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MANDATORY SERVICE BULLETIN

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Service Bulletin No. 592
(Supersedes Service Bulletin No. 369J)
Engineering Aspects are
FAA (DER) Approved

SUBJECT: Engine Inspection after Overboost

MODELS AFFECTED: All Lycoming piston engines.

TIME OF COMPLIANCE: As required by the subject bulletin.

NOTE

Prior to maintenance, review the entire Service Bulletin to be sure you have a complete understanding of the procedure and requirements to prevent mistakes from an incomplete review of all of the information in this document.

This Service Bulletin contains information about required corrective action to take in response to engine overboost on Lycoming supercharged and turbocharged engines. This information was in Service Bulletin No. 369J. With the revision, Service Bulletin No. 369K, this overboost information has now been moved to this Service Bulletin as a stand alone document for clarity.

Overboost in Supercharged and Turbocharged Engines

Overboost is a condition in which a reciprocating engine (which has either a supercharger or turbocharger) exceeds maximum rated manifold pressure. While this increase in manifold pressure supports engine operation during flight, during ground operation and take-off, an excess manifold pressure can damage the engine if it is not controlled correctly. If the throttle is opened too quickly, the high pressure enters the cylinders and is compressed to even higher pressure which can cause detonation, overheating, or cylinder damage.

The following control the maximum manifold pressure of supercharged/turbocharged engines:

- *Red-line throttle control by pilot* - usually reached somewhere before full-open throttle, depending upon density altitude
- *Preset density controller* - senses compressor discharge density and varies the manifold pressure to enable the engine to power up to critical altitude, regardless of the density altitude. Take-off is at full throttle. However, the red line on the manifold pressure gage is the maximum permissible for a hot day at high field elevation. Refer to the airframe or engine operator's manual for standard day manifold pressure.

NOTE

Full rated power must have a lower manifold pressure on a below-standard temperature day and higher on an above-standard day. If the density controller is not

adjusted correctly or operates incorrectly, an overboost can occur without exceeding red-line manifold pressure.

- *Preset absolute variable pressure controller* - used on engines with a turbo compressor air bleed to pressurize the aircraft cabin. The controller is preset at the factory and has a red-line manifold pressure at full throttle regardless of density altitude.
- *Preset slope controller* - used on engines that do not have a turbo compressor air bleed to pressurize the aircraft cabin. The controller is preset at the factory and has a red-line manifold pressure at full throttle regardless of density altitude.

To prevent overboost, some Lycoming turbocharged engines have a pressure relief "pop off" valve installed between the compressor outlet and the fuel injector/carburetor to prevent excess manifold pressure surges. Even though manifold pressure may continue to rise above its rated value, power output will not change much. In fact, as the valve lifts off its seat, at approximately 2 in.-Hg above rated pressure, power may decrease even if manifold pressure continues to rise above rated pressure.

In Table 1, pressure relief valves are divided into three categories based on manifold pressure requirements and the corresponding maximum pounds required to push down the valve.

Table 1
Pressure Relief Valve Categories

Categories – Manifold Pressure Required to Develop Rated Power	Maximum Pounds to Depress Valve
30.00 to 40.00 inches Hg.	*43 lbs.
40.00 to 50.00 inches Hg.	*58 lbs.
50.25 to 60.00 inches Hg.	*72 lbs.

* Any lower pressure is acceptable as long as the valve, when in service, does not lift off its seat prior to reaching manifold pressure.

CAUTION

ON ENGINES WHERE MANIFOLD PRESSURE IS THROTTLE-CONTROLLED BY THE PILOT, DO NOT ADVANCE THE THROTTLE BOOSTING MANIFOLD PRESSURE BEYOND RED-LINE TO DETERMINE IF THE ABSOLUTE PRESSURE RELIEF CONTROLLER IS FUNCTIONING. THIS IS AN EMERGENCY CONTROLLER. DELIBERATE MANIFOLD PRESSURE OVERBOOST MUST BE AVOIDED.

The best way to prevent overboost is to stop the throttle movement momentarily several inches below rated manifold pressure.

During take-off with low oil temperature, if the throttle is moved too quickly, the manifold pressure can overboost momentarily above its maximum rated pressure by 1 to 2 in.-Hg but then returns immediately to the maximum rated pressure. If the overboost does not exceed 2 in.-Hg for more than 3 seconds, it may be disregarded. However, if the overboost is longer than 3 seconds and/or exceeds its rated pressure by more than 2 in.-Hg, the corrective actions in this Service Bulletin must be taken as instructed in the following sections:

- Corrective Action for Overboost on Engines without a Pressure Relief Valve
- Corrective Action for Overboost on Engines with a Pressure Relief Valve

It is the responsibility of the operator to monitor manifold pressure to make sure limits are not exceeded. The continued use of an engine after overboost has occurred is at the discretion and the responsibility of the operator.

Corrective Action for Overboost on Engines without a Pressure Relief Valve

Table 2 identifies corrective action to take for corresponding progressive levels of engine overboost on engines that *do not have pressure relief valves.*

Table 2
Corrective Action for Overboost Engine Without a Pressure Relief Valve

Overboost Conditions	Corrective Action
Overboost equal to or less than 2 in.-Hg and for less than 3 seconds	Make engine logbook entry.
Overboost not exceeding 3 in.-Hg. for 5 seconds.	Make engine logbook entry. Include maximum manifold pressure reached, duration of overboost, cylinder head temperature, ambient air temperature, and pressure altitude.
Not exceeding 5 inches Hg. or 10 seconds.	Make engine logbook entry. Normal 50-hour inspection plus particular attention to steps 1, 2 and 3 below.
Not exceeding 10 inches Hg.	Make engine logbook entry. Remove engine from aircraft; completely disassemble and inspect engine. Replace all parts that do not come within maximum service limits as shown in latest revision of Lycoming Service Table of Limits.
Over 10 inches Hg.	Complete engine overhaul required plus replacement of crankshaft.

Take the following steps as corrective action for an overboost engine without a pressure relief valve:

1. Inspect cylinder assemblies for signs of cracked heads, particularly around the lower spark plug holes and for cracks around the hold-down flange of cylinder barrels. Also examine barrels for burned paint and for oil leaks around cylinder base flanges.
2. Remove oil screens and inspect for metal particles; make sure the particles are metal and not hard carbon.
3. Remove all spark plugs and inspect them closely for physical and structural defects. Spark plugs removed may be reused providing that each plug satisfactorily tests in a spark plug test unit as acceptable and exhibits none of the following defects:
   a. Fine wire plugs with loose center or ground electrodes
   b. Electrodes show signs of metal or impact damage
   c. Massive electrode plugs with copper run-out of center electrode
   d. Ceramic core nose with a cracked or crazed surface
4. Record this corrective action in the engine logbook.

Corrective Action for Overboost on Engines with a Pressure Relief Valve

1. Determine the cause for overboost and correct it.
2. Remove the absolute pressure relief valve (pop-off valve).

NOTE

Should the relief valve fail to lift off its seat within prescribed limits, the valve has malfunctioned. If so, refer to and comply with Table 2. Also, either reset or replace the pressure-relief valve.

3. Place the relief valve assembly mounting flange down, on a calibrated scale. The valve head should protrude approximately 0.2 inch below the mounting flange. Make sure that the mounting flange remains parallel to the scale surface; apply pressure to the top of the valve housing. If the valve head depresses flush with the mounting flange surface, without exceeding the maximum pounds of force shown in Table 1, the valve is functioning.
4. Record corrective action in the engine logbook.