing tank. The left-wing tank was empty but there was damage to that tank. He did not notice a smell of fuel in the engine bay and all the fuel hoses were connected. Both carburettor float bowls contained a low level of fuel and there were a few small black rubber particles in the left carburettor bowl. The carburettor floats were weighed and were within specification. The gascolator bowl contained some fine sand-like debris, but the mesh filter was clear. He examined a sample of fuel from the right tank which contained black particles which he thought to be rubber material from a fuel hose.

The No 1 fuel filter from the left tank was clear, while the No 2 fuel filter from the right tank contained some debris (Figure 5). This filter was sent to the AAIB for examination. The debris inside it consisted of straw-like debris and red flakes that had the appearance of paint (Figure 6).

Footnote

[2] Maintenance Manual (Line Maintenance) for Rotax Engine Type 912 Series, Ref. No. MML-912, Edition 2, Rev. 1.

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Figure 5

Inline fuel filters (left image is No 1 filter from left tank; right image is No 2 filter from right tank)



Figure 6

Debris recovered from the No 2 filter from right tank

The fuel tanks were cut open, and similar red flakes and straw-like material were found inside the right tank. The fuel pick-up tube had detached from the fuel outlet, but it was possible this was the result of impact forces. The previous owner was asked to inspect the jerrycans he had used to fill the tanks. These cans had a red/brown internal coating. He filled them up and then poured the contents out through a piece of cloth. A few reddish-brown flakes were recovered. He also reported that he had not seen this filter fill up with debris before.

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While inspecting the fuel tanks it was noticed that the left-wing tank, which was infrequently used, had a thick grey coating consistent with what the first builder had described as applying (Figure 7). Whereas a large section of the right-wing tank had a mostly cream coloured appearance which had started to flake and break up. There was a portion of grey near the filler at the outboard end of the tank (Figure 8).



Figure 7
Base of left-wing tank



Figure 8
Base of right-wing tank

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Although the investigation began with the consideration that debris might have caused a fuel flow restriction and loss of power, the investigation focus changed when the recorded data revealed a very high fuel flow. The data was sent to the engine manufacturer for analysis and they stated that: '*The observed drop in fuel pressure, combined with a simultaneous increase in fuel flow, suggests a possible disconnection or leak in the fuel line between the carburettor and the fuel flow meter. This would result in unmetered fuel flow, explaining the discrepancy. Additionally, the observed rise in manifold pressure indicates that the engine ceased operation, likely due to fuel starvation*.'

The LAA were approached with this information, and they sent two engineers to examine G-CKIS. The LAA engineers confirmed that the fuel flow sensor and fuel pressure sensors were installed as per the diagram in Figure 4. There were no cuts in the fuel hoses and no disconnections, so the fuel hose assembly was removed and taken away to be tested.

The LAA tested the fuel hoses using compressed air at a pressure of 0.5 bar. The LAA engineer stated that '*while there was no single major leak source, bubble mixture revealed several joints were leaking air to some degree, and the leakage rate was affected by waggling the pipes on their barbs despite being clamped up. Several pipes could be pulled off their barbs without a great deal of effort.'* The two joints with the most leakage were the joints leading to the carburettors (Figure 9).

These tests were conducted six months after the accident, after the fuel hoses had time to dry, which could have loosened the connections and influenced the leakage findings.

The installed location of the leaking joint to the left carburettor is shown in Figure 10. The LAA engineer stated that this was one of the two 90° unions that leaked in the pressure test and *'it leaked at the connections of the union to both hoses. Disturbing the hoses made the leak rate change. This union, like another on the other side was quite unnecessary and between them introduced four extra potential sources of leakage and a pair of unnecessary fuel pressure drops.'*

