



**CIVIL AVIATION
SAFETY AUTHORITY
AUSTRALIA**

Our Reference: F88/0598GJC

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**Attention: Certificate of Registration Holders
Skyfox C25, C25N aircraft**

FUEL LEAK EVENT - ELECTRIC FUEL PUMP

CASA was recently advised of a severe fuel leak on a Skyfox C25N aircraft. The leak occurred from the electric fuel pump, part number 51ML1 and resulted in a large pool of fuel under the aircraft. A review of the CASA defect report database showed that no other fuel leaks have been reported to CASA. The aircraft was operated on automotive gasoline (Mogas).

Investigation into the leak identified that all the seals in the pump had swollen considerably which may possibly be attributed to changing from standard unleaded Mogas to Shell Optimax. The leakage occurred within a few flying hours of changing from standard unleaded to Optimax. The pump had operated around 600 hours. A number of these pumps have operated for significantly higher hours.

The electric fuel pump is an automotive pump manufactured in New Zealand and is used in carburetted motor vehicles worldwide. The seals in the affected fuel pump are manufactured from Nitrile, a common seal material in automotive applications with moderate resistance to aromatics. In general premium unleaded Mogas has a higher level of aromatics than the standard unleaded. It should be noted, however, that some unleaded fuels have a significantly higher level of aromatics than Shell Optimax.

Nitrile seals have a good service history with both standard and premium unleaded fuels. The improved premium unleaded grades of fuel, such as Shell Optimax have been on the market for about 18 months and have not exhibited any problems with fuel system component seals. During that period it can be reasonably assumed that Nitrile seals have been exposed to Optimax.

The manufacturer of the pump advised it has given excellent service for the past 25 years of operation worldwide, even during in the mid-90's in New Zealand when some problems occurred following the introduction of premium unleaded fuels in that country.

Seals from the defective pump when soaked in Optimax exhibited a significant increase in "swell" relative to that associated with standard unleaded. Excessive seal swell will inhibit the performance of the seals under pressure thereby creating a higher potential for fuel leakage. Testing of the seals with other high aromatic fuels did not produce excessive seal swell.

The Skyfox flight manual specifies 100LL Avgas or unleaded automotive gasoline with a minimum octane rating of 90 RON as the approved fuels for the aircraft. Standard unleaded Mogas in Australia satisfies the minimum 90 RON requirement. Premium unleaded automotive fuels are approximately 96 RON v(Optimax is around 98 RON) and are, therefore, approved for use in the Skyfox. While the new "lead replacement" fuels are technically unleaded fuels and have a RON value >90, they have not been approved for aircraft use.

CASA is currently in discussion with Shell to determine the level of compatibility of Shell Optimax with Nitrile material. Shell's position is that the fuel leak should not be attributed to Optimax by itself. Other factors (such as operating on fuel containing alcohol) may have caused deterioration of the seals. Shell will undertake further experiments to ensure Optimax has no adverse effects on automotive fuel system components.

Until such time as a final conclusion can be drawn, CASA recommends owners of Skyfox aircraft only use standard unleaded Mogas or 100LL Avgas in their aircraft. If any owners have used premium unleaded Mogas, in particular Shell Optimax, in their Skyfox aircraft, CASA would appreciate feedback on their experience.

Additionally, owners need to be aware that high aromatics and other additives used in Mogas, can cause accelerated deterioration of seals in other fuel system components and flexible fuel hoses. As such, CASA also recommends owners maintain a heightened awareness for potential fuel leaks throughout the aircraft fuel system. Compliance with the fuel system flow check specified in the Skyfox Maintenance Manual at maintenance check periods will help to detect deterioration in flexible rubber lines. Consideration should also be given to replacement of flexible fuel lines at intervals of about 5 years.

The purpose of this information is to alert Skyfox owners to the reported fuel leak and provide recommended action to minimise the potential for a similar problem to occur on other Skyfox aircraft. CASA will continue to monitor the situation and will advise owners of the results of this investigation and welcomes feedback from operators who have used Shell Optimax in their aircraft.

Yours faithfully



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cc. All CASA Airworthiness Team Leaders
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