

MAINTENANCE TEST FLIGHTS

by Rick Wheldon

We all take our airplanes into maintenance on a regular basis. Aside from the unpleasant aspect of settling the bill, one other factor is relevant to all maintenance events – we have to fly the airplane away. This has been accomplished in a variety of ways, ranging from just strapping the airplane on and leaving, to thoroughly investigating the maintenance that was accomplished and flight testing as appropriate. (This second technique was carried to its extreme back in the 1960s when the factory maintained an MU-2 Service Center in San Angelo. A friend of mine was flying nearly 100 hours a month. He would fly his airplane to San Angelo, open up a folding chair and grab a book while the airplane was placed on jacks, and he would sit there for 3 days while the airplane was inspected. I dare say that there wasn't much about his airplane that he was unaware of.)

Once the maintenance is complete, a decision to test fly the aircraft must be made. FAR 91.407(b) provides guidance on when a flight test is required. It states:

b) No person may carry any person (other than crewmembers) in an aircraft that has been maintained, rebuilt, or altered in a manner that may have appreciably changed its flight characteristics or substantially affected its operation in flight until an appropriately

rated pilot with at least a private pilot certificate flies the aircraft, makes an operational check of the maintenance performed or alteration made, and logs the flight in the aircraft records.

The issue then is whether the “flight characteristics” or “operation in flight” have or may have been affected. One could argue that the “operation in flight” clause might require a flight test on nearly any aircraft system that has been repaired. However, FAR 91.407 (c) allows relief from the flight test requirements, if the checks can be effectively completed on the ground.

(c) The aircraft does not have to be flown as required by paragraph (b) of this section if, prior to flight, ground tests, inspection, or both show conclusively that the maintenance, preventive maintenance, rebuilding, or alteration has not appreciably changed the flight characteristics or substantially affected the flight operation of the aircraft.

There is additional direction on flight check requirements from the MU-2 Maintenance Requirements Manual. The MRM includes some general guidelines for conducting flight checks, but also has more specific requirements than the FARs. The MRM says that a functional check flight is necessary following:

1. Removal, repair, replacement, or adjustment of engine, propeller or their components and controls.

2. Removal, repair, or replacement of fuel system components.

3. Removal, repair, or replacement of flight control surfaces.

4. Removal, repair, or replacement or adjustment of flight control mechanisms, cables, rods, or torque tubes.

5. Major structural repair or modification.

6. Removal, repair, or replacement of accessories or auxiliary equipment which require in-flight checks or calibration.

Clearly, the guidance is this – check most everything that was done, or ensure that it has been adequately checked by maintenance. That being the case, I would like to suggest some guidelines to most effectively allot your time when arriving at the airport and to properly determine what checks need to be performed.

First, allow plenty of time. Rushing will lead to shortcuts, and a late PM arrival at your maintenance facility leaves little time to properly prepare for a test flight and return for further maintenance if the results are not satisfactory.

Second, grab a notepad and the maintenance work order. Find the lead mechanic and sit down nearby. Read all squawks and corrective actions, and clarify any maintenance actions with the lead man. Make two lists. Separately, write down the squawks that need to be flight checked and the squawks that can be ground checked. Note

that a maintenance signoff ending with “Ops check OK” might satisfy the requirements of 91.407 (c), but you might still prudently choose to do your own check of the system, either on the ground or in flight. By making two lists, you will separate items which can be effectively checked on the ground, thus minimizing flight time and reducing the associated costs.

Next, check the logbook entries. Some maintenance shops have been making log entries saying “flight check required” or something similar, especially now that flight idle fuel flow checks are required every 100 hours. These entries typically require pilot signatures. Make sure the logbook entry is consistent with the work order. I like to also have some accounting of when the next scheduled maintenance comes due, so that I can project my future requirements. For example, if I am completing a 100 hour inspection, it would be poor planning to leave with an AD coming due in another 50 hours.

If you determine that a flight check is required, ensure that the weather is suitable. For example, an NTS flight check should be conducted with a ceiling of at least 5000 ft. so that, in the event of a failed NTS system, plenty of altitude is available to recover and shut the engine down. Also, the flight idle descent requires a descent from 6000 to 4000 ft., which is best accomplished in VFR conditions. (Note: for the flight idle fuel flow check, I recommend performing the check prior to landing when inbound to a 100 hour inspection. This greatly simplifies the signoff and maintenance release process.)

Plan the flight checks to be per-

formed. Do you understand what the indications of a satisfactory or a failed check would be? If the check fails, what troubleshooting could you accomplish to aid the mechanic in resolving your problem? This is the time to jointly develop your test plan with your mechanic.

Determine if you are comfortable with the flight checks to be performed. Many pilots have never performed an NTS flight check, and, although an easy maneuver, the pilot must be thoroughly prepared for an NTS failure, which requires prompt and precise action. If you’ve never accomplished a certain maneuver, fly with a copilot or mechanic who has done it before.

Finally, although not an absolute requirement, I find it to be best practice to remain at your maintenance airport on a local flight instead of conducting a “repositioning” flight test. It’s harder to make the decision to turn around when you are in the mindset of having left for home.

Maintenance flight tests are an integral part of returning an aircraft to service. Not only are these flight checks required by law, but prudence demands that systems essential to your safety should be confirmed to be operating properly. With proper planning, these checks can be conducted with the expectation that your airplane will ultimately depart your maintenance facility in an airworthy condition.

FUNCTIONAL CHECK FLIGHT

A test flight is required after any modification work, repair or component replacement considered relative to safety or which affect

flight characteristics of the airplane. Some of the more obvious reasons for requiring a test flight are listed below as guidelines.

A. Conditions Requiring Functional Check Flight:

7. Removal, repair, replacement, or adjustment of engine, propeller or their components and controls.
8. Removal, repair, or replacement of fuel system components
9. Removal, repair, or replacement of flight control surfaces.
10. Removal, repair, or replacement or adjustment of flight control mechanisms, cables, rods, or torque tubes.
11. Major structural repair or modification.
12. Removal, repair, or replacement of accessories or auxiliary equipment which require in-flight checks or calibration.
13. Removal, repair, or replacement of instruments or navigation equipment.

B. Preflight Requirements:

1. Ground crew preflight inspection per guidelines in this manual.
2. Pilot’s preflight inspection per approved Airplane Flight Manual.

C. In-flight Requirements:

1. Check applicable areas of repair or modification, etc. for normal operation.
2. Check all instruments, controls, and systems for normal operation.

D. Postflight Requirements:

1. Postflight inspection per guidelines in this manual.
2. Correct pilot squawks.

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