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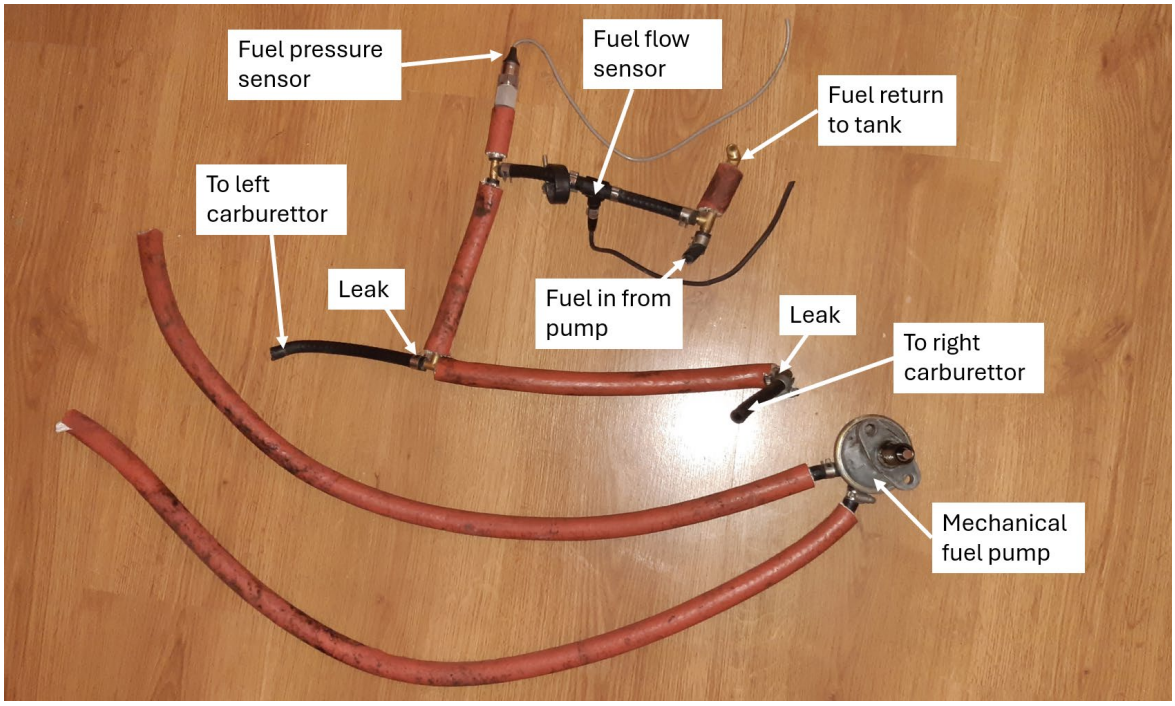


Figure 9

Removed fuel hose assemblies showing location of leaks



Figure 10

Location of one of the leaking joints at the left carburettor

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LAA safety actions

As a result of their findings the LAA published two safety articles in their 'Light Aviation' magazine. The January 2026 edition contains an article in the 'Engineering Matters' section titled '*Fuel system pipework and joints'*. The article includes the following:

> *'Going back to where the piece started off, designers usually plan for a simple fuel system, but systems do tend to get more complex over time. The builder wants to fit an electric fuel pump – introducing two extra connections; a fuel flow transducer – two more connections. Maybe a Rotax 912 engine with twin carburettors and needing a vapour return line, meaning an extra 'tee piece' in the fuel feed (three extra connections plus another to the second carb), and four more for the vapour return line and its orifice, which is embedded in another tee piece.*
>
> *Before you know where you are, the number of rubber hoses has gone up from two to seven and the number of connections, each a possible leak point, from four to 16. Not only has the potential for leakage at joints gone up four-fold, but the exercise of changing the rubber pipework every few years has escalated from a half-hour job to a project that might take a whole weekend.*
>
> *What prompted this piece was that we recently came across an aeroplane that had suffered an engine power loss in flight, where all the evidence pointed towards a fuel system issue. The design of aircraft had originated as a simple type with a two-stroke engine, but this was a late model with a more sophisticated engine and instrumentation. Its fuel system components were linked by a great many rubber pipes with push-on fittings, including 90º angle fittings where changes of direction were needed in the pipe runs.*
>
> *While it was not possible to identify any single source of leakage that might have caused the accident, there were many loose joints and the way that the system had been configured made it very susceptible to leakage from any one of a number of points.*
>
> *While no specific design requirements had not been complied with, nor inspection rules broken, our conclusion was that with a fuel system that had grown to this level of complexity, it would have been appropriate if the fuel system changes had included a switch from push-on rubber hoses to the more reliable screw-on reinforced hoses and 'solid' pipes, as befits a complex system with so many joints.*
>
> *It perhaps shouldn't need adding, but we will anyway, that a fuel system leak causes risks not only of an engine stoppage, as in this case, but also of an in-flight fire, which explains why the topic has raised particular concerns recently among our airworthiness and design teams.*

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For owners of existing aircraft with push-on fuel hoses the safety message is clear – particularly where there are multiple joints in the system, great care is needed to make sure all joints remain secure, and fuel and air-tight, and that the number of pieces of hose and joints involved does not discourage changing time-expired or visibly deteriorating flexible hoses in a timely manner.'

The February 2026 edition of 'Light Aviation' magazine contains an article in the 'Engineering Matters' section titled '*Fuel line contamination'*. The article includes the following:

'Another recent power-loss event, discussed in the previous issue of Light Aviation magazine, reinforces the importance of ensuring clean fuel lines. Post-incident inspection revealed significant contamination, with flakes similar to the red paint from the interior of a jerrycan and a straw-like material, in the right-wing fuel filter and tank. One theory suggests that the infrequent use of the right tank may have allowed chemical degradation of the inner coating, with contaminants accumulating until a switch between tanks during a long flight introduced them into the system.

