KELLY AEROSPACE
Power Systems
PO Box 273 • Fort Deposit, AL 36032
(334) 227-8306 • Fax: (334) 227-8596

Service Bulletin

The technical content of this letter is FAA Approved

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TURBOCHARGER SYSTEM OPERATIONAL TESTS

INTRODUCTION:

All overhauled or repaired turbochargers must be tested according to the Kelly Aerospace Power Systems Turbocharger Overhaul & Maintenance Manual (P/N 400600-0000) prior to returning the aircraft/rotorcraft to service. While many turbochargers are overhauled or repaired at a facility where testing of the aircraft/rotorcraft is possible, many are exchanged with units off the shelf or are placed on the shelf as inventory. Overhaul shops or facilities that are unable to test the overhauled or repaired turbochargers on the aircraft/rotorcraft are required inform their customers that the Turbocharger System Operational Test must be performed prior to return to service. Since the Turbocharger Overhaul & Maintenance Manual may not be available at all aviation service centers, the Turbocharger System Operational Test has been duplicated herein.

This Service Bulletin is being issued to assure that any Kelly Aerospace Power Systems overhauled or repaired turbocharger is tested per Turbocharger System Operational Tests as found in the Overhaul & Maintenance manual.

COMPLIANCE:

Whenever a Kelly Aerospace Power Systems overhauled or repaired turbocharger is installed on an aircraft or rotorcraft.

EFFECTIVITY:

Any aircraft or rotorcraft utilizing Kelly Aerospace Power Systems turbocharger, which has been overhauled or repaired (Including those units made by Garrett/AirResearch, AlliedSignal Garrett/Honeywell, Consolidated Fuels, Rajay/RotoMaster, and Rajay).

PROCEDURE:

Perform the following operational checks on the aircraft/rotorcraft before it is returned to service.

TURBOCHARGER SYSTEM OPERATIONAL TEST:

CAUTION:

The operational checks herein are generic in nature but will apply to most turbocharged aircraft. Should these procedures conflict in any way with those in the aircraft/rotorcraft AFM or POH, the procedures in the AFM or POH must be used.

WARNING:

Prior to turning over or starting the engine, make sure that all equipment, staff or other persons are clear of the propeller or rotors and testing area.

PROCEDURE: (cont'd)

PRE-LUBRICATION OF TURBOCHARGER:

All overhauled or repaired turbochargers must be pre-lubricated prior to installation and prior to engine start. Preheat engine in extremely cold conditions.

A. Just prior to mounting, prime the turbocharger with engine oil by filling the oil inlet of the turbocharger bearing housing and rotating the T-wheel by hand to coat the bearings.

B. Make sure the oil inlet line is clean and free of obstructions. Crank the engine over with the ignition off and the fuel in the idle cut off position until oil comes out of the turbocharger drain line. Connect the drain line. Start the engine and observe oil pressure. Should oil pressure not rise to 10 psi within 5 seconds, shut engine down and investigate the cause. When proper oil pressure is reached, idle the engine for 5 minutes minimum. Shut engine down and check for oil leaks.

GROUND RUN AND SETUP:

Perform a ground run-up to check basic performance and integrity of the turbocharging system. Prior to accomplishing this procedure, check the appropriate aircraft service or maintenance manual for the ground run procedures and check the appropriate AFM or POH for the applicable preflight procedures. Should these tests reveal improper conditions, additional information on troubleshooting, may be found in the Kelly Aerospace, Aircraft Turbocharger and Control Systems Reference With Troubleshooting Guide Handbook, P/N 400888-0000.

WARNING:

Prior to starting and running the engine, make sure that an appropriate testing area is selected and that all equipment, staff or other persons are clear of the propeller or rotors.

CAUTION:

It is not advisable to perform the ground run-up or Pre-lubrication on an overhauled or repaired turbocharger in extremely cold weather conditions. Preheat the aircraft prior to accomplishing these tests.

A. Before beginning these tests, read the applicable sections of the appropriate service or maintenance manuals as well as the AFM and POH regarding run up procedures. Should any step herein conflict from the AFM or POH procedures, use that information.

B. Start the engine and observe oil pressure. Should oil pressure not rise to 10 psi within 5 seconds, shut engine down and investigate the cause. When proper oil pressure is reached, idle the engine for 5 minutes. Allow the oil temperature to stabilize at 120 deg. F (or as called out in the AFM or POH) and the oil pressure above 10 psi. *Stay within the minimum and maximum limitations!*

Note:

Blue or white smoke may appear from the exhaust during initial start and run up. Unless the smoke is extreme or appears in combination with an oil pressure drop, it can be considered normal. Lubricants used in assembly may make light smoke for up to 30 minutes operation.

GROUND RUN AND SETUP: (CONT'D)

C. Advance the throttle slowly in 500 RPM increments until takeoff power is reached. Pause at each RPM step and allow the engine to stabilize (the turbocharger will lag slightly). At each RPM step, observe oil pressure, oil temperature, TIT/EGT, and manifold pressure (MAP). These indications should not fluctuate but remain steady. Oil pressure above idle should be a minimum of 30 psi. Take care not to overboost the engine when approaching takeoff power, throttle movement at power is sensitive. Consult the applicable AFM or POH and determine and record TIT/EGT and MAP at takeoff power.

D. Retard the throttle slowly to idle. Great care should be taken not to reduce power rapidly. For 400 series (Garrett style) turbochargers, operate the engine at idle for 3 to 5 minutes to allow the turbine wheel to slow down. No idle time is required on 600 series (Rajay/RotoMaster style) turbochargers.

