
FUEL SYSTEM

An abundant supply of clean fuel is fundamental to engine operation, and safety of flight.

The builder bears responsibility for the design and construction of the amateur-built aircraft, but a Special Certificate of Airworthiness–Amateur-built will not be issued to an aircraft that has features that do not provide reasonable confidence of safe operation, or which are apparently and obviously unsafe.

Builders must take care to ensure that there will be an adequate supply of clean fuel to the engine, and that there are drains that allow detection and removal of water or contaminated fuel prior to flight.

A safe fuel system will have the features described below.

General

The fuel system of an amateur built aircraft must be constructed and arranged to ensure an abundant flow of clean fuel at the rate and pressure necessary for proper engine operation in all aircraft ground and flight attitudes and engine power settings.

The fuel system contains four sections;

Fuel Tank

Fuel System Drains

Fuel Lines and Hoses

Fuel Strainer or Filter Assembly

Fuel Tank

Each fuel tank must be able to withstand, without failure, the vibration, inertia, fluid, and structural loads that it may be subjected to in operation.

Each fuel tank should;

- 1) have a drainable sump that allows for the drainage of any hazardous quantity of water from any part of the tank.
- 2) be ventilated to prevent formation of a vacuum as fuel is consumed.

Fuel System Drains

At low points of the system where water is likely to collect, a drain should be installed.

Each drain should:

- 1) discharge clear of all parts of the aircraft;
- 2) positively lock in the closed position;
- 3) allow the fuel to be caught to check for water or sediment;
- 4) be observable for proper closing; and
- 5) be located or protected to prevent accidental fuel spillage.

Fuel Lines and Hoses

Flexible hoses and rigid lines must be rated for fuel use.
Methods of installation must be appropriate for the material used.

Plastic or other non-metal rigid fuel lines are not normally acceptable in the engine compartment.

Non-metal rigid fuel lines may be acceptable within the fuselage and wings, provided that they are made of an appropriate fuel-resistant material and are properly installed with due attention paid to their environment, including abrasion, impact, puncture and degradation considerations.

Similarly, flexible fuel hoses in the engine compartment must be suitable for the particular application and properly installed.

In all cases metal firewall pass thru fittings, known as “bulkhead fittings”, are required.

The use of fire sleeves to cover all fuel and oil lines and hoses within the engine compartment is strongly recommended.

Fuel lines and hoses should be routed below electrical wires, and be protected in areas that may become hot.

Fuel Strainer or Filter Assembly

All aircraft must have a fuel strainer or filter assembly between the fuel tank outlet and the engine.

A fuel strainer or filter assembly should be:

- (1) accessible for draining and cleaning;
- (2) capable of trapping sediment, and be easily serviceable to remove the sediment;
- (3) mounted so that its weight is not supported by the connecting lines.

The strainer or filter function should provide;

- (1) a screen or element which is easily removable;
- (2) be capable of removing contaminants while providing an sufficient flow of clean fuel to the engine;
- (3) be rated to withstand expected fuel flows and pressures.

A fuel strainer assembly will normally have an integral water separator with a drain valve.

If a filter assembly is used instead of a fuel strainer assembly, drains at all low points of the fuel system, including between the tank and the engine, must be provided to allow pre-flight checking for water or contaminants.

Gascolators

The recommended and most commonly adopted way of fulfilling the capabilities required of the fuel strainer or filter assembly is to install a single unit commonly referred to as a “gascolator”.

A “Gascolator” is a trade or industry term for a unit that combines a filter screen, a water and sediment separator, and a drain.

Gascolators are normally installed at the, or a, low point in the fuel plumbing so that it also serves as a low point drain.

The Exemption from Section 549.01 of the Canadian Aviation Regulations Part 3 Para. 26 (J) states that an amateur built aircraft shall have a “gascolator” located at the lowest point of the fuel system.

The inclusion of a “gascolator” as part of an aircraft’s fuel system has been repeatedly examined, validated and recommended by various TCCA technical working groups.

Gascolator Alternatives

In some aircraft designs, installation of a ‘gascolator’ as a unit may not be possible or practical. Other means of achieving the necessary capabilities of the Fuel Strainer or Filter Assembly may be employed if, for reasons of practicality, the builder chooses to develop an alternate design that performs the same functions and meets the intent of this guidance.

The builder of the aircraft must be prepared to demonstrate that whatever means are employed, an adequate supply of filtered fuel, free of water and sediment, to the engine is assured, and that there are drain(s) that will allow detection and removal of contaminated fuel prior to flight, with reasonable ease.

Readily serviceable in-line filters of sufficient capacity, together with separate water drains at low points, may be employed.