

Oil Out the Air Box

By John Propst with Technical Review by Bill Pancake

Abstract: This article discusses an issue related to engine oil leaking out the carburetor air box on small continental aircraft engines.

Background

An aircraft with a small Continental engine is restored and the engine has a major overhaul. Following the restoration, the plane and engine performs like a new one. It flies true and the engine performs better than expected with very little oil consumption (say 1 to 2 quarts in 25 hours). Yet the owner notices engine oil leaking from the air box. This article describes one scenario that explains the cause for this leakage.

The new cylinders, pistons, and piston rings available from several manufacturers do a much better job of sealing the piston to the cylinder. This is witnessed by extremely high differential compression tests and very low oil consumption. This results in higher intake vacuum levels, especially when the engine is at idle with the carburetor butterfly valve nearly closed.

This high vacuum level during idle in turn results in a high differential pressure across the intake valve guides. During idle, especially during and following landing of the aircraft, this sucks oil into the intake manifold system from the cylinder head. This oil then migrates by gravity down the intake tubes into the updraft carburetor and out the carburetor intake into the airbox. From here the oil eventually exits the airbox and streaks down the inside or outside of the engine cowling onto the belly of the plane.

This same phenomenon can be experienced in other vehicles including older automobiles with the following exception. Most other vehicles have a downdraft rather than updraft carburetor so the oil remains in the intake manifold system where it reveals itself as a puff of black smoke when the engine is restarted. Newer automobile engines were improved by installing better seals on the valve guides. These improvements have not been extended to our small continental engines.

It is important to remember that all inspection, maintenance, alterations, and documentation should be done in accordance with Part 43 of the Federal Aviation Regulations (FAR).

January 2015 Update

With the help of a JPI 830 engine monitor on a C-85-12 engine (upgraded with the O-200 STC), I performed a couple tests related to the shutdown of the engine.

The first method for shutting down the engine was to pull the mixture control on the Marvel Schebler Carb. The throttle was in the idle position. Using this method the measured manifold pressure on engine shutdown was between 9 and 10 inches vacuum. Both oil and gasoline was observed leaking from the airbox.

The second method for shutting down the engine was to turn the fuel valve off while taxiing to the hangar. Upon reaching the hangar, the throttle was gradually increased as the engine was dying of fuel starvation. Using this method, the measured manifold pressure on engine shutdown increased to near atmospheric pressure (28 - 30 inches). No significant oil or fuel was observed leaking from the airbox.