E. Shut down the engine and inspect for oil leaks and general security. *If installed, tap V-band coupling to assure seating and re-torque nut. (See Table 1 page 5)* If proper TIT/EGT or MAP was not achieved, investigate cause. Compare all engine parameters to the requirements in the AFM or POH and if necessary, perform an engine setup per the applicable aircraft service or maintenance manual. If required, repeat this check.

OPERATIONAL FLIGHT TEST:

WARNING:

The operational flight test must be performed by an appropriately rated, current pilot familiar with the aircraft/rotorcraft and the requirements and limitations of the AFM or POH.

Perform a flight test to confirm operation of the turbocharging system. While there are many types of turbocharging systems, they can be categorized as Manual or Automatic.

MANUAL SYSTEMS: The most basic form of manual control is the fixed bleed system which allows exhaust gas to continuously escape through an orifice of predetermined size. The size of the orifice determines the critical altitude of the engine. More complex manual systems will have a method to adjust the wastegate through use of a vernier cable. These systems may or may not incorporate a pressure relief valve so great care must be taken not to overboost the engine.

AUTOMATIC SYSTEMS: The automatic systems that control turbocharger operation use air pressure sensors installed at various points in the induction system. They in turn will cause changes to the oil pressure that controls the position of the wastegate. There are many different systems therefore, it is very important that the mechanic and pilot understand what manifold pressures he should expect when full throttle is applied for takeoff.

PRECAUTIONS:

1. Do not exceed the red-line temperature limitations during takeoff, climb and max performance cruise power operation.
2. Keep the cylinder head temperature (CHT), Oil temperature, turbine inlet temperature (TIT or EGT) below the max limits stated in the aircraft AFM or POH .
3. Whenever mixture is adjusted, rich or lean, it should be done slowly.
3. Unless it conflicts with the aircraft AFM or POH, always return the mixture slowly to full rich before increasing the power setting.
4. At all times, caution must be taken not to shock cool the cylinders. Do not allow a CHT change of more than 50 deg. F per minute.
5. The throttle(s) must be operated smoothly or the engine(s) will surge. Smooth and steady operation of the mixture control will assure that TIT/EGT limits are not exceeded.

OPERATIONAL FLIGHT TEST: (CONT'D)

Prepare the aircraft for the test flight. Perform a preflight and run up according to the appropriate aircraft AFM or POH. Proceed with normal takeoff. Due to the special nature of rotorcraft, the flight test may be substantially different, however a basic check of performance per the AFM or POH must be applied.

A. TAKEOFF: Using AFM or POH data, establish a max power takeoff and record engine parameters with close attention to MAP. If applicable reduce power within time limits. Manual systems will require constant attention. Extreme care must be taken not to overboost the engine. Should an overboost occur, refer to the latest revision of Lycoming Service Bulletin 369 or Teledyne Continental Motors Service Bulletin 67-12.

B. CLIMB: Using AFM or POH data, establish max power climb, record the engine parameters each 1000 feet, with close attention to MAP and TIT/EGT. Remember, to increase power, enrich the mixture, increase RPM, and then MAP. Maintain a consistent climb until critical altitude is reached, however do not exceed max CHT. Without changing power setting, climb above critical and note that MAP decreases.

C. CRUISE: Using AFM or POH data, establish a max performance cruise and then an economy cruise setting. Record engine parameters, fuel flow, and aircraft speed. Compare to the AFM or POH published information.

D. DESCENT AND LANDING: Using AFM or POH data, descend and land. Please note, manual systems will require constant attention. For decent, do not pull throttle(s) back rapidly, do not allow a CHT change of more than 50 deg. F per minute, and remember to decrease power decrease MAP and then RPM. For landing, follow the procedures in the AFM or POH.

RETURN TO SERVICE:

After landing, determine turbocharger performance using the data recorded. Any discrepancy noted must be investigated and a remedy applied before returning the aircraft to service. In most cases, improper or low performance will be related to conditions other than the turbocharger, in order of importance, consult the aircraft service or maintenance manual, Kelly Aerospace, Aircraft Turbocharger and Control Systems Reference With Trouble-shooting Guide Handbook, P/N 400888-0000, and the Kelly Aerospace Overhaul manual. If the operational test procedures are satisfactory, make the appropriate logbook entries and return the aircraft to service.

DISPOSITION OF INVENTORY:

Any turbocharger which has been overhauled or repaired and placed in inventory must be delivered with a copy of this Service Bulletin. Download the Service Bulletin file at http://www.kellyaerospace.com/, select service bulletins and turbocharger system components. Additional copies may be made from the file.

CONTACT INFORMATION:

If you have any questions concerning the instructions in this service bulletin, please contact Kelly Aerospace Power Systems Technical Support at 888-461-6077.

Questions concerning aircraft or rotorcraft service or operation must be forwarded to the applicable manufacturer of that product.

Table 1 - V-Band Clamp Torque

Clamp P/N*	Diameter mm	Diameter in	Nut Torque
400500-925	235.0	9.25	110-130 in/lbs
400720-775	196.9	7.75	40-60 in/lbs
400720-685	174.0	6.85	40-60 in/lbs
446397-775	196.9	7.75	110-130 in/lbs

All KAPS 600 series (Rajay, RotoMaster)

CF600391-00	ALL	ALL	15-20 in/lbs

* Part number etched on strap or check diameter.