Service Newsletter

August 9, 1985

SNL85-34

TITLE

PROPER ENGINE BREAK-IN PROCEDURE (For all Piston Engine Airplane Models)

TO

CESSNA DISTRIBUTORS, CATEGORY I THRU CATEGORY IV DEALERS, AG DEALERS AND CPC'S

DISCUSSION

Proper engine break-in on new or overhauled engines, is important to allow early piston ring seating to take place and is necessary to maintain rated compression, engine power and minimize oil consumption during the life of the engine. To promote piston ring seating, Teledyne Continental and Avco Lycoming recommend high power settings during the first 50 hours of operation. Reference attached Continental Bulletin M81-5 and Lycoming Service Instruction 1427A.

High power settings are necessary to ensure that the rings seat fully during this critical break-in period. If high power settings are not used, cylinders may get a "glazed" surface before the rings are fully seated. This can reduce engine efficiency and cause higher than normal oil consumption.

Dealers are reminded of the importance of using high power settings during the break-in period, as recommended in the Pilot's Operating Handbook, and attached Continental and Lycoming publications, and should also stress this to customers of new piston airplanes.
Service Instruction

DATE: March 15, 1985

Service Instruction No. 1427A
(Supersedes Service Instruction No. 1427)
Engineering Aspects are
FAA Approved

SUBJECT: Engine Test After Overhaul With Engine Installed in Aircraft.

MODELS AFFECTED: All Avco Lycoming Reciprocating Aircraft Engines Installed in Fixed-Wing Aircraft.

TIME OF COMPLIANCE: After Overhaul.

Ideally, a newly overhauled aircraft engine should be tested in a test cell where operating conditions can be closely monitored. Where a test cell is not available, the engine should still be tested on a test stand with a club propeller and a cooling shroud. However, it is not always convenient to test an engine in even this manner.

If a test cell or a test stand is not available, an engine should be properly tested after it has been installed in the aircraft.

The following procedure provides a guideline for testing a newly overhauled engine that is mounted in the aircraft. Information on the “ground run after top overhaul or cylinder change with new rings” and the “flight test after top overhaul or cylinder change with new rings” procedures are published in Avco Lycoming operators’ manuals and Service Instruction No. 1124B.

PREPARATION FOR TEST

1. Pre-oil the engine in accordance with Service Instruction No. 1241.

2. It is particularly important that the cylinder head temperature gage, oil temperature gage, manifold pressure gage, and tachometer be calibrated prior to testing.

3. Engine accessories, such as the fuel pump, fuel metering unit, and magnetos, should be overhauled or replaced with new units before testing engine. This applies to overhauled engines only.

CAUTION

Check that all vent and breather lines are properly installed and secured as described in the airframe maintenance manual.

4. Install airframe and intercylinder baffles and cowling.

5. For optimum cooling during ground testing, a test club should be used. Where this is not possible, however, the regular flight propeller can be substituted but cylinder head temperature must be monitored closely.
GROUND TEST

1. Face the aircraft into the wind.

2. Start the engine and observe the oil pressure gage. If adequate pressure is not indicated within 30 seconds, shut the engine down and determine the cause. Operate the engine at 1000 RPM until the oil temperature has stabilized or reached 140°F. After warm up, the oil pressure should not be less than the minimum pressure specified in the applicable operator's manual.

3. Check magneto drop-off as described in the latest revision of Service Instruction No. 1132.

4. Continue operation at 1000/1200 rpm for 15 minutes. Insure that cylinder head temperature, oil temperature and oil pressure are within the limits specified in the operator’s manual. Shut the engine down and allow it to cool if necessary to complete this portion of the test. If any malfunction is noted, determine the cause and make the necessary correction before continuing with this test.

5. Start the engine again and monitor oil pressure. Increase engine speed to 1500 rpm for a 5-minute period. Cycle propeller pitch and perform feathering check as applicable per airframe manufacturer’s recommendation.

6. Run engine to full-static airframe-recommended power for a period of no more than 10 seconds.

7. After operating the engine at full power, allow it to cool down moderately. Check idle mixture adjustment prior to shutdown.

8. Inspect the engine for oil leaks.

9. Remove the oil suction screen and the oil pressure screen or oil filter to determine any contamination. If no contamination is evident, the aircraft is ready for flight testing.

NOTE

Compile a log of all pertinent data accumulated during both the ground testing and flight testing.

FLIGHT TEST

WARNING

ENGINE TEST CLUBS MUST BE REPLACED WITH APPROVED FLIGHT PROPELLERS BEFORE FLYING AIRCRAFT.

1. Start the engine and perform a normal preflight run-up in accordance with the engine operator’s manual.

2. Take off at airframe-recommended take-off power, while monitoring RPM, fuel flow, oil pressure, oil temperature, and cylinder head temperatures.

3. As soon as possible, reduce to climb power specified in operator’s manual. Assume a shallow climb angle to a suitable cruise altitude. Adjust mixture per pilot’s operating handbook.

4. After establishing cruise altitude, reduce power to approximately 75% and continue flight for 2 hours. For the second hour, alternate power settings between 65% and 75% power per operator’s manual.

5. Increase engine power to maximum airframe-recommended and maintain for 30 minutes, provided engine and aircraft are performing within operating manual specifications.

