



Hose down



TOP: New fittings.

Fire sleeve "end dipped" and clamped in place. ID band indicates date of manufacture, pressure test, traceability and max operating.

LEFT: Corroded fittings.

No fire protection because:

- Firesleeve is cut too short
- Ends not sealed for fuel/oil intrusion
- Not clamped in place
- No ID band.

PHOTOS: AVIALL AUSTRALIA HOSE SHOP

They're critical to airworthiness, but are often overlooked. Trevor Robinson outlines the perils of neglecting hoses.

AUSTRALIA'S harsh environment can wreak havoc on critical flexible hose assemblies, compromising the aircraft systems they serve. Hose deterioration has the potential to cause catastrophic failure in instrument, lubrication, hydraulic, oxygen or fuel systems.

Airframe fuel hoses Although many aircraft system hoses are highly visible, airframe flexible fuel hoses are often hidden within the structure. One example is Piper PA-28 fuel lines from the fuel tank to the rigid line located in the wing. Although the hose is relatively easy to visually inspect through normal inspection panels, laying a spanner to the hose is an entirely different proposition.

Despite the manufacturer's recommendation that these hoses be replaced to coincide with the aircraft's engine change, they are rarely removed at all, much less replaced.

Piper also recommends replacement of the fuel tank vent hose every 1,000 hours, but anecdotal evidence suggests many aircraft still have their original vent hoses.

The Cessna 210 also has lots of airframe flexible fuel hoses. Located from the fuel reservoir to the fuel selector and on to the fuel bowl and filter, the C-210 has a number of flexible lines that have a replacement life of 1,000-hours.

Flexible hoses are obscured in many aircraft types, particularly twins, which possess flexible fuel lines on the aft side of the engine firewall. These hoses are not classified as engine bay hoses even though they experience temperature ranges similar to those of engine bay hoses. They are not subject to the same level of scrutiny as engine bay hoses. Inspect these hoses closely and critically, and set a replacement interval equal to that of engine compartment hoses.

The critics A claim that airframe hoses are not exposed to as much relative movement between the ends as engine compartment hoses is true. However, if you decide not to replace critical components when the engine is overhauled every 1,000 hours, then when should you do it?

Aircraft manufacturers have good reason to specify hose replacement in their maintenance manuals. While replacing the hose, the maintainer should also inspect the surrounding components and structures, along with the supporting fittings. The maintainer drains and purges the associated system, and cleans filters. These tasks, performed with limited extra effort, expose potential hazards.

The simplicity of flexible hose assemblies

belies their importance. A typical hose assembly consists merely of flexible hose, a socket, B-nuts and (perhaps) some firesleeve. The assembly is critical to the airworthiness of the aircraft.

The reasons for failure of medium to high-pressure flexible hoses are well known: corrosion, embrittlement, deficient routing (including twisting and chafing), poor manufacture or assembly, extreme operating pressures, incompatible fluids (both internally and externally) and exposure to extreme temperatures. However, manufacturers give limited guidance for inspection and testing of vacuum, instrument and drainage hoses. Many aircraft manufacturers opt for an "on condition" schedule of maintenance.

On condition Despite the widespread belief that "on condition" means replacement after failure, the concept focuses on the continued airworthiness of components, including hoses, provided the component continues to meet its desired physical condition and performance standards.

Rather than placing a hard replacement time on a particular component, the manufacturer relies on the expertise and judgment of the maintainer to determine the continued serviceability of the component.

"On condition" allows for greater flexibility in maintenance, offering maintainers and operators the ability to spread the inevitable component replacement costs.

Forty-two per cent of Australia's general aviation fleet is more than 30 years old, and there is a fair chance that aircraft instrument, vent or vacuum hoses are the same age. Replacements For many of the vacuum, instrument and vent hoses, replacement is a simple matter of buying a piece of approved hose and cutting it to length. Installing any deviation from the original hose's dimensions is considered a modification and requires engineering approval prior to installation.

For medium to high-pressure hoses, replacement has the additional "manufacture" step. This type of hose needs to be fabricated and tested before installation. This is performed by an approved manufacturing facility, or by the maintenance facility carrying out the aircraft maintenance. However, regardless of who is fabricating the hose, the facility must have access to approved data, tooling and test equipment, with supporting release documentation for the hose. Fabricating or manufacturing replacement hoses in the corner of the hangar, using only a vice and spanners, is not acceptable.

In a bid to do the right thing, maintainers sometimes install firesleeving on hoses or replace existing hoses with more robust ones of a higher pressure rating or construction. Although commendable, this is a modification and requires engineering justification and approval.


The schedule As the person responsible for the aircraft's maintenance schedule, the certificate of registration holder must ensure there is enough detail in the maintenance schedule to encompass an inspection and replacement program for all flexible hoses installed on the aircraft. Aircraft manufacturers, LAMEs, aircraft owner groups and the Civil Aviation Safety Authority give guidance to setting a maintenance schedule suitable for the aircraft and the environment in which it operates.

As the Australian aircraft fleet ages, and despite the best efforts of many owners to protect their aircraft by housing them in hangars, components inevitably deteriorate and need regular replacement. Component replacement is a necessary aspect of aircraft maintenance programs. It should not be seen as a nuisance.

Trevor Robinson is a CASA maintenance specialist. For more information see Airworthiness Bulletin 02-6 at www.casa.gov.au/avreg/aircraft/AWB/02/006.htm

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