

exhaust gases to escape directly into the cabin heat system. These failures, in most cases, are caused by thermal and vibration fatigue cracking in areas of stress concentration. Failure of the spot-welds, which attach the heat transfer pins, can result in exhaust gas leakage. In addition to a carbon monoxide hazard, failure of heat exchanger surfaces can permit exhaust gases to be drawn into the engine induction system, causing engine overheating and power loss.

Exhaust Manifold & Stack Failures

Exhaust manifold and stack failures are usually fatigue failures at welded or clamped points (e.g., stack-to-flange, stack-to-manifold, and crossover pipe or muffler connections). Although these failures are primarily fire hazards, they also present carbon monoxide problems. Exhaust gases can enter the cabin via defective or inadequate seals at firewall openings, wing strut fittings, doors, and wing root openings.

Internal Muffler Failures

Internal failures (baffles, diffusers, etc.) can cause partial or complete engine power loss by restricting the flow of the exhaust gases. If pieces of the internal baffling breaks loose and partially or totally blocks the flow of exhaust gases, engine failure can occur. [Figure 3-43] As opposed to other failures, erosion and carburization caused by the extreme thermal conditions are the primary causes of internal failures. Engine backfiring and combustion of unburned fuel within the exhaust system are probable contributing factors. In addition, local hot-spot areas caused by uneven exhaust gas flow can result in burning, bulging, or rupture of the outer muffler wall.

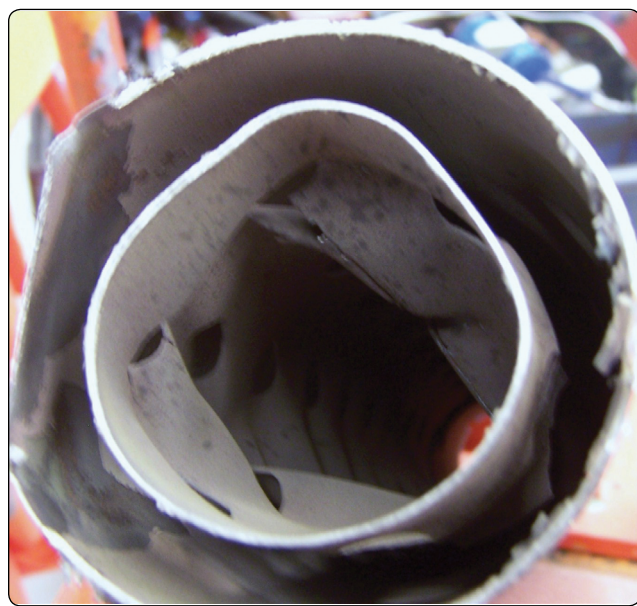


Figure 3-43. An example of internal muffler failure. Muffler failure can be caused by erosion and carbonization, which in turn can lead to breakage blocking exhaust flow.

Exhaust Systems with Turbocharger

When a turbocharger or a turbosupercharger system is included, the engine exhaust system operates under greatly increased pressure and temperature conditions. Extra precautions should be taken in exhaust system care and maintenance. During high-pressure altitude operation, the exhaust system pressure is maintained at or near sea level values. Due to the pressure differential, any leaks in the system allow the exhaust gases to escape with torch-like intensity that can severely damage adjacent structures. A common cause of malfunction is coke deposits (carbon buildup) in the waste gate unit causing erratic system operation. Excessive deposit buildups may cause the waste gate valve to stick in the “closed” position, causing an overboost condition. Coke deposit buildup in the turbo itself causes a gradual loss of power in flight and low manifold pressure reading prior to takeoff. Experience has shown that periodic de-coking, or removal of carbon deposits, is necessary to maintain peak efficiency. Clean, repair, overhaul, and adjust the system components and controls in accordance with the applicable manufacturer’s instructions.

Augmentor Exhaust System

On exhaust systems equipped with augmentor tubes, the augmentor tubes should be inspected at regular intervals for proper alignment, security of attachment, and general overall condition. Even where augmentor tubes do not contain heat exchanger surfaces, they should be inspected for cracks along with the remainder of the exhaust system. Cracks in augmentor tubes can present a fire or carbon monoxide hazard by allowing exhaust gases to enter the nacelle, wing, or cabin areas.

Exhaust System Repairs

It is generally recommended that exhaust stacks, mufflers, tailpipes, etc., be replaced with new or reconditioned components rather than repaired. Welded repairs to exhaust systems are complicated by the difficulty of accurately identifying the base metal so that the proper repair materials can be selected. Changes in composition and grain structure of the original base metal further complicate the repair. However, when welded repairs are necessary, the original contours should be retained; the exhaust system alignment must not be warped or otherwise affected. Repairs or sloppy weld beads that protrude internally are not acceptable as they cause local hot spots and may restrict exhaust gas flow. The proper hardware and clamps should always be used when repairing or replacing exhaust system components. Steel or low temperature, self-locking nuts should not be substituted for brass or special high temperature locknuts used by the manufacturer. Old gaskets should never be re-used. When disassembly is necessary, gaskets should be replaced with new ones of the same type provided by the manufacturer.