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AIRWORTHINESS
CAUTION
EXHAUST SYSTEMS: MAINTENANCE

1. PURPOSE

To emphasise the safety hazards that occur when aircraft exhaust systems are poorly maintained. The following information is provided on problems that could be expected as well as recommendations on ongoing preventative maintenance action to be adhered to by pilots, Aircraft Maintenance Engineers (AME's) or Aircraft Maintenance Organisations (AMO's).

2. GENERAL

The probable results of exhaust system failures could include: -

2.1. Occupants become incapacitated due to carbon monoxide intoxication.
2.2. Engine malfunction/failures.
2.3. Engine nacelle compartment fires.
2.4. A combination of the above.

3. SAFETY HAZARDS

The following hazards could be experienced when exhaust systems fail: -

3.1. Failure of the exhaust gas-to-air heat exchanger (heater) may cause carbon monoxide gas to enter the cabin, affecting the mental alertness, judgment and reasoning of the pilot which could contribute to the cause of an accident/incident.
3.2. Failure of exhaust stack pipes, manifolds and tail pipes, could introduce carbon monoxide gas, smoke or fire into the aircraft cabin area.
3.3. Partial power loss and power failures could result from internal muffler failure. Failure of internal baffles of mufflers could cause partial or complete blockage of the escaping exhaust gasses.

4. REASONS FOR EXHAUST FAILURES

The primary cause of exhaust failures could be inadequate and infrequent inspections/checks and the lack of routine and preventative maintenance between mandatory inspections. Contributing factors to exhaust system deterioration and failure:

4.1. Engine operating temperatures.
4.2. Metal fatigue caused by engine vibration in areas of high stress concentration.
4.3. Wear at joints or connections due to engine vibration.
4.4. Engine backfiring due to unburned fuel in the muffler.
4.5. Unauthorised repairs to exhaust systems and substances.

5. PROMINENT PROBLEM AREAS

It should be appreciated that exhaust system deterioration starts at installation and progresses through the lifespan thereof. The following however have been found to be the most prominent problem areas:

5.1. Exhaust manifold and stack fatigue failures usually occur at welded or clamp joints (eg. Exhaust stack flanges, stack to manifold cross pipes, or muffler connections.)
5.2. Muffler and heat-exchanger failures usually occur on the inner wall surfaces. A thorough inspection can only be accomplished when the outer heat shield is removed. This inspection may only be accomplished by a suitably rated AMO or AME.

6. INSPECTION/CHECK

In accordance with Part 91.09.2 of the Civil Aviation Regulations, 2024, as amended, the serviceability and airworthiness of an aircraft is the prime responsibility of the registered owner/operator of the aircraft. In the interest of aviation safety, owners/operators should perform daily preflight inspections which should include a thorough visual external inspection/check of the exhaust system.

6.1. Should it be required to remove engine cowlings to accomplish the above-mentioned inspection/check it may be necessary to do so at frequent intervals (hours of operations). For the recommended intervals refer to manufacturer's publications and Service Bulletins.
6.2. To facilitate a good inspection/check the use of a high-intensity telescopic, hinge-handle mirror or a bore scope inspection is recommended.
6.3. A detailed visual inspection/check of exhaust systems should entail:
6.3.1. Muffler and heat exchanger for general condition and leaks.
6.3.2. Leaking exhaust stack gaskets (blown gaskets).
6.3.3. Loose or broken clamp connections, attachments and stacks.
6.3.4. Cracked or broken stacks and tail pipes.
6.3.5. Dented stacks.
6.3.6. Cracks adjacent to welded areas and stack bends.
6.3.7. Thinning of joint areas due to vibrational wear.
6.3.8. Metal pitting due to internal erosion by combustion products.
6.3.9. Turbo and supercharger for:

a) Improper installation, including misalignment of exhaust flanges, ball joints and/or connections or any factor which could result in abnormal wear or chafing.
b) Supercharger assemblies for cracks and wear.

NOTE: In addition to the above, the firewall seal(s) should be carefully inspected to ensure that the exhaust gasses cannot enter the cabin area. The engine compartment should be free of combustible materials to reduce the possibility of fire hazard.

6.4. Exhaust leaks and/or cracks are indicated by a gray-white or sooty-black streak or discolouration of the heat exchanger jacket. When defects are suspected, they should be further inspected by an approved person before further flight. An extensive engine RPM drop noted during the application of carburettor heat is also an indication of a cracked or leaking heat exchanger.

6.5. Anytime exhaust fumes are detected in the cabin, immediately shut off the cabin heat control, open a fresh air vent and land as soon as possible and a thorough inspection of the entire exhaust system should be conducted, and special attention should be given to the muffler and heat exchanger, in accordance with the manufacturers recommendations by an approved person before further flight. Any work to the aircraft or the exhaust system should be certified in the aircraft logbooks or flight folio.

7. SUPPLEMENTARY READING MATERIAL

The following publications may be consulted regarding the inspections and maintenance required;

7.1. AIC 64.9 carbon monoxide contamination in aircraft.
7.2. AD's and Maintenance Advisory Notices.
7.3. Manufacturers' publications such as:- Service letters, Information letters, Service bulletins and maintenance manuals.
7.4. The following FAA publications:-

7.4.1. AC20-106. Aircraft inspection for General Aviation Aircraft Owner (SN. 050-007-00449-4).
7.4.2. AC43.13. Acceptable Methods, Techniques and Practices, Aircraft Inspection and Repairs.
7.4.3. AC65.12A, Airframe and Powerplant Mechanics Powerplant Handbook. (SN 050-007-00373-1).
7.4.4. AC20-32B, Carbon Monoxide (CO) Contamination in Aircraft Detection and Prevention.