USE OF MOTOR GASOLINE (MOGAS) IN LIGHT PISTON ENGINE AIRCRAFT

1. Introduction

1.1 The DCA requires all aircraft to be operated with the fuel specified in the approved Flight Manual/Pilots Operating Handbook. Any change in fuel specification is a modification to the aircraft type certification standard and, as such requires DCA approval. Thus the use of motor gasoline (mogas) is not permitted by the DCA unless the aircraft concerned was type certificated using this fuel (or its use subsequently approved). The only aircraft type currently on the Malaysian register which was certificated using mogas is the Grob G.1 09B.

1.2 The DCA is aware of the high cost of avgas and that certain foreign regulatory authorities are approving the use of mogas in some types of light piston engined aircraft, but does not consider that these approvals can be directly read across to the use of such a fuel in Malaysia. All such approvals are related to a specific climatic envelope and the use of fuels produced within defined specification limits.

2. Discussion

2.1 It is important to realise that mogas differs from avgas in being produced to much wider specifications allowing for considerable variability in chemical composition and physical properties. It follows that mogas marketed in Malaysia can show significant variation in characteristics related to the refineries from which it was supplied.

2.2 Lead content of mogas can vary widely from supplier to supplier and is also dependent on the fuel grade i.e. regular or premium. The maximum lead content in avgas is closely controlled and, furthermore, is added in the form of tetraethyl lead (TEL) with just the chemically correct proportion of ethylene dibromide (EDB) to act as a scavenging agent. Mogas may include tetramethyl lead (TML) in addition to TEL and has more scavenging agent. The excess of scavenging agent could well lead to accelerated corrosion of components of an aircraft engine not designed for such a fuel.

2.3 Depending on its source, mogas can be less chemically stable and have a greater propensity for gum formation than avgas. It may also contain more sulphur (another possible cause of corrosion), and a higher proportion of aromatic hydrocarbon compounds to contribute to unwanted carbon formation and possible deleterious effects on rubber seals, etc. in the engine and aircraft fuel systems. Mogas usually contains additives that are not approved for avgas and whose possible effects on aircraft engines are consequently unknown.

2.4 The Reid vapour pressure (RVP) of avgas is required to lie in the range 5.5 to 7.0 pounds per square inch (38 -48 kPa) and engine and aircraft fuel systems are designed, tested and certificated on that basis. The DCA has no data on the RVP of locally available mogas but it is probable that the top end of the range is considerably higher than that specified for avgas.

2.4.1 The difference in volatility and vapour pressure between avgas and mogas can be highly significant in relation to the risk of vapour lock. Aircraft fuel systems are not designed to cope with large volumes of vapour and may be especially susceptible to this problem when climbing to altitude with warm mogas in the fuel tanks.

2.5 The standard and purity of avgas is closely controlled by official specification supported by the fuel companies’ aviation quality control and distribution systems, providing reliable assurance that the product is fully satisfactory at the point of delivery to the customer. Mogas is not subject to nearly the same degree of control in manufacturing and subsequent handling.

2.6 Aircraft owners and operators should also be aware that the principal manufacturers of aircraft piston engines are adamant that their warranties only apply when their engines are operated on avgas of at least the minimum knock rating (expressed as Octane or Performance Number) specified in the relevant type certificate.

3. Summary

3.1 It will be realised from a study of the content of paragraphs 2.1 to 2.5 that approval for the use of mogas is a complex subject. Consideration has to be given to the wider specification parameters of mogas compared to avgas and their effects on airframe fuel system and engine operation. Preparation of
a modification proposal to the DCA for the use of mogas requires the services of an organisation competent to assess the related airworthiness requirements arrange the necessary tests and flight trials and prepare the necessary documentary submission.

3.2 Taking all the facts into consideration the DCA has decided that applications for the use of mogas will not be considered unless supported by the aircraft manufacturer concerned who will be required to produce appropriate technical substantiation.

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