Don't forget, even routine tasks like trimming fuel pipes can introduce hazards. Sawing pipes creates fine rubber or plastic particles that can cling to cut edges or fall inside the pipe itself. Once fuel flows, these particles can migrate and clog injectors or carburettor jets. When trimming hoses, make sure the cut and inside of the pipe are both clean before attaching them to fittings or equipment.'

It should be noted, however, that it was the left tank that was infrequently used. The LAA are considering publishing an article on the use of fuel tank liners given the findings from the right tank on G-CKIS.

Alternative theory for the high fuel flow indication

Subsequent to the LAA's examination of the aircraft, the AAIB was contacted with an alternative theory for the high fuel flow indication. The AAIB was sent a video of a Rotax 912ULS being run with just 1 litre of fuel remaining in the selected tank. Just before the engine starts to run rough and stop as a result of fuel starvation, the fuel flow indication rises sharply to 167 L/hr and the fuel pressure drops. Prior to engine stoppage air would have been entrained from the fuel tank as the level in the tank dropped below the outlet port.

The engine manufacturer was sent this video and they stated that erroneously high fuel flow indications can be caused by air or gas bubbles in the fuel lines spinning the rotor in the fuel flow sensor.

Analysis

The engine stoppage was preceded by a rapid rise in fuel flow that was more than double the indicated fuel flow at takeoff power. Combined with the drop in fuel pressure this could have been indicative of a fuel leak between the fuel flow sensor and the carburettors, resulting in an increased fuel flow rate through the flow sensor but insufficient fuel flow

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to the carburettors and loss of power. A test of the fuel hose assembly in the engine bay revealed several joints that were leaking to some degree with the most leakage from the two 90° joints leading to the carburettors. These hoses could also be pulled off their barbs with little effort. However, these tests were conducted six months after the accident, after the fuel hoses had time to dry, which could have loosened the connections and influenced the leakage findings.

It was also possible that the high fuel flow indication was caused by air being sucked into the fuel lines. This could occur due to a loose connection or a leak upstream of the fuel flow sensor. Alternatively, if the aircraft had skidded during the left turn due to excessive application of left rudder, then this could have unported the fuel in the right tank, allowing air to be sucked in from the tank, but the fuel level of 20 litres, as reported to be remaining after the accident, would have reduced the chance of that happening.

If the cause was related to a leak or a loose connection, then this could have possibly been prevented if the fuel hoses had been replaced after five years in accordance with the engine manual, although this was not required. The LAA stated that, although design requirements had been complied with, due to the complexity of the fuel system and the number of connections it would have been appropriate to switch from push-on rubber hoses to more reliable screw-on reinforced hoses and solid pipes. This advice was highlighted in an article in their 'Light Aviation' magazine.

The red debris found in the right tank was likely from the jerrycans used to fill the tank. The left tank did not contain this debris, possibly because it was not used as frequently. The right tank fuel filter caught the debris and did not result in a loss of fuel flow. This highlights the importance of regularly checking the fuel filters.

The left tank had a solid grey coating which matched what the first builder recalled applying to both fuel tanks and which he said was Kreem fuel tank liner, in accordance with the build manual. However, a large section of the right tank base had a cream-coloured base that had started to flake and break up. Because the right tank was more frequently used the presence of fuel might have interacted with the fuel tank liner to cause this break-up. The manufacturer of Kreem stated that their product was white, so it could not be determined what fuel tank liner material had been used. A borescope inspection of the fuel tanks could have detected the liner break-up. The LAA are considering publishing an article on the use of fuel tank liners to provide further guidance to builders and owners.

Conclusion

The loss of engine power was preceded by an excessively high indicated fuel flow rate which could have been caused by a fuel leak downstream of the fuel flow rate sensor which starved the carburettors of fuel, or it could have been caused by air being sucked past the fuel flow sensor, possibly due to a loose connection, a leak upstream of the fuel flow sensor, or fuel tank unporting. Post-accident testing identified multiple leaking fuel joints and loose push-fit hose connections, but these could have been affected by the six-month period between the accident and testing. Although debris and fuel tank coating degradation

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were identified, these were unlikely to have contributed to the loss of power. This accident highlights the importance of checking fuel hose security, inspecting fuel filters and fuel tank liners.

Safety actions

The LAA published two articles in the 'Engineering Matters' section of their 'Light Aviation' magazine, one on '*Fuel system pipework and joints'* and one on '*Fuel line contamination'.*

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