CAUTION

Avoid low-manifold pressure during high engine speeds (under 15” Hg.) and rapid changes in engine speeds with engines that have dynamic counterweight assemblies. These conditions can detune, or damage, the dampers, rollers, and bushings in the counterweights.

6. Descend at low cruise power, while closely monitoring the engine instruments. Avoid long descents at low manifold pressure. Do not reduce altitude too rapidly or the engine temperature may drop too quickly.
7. After landing and shutdown, check for leaks at fuel and oil fittings and at engine and accessory parting surfaces. Compute fuel and oil consumption and compare to the limits given in operator's manual. If consumption exceeds figures shown in manual, determine the cause before releasing aircraft for service.

8. Remove oil suction screen and oil pressure screen or oil filter to check again for contamination.

NOTE

To seat the piston rings in a newly overhauled engine, cruise the aircraft at 65% to 75% power for the first 50-hours, or until oil consumption stabilizes.

NOTE: Revision "A" revises test procedures.
16 February, 1981

TO: Aircraft Manufacturers, Distributors, Dealers, Engine Overhaul Facilities, Owners and Operators of Teledyne Continental Motors' Aircraft Engines.

SUBJECT: ENGINE OPERATION AFTER CYLINDER REPLACEMENT AND/OR MAJOR OVERHAUL

MODELS AFFECTED: All Models (Steel, Nitrided or Chrome Cylinders)

Gentlemen:

Proper operation of the engine following cylinder replacement or major overhaul is extremely important. The following procedures should be followed to insure that adequate lubrication is being provided to newly installed components and that the piston ring seating will occur as soon as possible.

I. Operation After Major Overhaul Utilizing an Engine Test Cell

A. Servicing and Pre-starting Procedures

1. Service the lubricating system with mineral oil (MIL-C-6529 Type II.) of the appropriate grade depending on ambient temperature.

2. Rotate the propeller by hand through several cycles with the spark plugs removed.

3. Pre-oil the lubrication system using an external pre-oiling pressure system.

4. Install the spark plugs and ignition harness.

B. Test Cell Operational Procedures

1. Consult the applicable TCM Overhaul Manual and follow the recommended test cell operational procedures listed.

II. Operation after major overhaul or cylinder replacement with engine installed in the aircraft.

A. The aircraft can be considered a suitable test stand for running-in overhauled engines contingent on the following conditions:

1. Install engine cowling.

2. Each cylinder must be equipped with a temperature sensing device to monitor the head temperature.

3. The flight propeller may be used contingent on careful observation of cylinder temperatures. Head the aircraft into the wind for this test.
B. Service and pre-starting procedures

1. Service the lubricating system with mineral oil (MIL-C-6529 Type II) of the appropriate grade depending on ambient temperature.

2. Rotate the propeller by hand through several cycles with the spark plugs removed.

3. Pre-oil the lubrication system using an external pre-oiling pressure system.

4. Install the spark plugs and ignition harness.

C. Engine Starting and Ground Operation

1. Assure that all engine and cylinder baffling is properly installed and in good condition.

2. Start the engine and assure that oil pressure rises to within the specified limits within 30 seconds.

3. Operate the engine at 750 RPM for one minute, gradually increasing toward 1000 RPM in three minutes. Check the magneto circuit for grounding prior to a normal shut-down. Allow the engine to cool adequately and then make a visual inspection for any irregularities.

4. Start the engine again and operate it at 750 RPM gradually increasing to 1500 RPM over a period of four minutes. If the engine is equipped with a controllable pitch propeller, cycle the propeller allowing only a 100 RPM drop. Return to the idle range and make adjustments to the idle mixture and RPM as required on carburetor engines and to the low unmetered fuel pressure, idle RPM and mixture on fuel injected engines. Position the throttle to 1200 RPM to smooth the engine. Then do an idle mixture check. Refer to the appropriate service information for these fuel system adjustments. Run engine up to full power for a period not to exceed 10 seconds. Visually inspect and correct any discrepancies. Check the oil quantity. Cowl the engine in preparation for test flight.

D. Test Flight

1. Ambient air and engine operating temperatures are of major concern during this test flight. Do a normal pre-flight run-up in accordance with the aircraft flight manual. Conduct a normal take-off with full power and monitor the fuel flow, RPM, oil pressure, cylinder head temperatures and oil temperatures. Reduce to climb power in accordance with the flight manual and maintain a shallow climb attitude to gain optimum airspeed and cooling. Rich mixture for all operations except lean for field elevation where applicable and lean to maintain smoothness during climb in accordance with airframe manufacturers operating instructions.

2. Level flight cruise should be at 75% power with best power or richer mixture for the first hour of operation. The second hour power settings should alternate between 65% and 75% power with the appropriate best power mixture settings. Engine controls or aircraft attitude should be adjusted as required to maintain engine instrumentation within specifications.

3. The descent should be made at low cruise power settings, with careful monitoring of engine pressures and temperatures. Avoid long descents with cruise RPM and manifold pressure below 18” hg.; if necessary decrease the RPM sufficiently to maintain manifold pressure.

4. Any discrepancies detected during test flight or any final adjustments necessary should now be made. The engine can be operated in normal service in accordance with the aircraft flight manual.