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USE OF AUTOMOTIVE GASOLINE (MOGAS)

1 INTRODUCTION

Using types of gasoline that are not prescribed by the TC- or the STC-holder for your aircraft and/or using gasoline of non-certified sources (e.g. local petrol station), can have serious consequences for aircraft safety and violates the Certificate of Airworthiness.

2 REASON FOR REVISION

The original AIC-B 04/07 (01 MAR 2007) entitled "USE OF AUTOMOTIVE GASOLINE (MOGAS) CONTAINING BIO-ALCOHOL" was focused specifically on the (bio-)alcohol percentage in MOGAS. Due to recent developments it was decided to address the general use of MOGAS and the consequences in an updated version of the AIC-B. In addition, the information in this revised AIC-B has been updated to reflect the current status of the source material.

3 APPLICABILITY

All operators and owners of aircraft equipped with spark ignited reciprocating or rotary combustion engines.

4 AUTOMOTIVE GASOLINE (MOGAS)

An increasing amount of aircraft is approved for operation with specific commercially available types of automotive gasoline (MOGAS). The specifications of these certified or approved types of MOGAS have to be prescribed by the (S)TC-holder in the approved aircraft documentation (e.g. flight manual).

While in the past most of the automotive gasoline did not contain methanol or ethanol, this situation has changed due to implementation of the Directives 2003/30/EC of 8 May 2003, which later was replaced by 2009/28/EC of 23 April 2009 of the European Parliament and of the Council, on the promotion of the use of energy from renewable sources. The current European directive allows a percentage of up to 10% of biofuels blended by volume in mineral oil derivatives without indication. A blended volume of 10% and higher of biofuel in mineral oil derivatives shall be required to be indicated at the sales points. It is anticipated that the amount of alcohol added to the automotive gasoline will increase even further in the future.

Some of the (S)TC-approvals to fly on specific commercially available types of MOGAS may be limited to a type of MOGAS that does not contain low-molecular weight alcohols (methanol or ethanol) or may contain a certain maximum percentage of low-molecular weight alcohols (methanol or ethanol).

5 CONSEQUENCES

The usage of automotive gasoline in aircraft that are not designed and approved for such usage, can cause the following problems:

- a. Increased risk for vapour lock due to a higher volatility. In practical sense: the forming of vapour in the fuel supply system (boiling) after e.g. a hot restart in flight or on ground.
- b. Increased risk of the forming of carburetor ice at higher ambient temperatures and lower ambient humidity than expected due to the increased heat absorption from the mixing air.
- c. Incompatibility with several materials in the fuel system. This leads to a faster than normal wear of natural and synthetic rubbers, and plastics e.g. gaskets, seals, fuel hoses, etc.
- d. Phase separation into an alcohol-rich aqueous phase and an alcohol-poor hydrocarbon phase when the fuel is cooled (e.g. at high altitude) and not free of water. This can lead to an increased risk of the forming of ice.
- e. Improper fuel quantity indication, especially present when capacitive fuel quantity gauging systems are used.
- f. Reduction of range due to the fact that methanol and ethanol have a lower energy content compared to gasoline.

These problems can cause engine in-flight shutdowns or fires due to fuel-leakage.

6 RECOMMENDATION

Check whether your aircraft is approved for operation with MOGAS.

- a. If your aircraft is not approved for operation with MOGAS, do not use MOGAS. Using fuels which are not approved for your installation violates the Certificate of Airworthiness.
- b. If your aircraft is approved for operation with MOGAS, but not MOGAS containing low-molecular weight alcohols, do not use MOGAS without having evidence that it is free of methanol or ethanol by asking for a certificate from the fuel supplier or performing a test for the alcohol presence (see paragraph 7).
- c. If your aircraft is approved for operation with MOGAS containing low-molecular weight alcohols, only use MOGAS when having evidence that the volume content of methanol or ethanol is within the limits of the approved aircraft documentation by e.g. asking for a certificate from the fuel supplier.

Operators of aircraft approved for operation with MOGAS containing methanol or ethanol have to consider the lower energy content of such fuel, which leads to a higher fuel consumption.

As part of your daily check, drain settled-out water from the aircraft fuel tanks using the approved aircraft procedures.

Using fuel originating from a local car petrol station using barrels or jerry cans can introduce aircraft safety risks. The fuel from a local car petrol station can have a quality below which is required in the aviation industry. Furthermore, barrels and jerry cans can be contaminated and consequently can negatively influence the quality even further. Storing of fuel in barrels or jerry cans for later use aggravates this effect.

7 ALCOHOL PRESENCE TEST

Contact the (S)TC-holder for test equipment, or use the following simple test method:

1. Add one part of water (100 ml) into a glass or chemical resistant plastic (e.g. TPX) container. A graduated cylinder is ideal; however, a non-tapered glass jar (e.g. a large 1 litre bottle) will work. Mark the level of the water, and then add nine parts (900 ml) of MOGAS.
2. Shake thoroughly, let the mixture rest for 10 minutes or until the automotive gasoline is bright and clear again. Record the level of the line between the automotive gasoline and water.
3. Assessment:
 - a. Apparent increase of water level: alcohol is present in the automotive gasoline. The water has absorbed the alcohol from the automotive gasoline and the amount of water will appear to have increased.
 - b. No apparent increase of water level: no alcohol is present in the automotive gasoline.

8 REFERENCES

Regulations:

- Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources.

Safety information from authorities:

- EASA
 1. Safety Information Bulletin 2007-01R1: Use of Automotive Gasoline (MOGAS) containing Bio-Ethanol.
 2. Safety Information Bulletin 2011-01R2: Unleaded Aviation Gasoline (AVGAS) UL 91.
 3. EGAST Leaflet – Piston Engine Icing (GA5).
- CAA-UK Aeronautical Information Circular P 077/2009: Induction system icing on piston engines as fitted to aeroplanes, helicopters and airships.
- FAA Special Airworthiness Information Bulletin CE-07-06: Alcohol (ethanol or methanol) present in the automobile gasoline on any general aviation airplane.
- TCCA Transport Canada TP 10737: The use of automobile gasoline (MOGAS) in aviation.

Aircraft accident and incident reports:

- Dutch Safety Board (OVV) report on the PH-WMW losing engine performance; probable cause: leaking of the fuel hose due to prolonged use of MOGAS with ethanol.
- Dutch Safety Board (OVV) report on the PH-WAI losing engine performance; probable cause: carburetor ice forming due to the use of MOGAS (in Dutch language).
- Dutch Safety Board (OVV) report on the G-BJSV with a fire in the carburetor; probable cause: changed starting procedure with the use of MOGAS (in Dutch language).

9 CONTACT INFORMATION

For further information, please contact:

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10 DOCUMENT CONTROL

This AIC-B replaces AIC-B 04/2007 dated 12 MAY 2016.

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