Z Energy and the use of Motor Gasoline (petrol) in Aviation applications

In many countries, Motor Gasoline - commonly called petrol - is approved by Aviation Authorities for use in a range of engine / aircraft combinations, typically those aircraft with engines that have a modest octane demand and which are mounted in aircraft where the fuel system design reduces the risk of vapour lock.

With non-microlight, Category A type aircraft, the approval for Mogas (petrol) use is controlled by the issuing of Supplementary Type Certificates (STCs) in the main. These STCs allow the user to utilise petrol as an alternative fuel to Avgas, with which the aircraft and engine combination would have been originally type certified.

Interestingly, the STCs to use petrol are an approval only by the licensing authorities (Civil or Federal Aviation Authorities); the oil companies, engine manufacturers and airframe manufacturers generally do not approve its use. Z has never supported the use of petrol in aviation applications. Our concerns essentially centre on the fact that the product is poorly defined for the demands of aviation, and there are some significant differences between petrol and Avgas properties and performance characteristics.

These differences can result in some safety concerns when using petrol.

The main areas of difference between petrol and Avgas are:

Octane

The 'octane' quality of petrol is a measure of how well the fuel can resist detonation and burn smoothly when ignited in the engine combustion chamber by the spark plug. Gasoline of high octane quality allows powerful, light, fuel efficient engines to be built. Avgas 100 is of very high octane quality, >99.6 Motor Octane Number (MON), while the best automotive gasoline sold to the public in New Zealand is typically only 86 Motor Octane Number. Therefore, if an aircraft engine requires 100 for octane, never use automotive gasoline - the fuel will not burn smoothly in the combustion chamber, causing detonation and potentially catastrophic failure.

Volatility

The boiling range and vapour pressure of automotive gasoline is much broader than Avgas. Such a broad volatility range for petrol is acceptable because the vehicles have been designed to use this fuel under the climatic conditions in the country. However, if put in an aircraft which might take-off from a hot airfield and climb to a few thousand feet, causing a drop in pressure, the gasoline can boil in the fuel lines and bubbles of vapour interrupt flow to the engine, causing erratic running or even stop the engine operating. Avgas has very tightly controlled vapour pressure/distillation limits to minimise such issues.

Composition

Petrol specifications allow a wider range of components to be used than can be used in Avgas. Petrol generally contains higher amounts of aromatic compounds than are present in Avgas. These components can result in compatibility issues with elastomers and seals used in the fuel system and change how the fuel burns in the combustion chamber.

Quality Assurance

Avgas quality and cleanliness is guaranteed by the use of dedicated manufacturing and storage and transport vessels. Housekeeping practices are very high and water and dirt is removed from the fuel. Each time the avgas fuel is transferred from a storage location, key properties are checked again and the results reviewed by a competent specialist before the fuel is sold to customers. The fuel is tested and monitored carefully throughout the supply chain which virtually eliminates the risk of contamination. The Avgas is filtered during delivery down to around 1 micron which will ensure the Avgas is clean, dry and on specification. None of these quality restrictions are in place in the petrol supply chain and it is possible that some intergrade contamination can occur.

All these factors result in an increase in the risk involved in using an unsuitable and uncontrolled product in an unforgiving environment.

If you would like more information on the issues that can occur when using petrol in aviation applications please follow the attached link* which gives a good summary of the Shell Aviation view on this topic.

http:www.z.co.nz/assets/PDFs/SAB-Q109.pdf