Engine Break-in Procedure and Quiz

N735LH, September 2023

**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 and cylinder head temperatures) 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 from Continental with the title “[Engine Break-In](https://www.csobeech.com/files/TCMEngineBreak-In.pdf)”. Detailed steps and precautions for the break-in are provided in [Continental Service Bulletin M89-7R1](http://www.americanpropeller.com/pdf/M89-7R1.pdf). (The Continental website doesn’t seem to be working, so these links point to copies I found online.) The POH for N735LH specifies power settings during break-in and leaning procedures. 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 N735LH 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 (Wes), Assistant Operations Manager (Dillon), or Operations Officer (Matt).

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. A full-rich mixture is typically appropriate only during start, during takeoff and climbs up to 5000’, 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. In cruise flight, use the lowest RPM (within the green arc range) that will provide smooth engine operation and allow for the specified power.
9. On the first flight of the break-in period, on reaching cruise altitude operate at 75% power for 60 minutes.
10. After the first 60 minutes of break-in, alternate between 65% and 75% power in cruise flight, but remain predominantly at 75% power.
11. Monitor oil temperature and cylinder head temperatures carefully, as both tend to be elevated during the break-in process. Open cowl flaps will likely be necessary for both climb and cruise. As necessary, increase airspeed (in a climb) or enrichen mixture to maintain temperatures within limits.
12. 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).
13. 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 cylinder head and 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.

**N735LH Break-In Quiz**

Consider the following questions regarding a break-in flight in N735LH. Please fill in your answers to each question and send to [operations@befa.org](mailto:operations@befa.org) (Wes), [asst.operations@befa.org](mailto:asst.operations@befa.org) (Dillon), and [mattfsmith@yahoo.com](mailto:mattfsmith@yahoo.com) (Matt) with the subject “break-in quiz”.

1. Will a one-way flight direct to Astoria comply with the break-in restrictions?
2. Consider a flight from Renton, stopping at Eastsound (KORS) and Bayview (KBVS), and then returning to Renton. Would it be possible to complete that in less than 3 hours Hobbs time while complying with these restrictions?
3. At 4000′ pressure altitude and 17°C OAT, what MP and RPM settings provide 75% power?
4. At 5000′ pressure altitude and 5°C OAT, what MP and RPM settings provide 65% power?
5. While in break-in, should you perform a lean burn-off before shutting down?
6. At what altitude should break-in cruise occur?
7. During break-in, when may low throttle settings be used?
8. Are touch-and-go landings permitted during break-in? How about stop-and-go landings?
9. When must a report be provided after a break-in flight?
10. What type of oil must be used during break-in?
11. Do the break-in rules preclude flying to Tillamook (KTMK), performing a touch-and-go, and then returning to KRNT?
12. Would an instrument training flight consisting of multiple approaches comply with the break-in restrictions?
13. [For instrument pilots] Can you make an IFR flight to Eastern Washington during the break-in period?
14. What engine instruments require especially careful monitoring during break-in flights?