Engine Break-in Procedure and Quiz

N435SP, September 2024

**Authorization is Required before Performing Break-In Flights**

For a new, rebuilt, or overhauled engine, a proper break-in is essential. The object is to get the piston rings to expand sufficiently to seat with the cylinder walls, and this seating will only occur when pressures inside the cylinders are great enough to cause adequate expansion of the piston rings. If this procedure is interrupted or neglected, the cylinder walls may become glazed. In that case, the break-in process stops, and excessive oil consumption is likely to result; extensive glazing can only be corrected by removing the cylinders and rehoning the cylinder walls.

During the break-in process, precautions are required. These include careful attention to the engine instrumentation (particularly oil temperature) and strict avoidance of conditions that can lead to ring flutter. These precautions may apply to all operations but are particularly important for the break-in period.

A plain-language description of the break-in procedure and its importance is available on the Lycoming website with the title [Hard Facts About Engine Break-In](https://www.lycoming.com/content/hard-facts-about-engine-break). Detailed steps and precautions for the break-in are provided in [Lycoming Service Instruction No. 1427C](https://www.lycoming.com/content/service-instruction-no-1427c). (For our purposes, specifically the information in Section 1.C. “Fixed Wing, Flight Test”.) The POH for N435SP specifies power settings during break-in and leaning procedures for both ground and flight operations. Pilots performing break-in flights must be familiar with these references.

You must be authorized by BEFA Operations to act as PIC or to instruct in N435SP during the break-in period. To request authorization, review the references above, read and understand the rules below, and submit a completed quiz to the Operations Manager (Dillon) or Operations Officer (Scott).

BEFA pilots must adhere to the following rules during the engine break-in process:

1. In the “Flight Route/Legs” entry on the FSP reservation, describe the planned flight (including route, altitudes, and approaches) and verify that it meets these requirements.
2. Every leg of every flight shall include a cruise portion of at least 60 minutes duration, with no low-power cruise, no slow flight, no stalls, and no repeated (VFR or IFR) approaches or landings. A 60-minute cruise should follow each and every takeoff.
3. Select a route that allows a low-altitude cruise, and cruise at the lowest altitude consistent with safety. Initial flights should be lower, but after that a maximum of 5000’ cruise altitude is recommended. Sufficient cruise power cannot be obtained at density altitudes above 8000’.
4. Use only straight mineral oil of the appropriate weight. This is important, and if you have any questions about the correct oil, please ask Operations. Do not use Phillips X/C 20W50.
5. Ground operations must be minimized. Plan ahead to avoid any delays during taxi and runup.
6. Adjust the mixture according to the POH, both on the ground and in flight. A full-rich mixture is typically appropriate only during engine start, during takeoff and climbs up to 3000’, and following initiation of the BEFORE LANDING checklist. Note that this is a change from past practice.
7. On takeoff, as soon as safe to do so, transition to a shallow climb with a higher-than-normal airspeed to enhance cooling.
8. On the first flight of the break-in period, on reaching cruise altitude operate at 75% power for 60 minutes.
9. After the first 60 minutes of break-in, alternate between 65% and 75% power in cruise flight, but remain predominantly at 75% power.
10. Monitor oil temperature carefully, as it tends to be elevated during the break-in process. As necessary, increase airspeed (in a climb) or enrichen mixture to maintain temperatures within limits.
11. Do not perform fast descents with low throttle settings, as this will cause ring flutter and damage to the engine. Descents should be performed at low cruise power. In flight, low throttle settings are appropriate only at low airspeeds (such as for approach and landing).
12. After the flight, a report must be provided to the operations team, including the following:
    1. A general description of the flight
    2. Whether any oil was added, and if so, how much
    3. Any deviations from the break-in rules, with the reasons
    4. A record of the oil temperatures observed during the flight

Deviation from these rules is allowed to the extent that it is required for an urgency or emergency or to comply with ATC instructions.

**N435SP Break-In Quiz**

Consider the following questions regarding a break-in flight in N435SP. Please fill in your answers to each question and send to [operations@befa.org](mailto:operations@befa.org) (Dillon) and [scott.hunziker@gmail.com](mailto:scott.hunziker@gmail.com) (Scott) with the subject “break-in quiz”.

1. Will a one-way flight direct to Hoquiam comply with the break-in restrictions?
2. Consider a flight from Paine, stopping at Eastsound (KORS) and Bayview (KBVS), and then returning to Paine. Would it be possible to complete that in less than 3 hours Hobbs time while complying with these restrictions?
3. At 3500’ pressure altitude and 13°C OAT, what RPM setting provides 75% power?
4. At 4500’ pressure altitude and 4°C OAT, what RPM setting provides 65% power?
5. Should you lean on the ground, and if so, how?
6. While in break-in, should you perform a lean burn-off before shutting down?
7. At what altitude should break-in cruise occur?
8. During break-in, when may low throttle settings be used?
9. Are touch-and-go landings permitted during break-in? How about stop-and-go landings?
10. When must a report be provided after a break-in flight?
11. What type of oil must be used during break-in?
12. Do the break-in rules preclude flying to Astoria (KAST), performing a touch-and-go, and then returning to KPAE?
13. Would an instrument training flight consisting of multiple approaches comply with the break-in restrictions?
14. [For instrument pilots] Can you make an IFR flight to Eastern Washington during the break-in period?
15. What engine instrument requires especially careful monitoring during break-in flights?