

Date: 23th April 2024

Subject: Vapor lock preventive actions, applicable to all Pipistrel aircraft equipped with Rotax 912, 912 iS and 914 engine types

Dear valued owners and operators,

due to recent field experience of several engine failure events that have all the indications of being associated with vapor forming excessively in the fuel system, Pipistrel would like to draw your attention to the preventive actions, significantly reducing the possibility of vapor lock occurrences.

General facts and hazards

Normally, the fuel remains in a liquid state until it is discharged into the air stream and then instantly changes to a vapor. However, under certain circumstances, the fuel may prematurely vaporize in the lines, pumps, filters or other components. This leads to formation of vapor pockets obstructing the fuel flow through the units that are designed to handle liquids rather than gasses, which can eventually result in abnormal engine behaviour, such as rough running, partial or total loss of power.

There are certain atmospheric conditions, that can lead to increased possibility of vapor lock occurring; high operating temperature (above 26 °C / 80 °F) and high density altitude - low air pressure environments.

Besides atmospheric conditions, significant role also plays the fuel composition. Some fuels use additives that affect the vaporization characteristics. This is measured as Reid Vapor Pressure (RVP). RVP ranges from 0.3 to 0.49 bar (4.4 to 7.1 psi) with AVGAS, and from 0.48 to 0.97 bar (7 to 14 psi) with MOGAS. Fuels with high RVP are more volatile. This has especially appreciable effect in the colder areas, as the more volatile additives lead to vaporization at lower temperatures, which optimizes combustion in such environments. While this characteristic increases fuel stability in areas with lower operating temperatures, it also leads to premature vaporization in warmer environments, and causes more pollution during combustion.

For the reasons mentioned above, summer and winter blend fuels are used in some areas, where local regulations define whether the terminals are required to sell summer or winter blends in certain parts of the season, regulated by the due dates that have to be followed. However, there are a "transition" timeframes, within which the changeover must be completed. This leads to potentially hazardous timeframe phases especially in spring, as the operating air temperatures become high and some local fuel stations may still be selling the winter blend MOGAS with high RVP.

Preventive actions

Pipistrel recommends to comply with the preventive actions outlined on the following page, which may significantly reduce the possibility of vapor lock occurrences.

1. APPROPRIATE FUEL SELECTION

Besides following the fuel type prescriptions as outlined in the applicable flight manual, placards on the aircraft and the latest revision of Rotax document [1], it is strongly advised to pay attention also to the winter/summer blend fuels, especially when using MOGAS. It is vital to use low RVP fuels in the warmer areas with high operating air temperatures. If aircraft was stored for longer period OR if it was transported from a colder environment and there is possibility of having winter-blend fuel in the tank(s), it is advised to completely drain in and replenish with appropriate fresh fuel.

When in doubt, resort to using AVGAS or an approved type alcohol-free fuel that may be available.

2. FLIGHT OPERATIONS

Below are outlined general tips, relevant to flight operations, that shall reduce the risk of the excessive formation of vapor in the fuel system.

NOTE: Steps specified below act as additional content to the existing procedures outlined in the applicable aircraft flight manual.

BEFORE FLIGHT:

- If temperatures rise in the area of run-up, it is advised to increase RPM above idle in order to force more air through the engine compartment, which will maximize the cooling.
- If aircraft is equipped with auxiliary/booster fuel pump, pay attention to its sound – any significant “non-standard” deviation in pitch of the sound could indicate presence of the trapped vapor.
- After takeoff, reduce climb angle to increase airflow through the engine compartment, which will maximize the cooling.

AFTER FLIGHT:

- If situation permits, park the aircraft with nose pointing into the wind.
- Before shutdown, let the engine cool down at idling.
- Keep the doors opened – this will allow heat to escape from the cabin, which is especially beneficial at configurations with fuselage tank installed.

Thank you for your cooperation.

With best regards,

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References: [1] SI-Selection of suitable operating fluids for ROTAX® EngineType 916 i (Series), 915 i (Series), 912 i (Series), 912 and 914(Series)