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# **SERVICE BULLETIN**

**No. SB-AG-54**

Revision IR; 6/6/2011

**S2R-T660 ELEVATOR**

**PUSH-PULL TUBE END**

**FITTING INSPECTION**

**AIRPLANES AFFECTED: All S2R-T660 Models**

**MODEL**

**SERIAL NUMBERS**

**S2R-T660**

**T660-101 through T660-125 and T660-127**

**REASON FOR THIS PUBLICATION:**

A Thrush S2R-T660 aircraft was severely damaged in a hard landing due to loss of elevator control. The cause of the loss of elevator control was traced to a failure of the elevator push-pull tube forward end fitting. The threaded shaft holding the rod end bearing had broken completely in two. The NTSB examined the broken threaded shaft and concluded that the cause of the failure was metal fatigue (ref. NTSB No. CEN09LA526). The exact cause of the metal fatigue was not determined. The threads of this part are machined and the fatigue crack started at the bottom of the last thread. This suggests that a stress riser was created by an overly sharp cut or by exposing a metal inclusion, and the stress riser lead to the fatigue crack.

Thrush Aircraft, Inc. has redesigned this end fitting to have rolled threads rather than machined threads. The rolling process displaces the material into the desired thread profile, rather than cutting away material to create the threads. Thread rolling has two advantages over machine cut threads: 1) the roots of the threads are not machined and therefore not as sharp, reducing the possibility of producing a stress riser, and 2) displacing the shaft material to form the threads cold works the material and thereby strengthens it.

This Service Bulletin requires replacement of the existing elevator push-pull tube forward end fitting with one having rolled threads, or repetitive inspection of the fitting until it is replaced.

**COMPLIANCE**

This Service Bulletin is considered mandatory for all affected airplanes. The push-pull tube end fitting, P/N 9006-51, must be replaced with end fitting P/N 9006-58 within 25 flight hours, or the threaded shaft of the end fitting must be magnetic particle inspected within 25 flight hours. Thereafter the magnetic particle inspection must be repeated every 100 flight hours until the P/N 9006-58 end fitting is installed.

**BY WHOM WORK WILL BE ACCOMPLISHED:**

The magnetic particle inspection of the end fitting and the end fitting replacement and re-rigging of the elevator control system must be accomplished by an FAA licensed A&P mechanic, or foreign equivalent. The action must be recorded in the airplane log book and signed off by the mechanic.

**APPROVAL:**

This Service Bulletin is approved by Thrush Aircraft, Inc. Proper execution of the Service Bulletin assures that the tube end fitting complies with FAA Approved Type Design Data.

**MAN HOURS:**

Three hours are required for replacing the P/N 9006-51 with the P/N 9006-58 and re-rigging the elevator control system per the maintenance manual. Magnetic particle inspection will require one hour.

**SPECIAL TOOLS:**

If inspecting rather than replacing the part, magnetic particle inspection equipment is required.

**INSPECTION:**

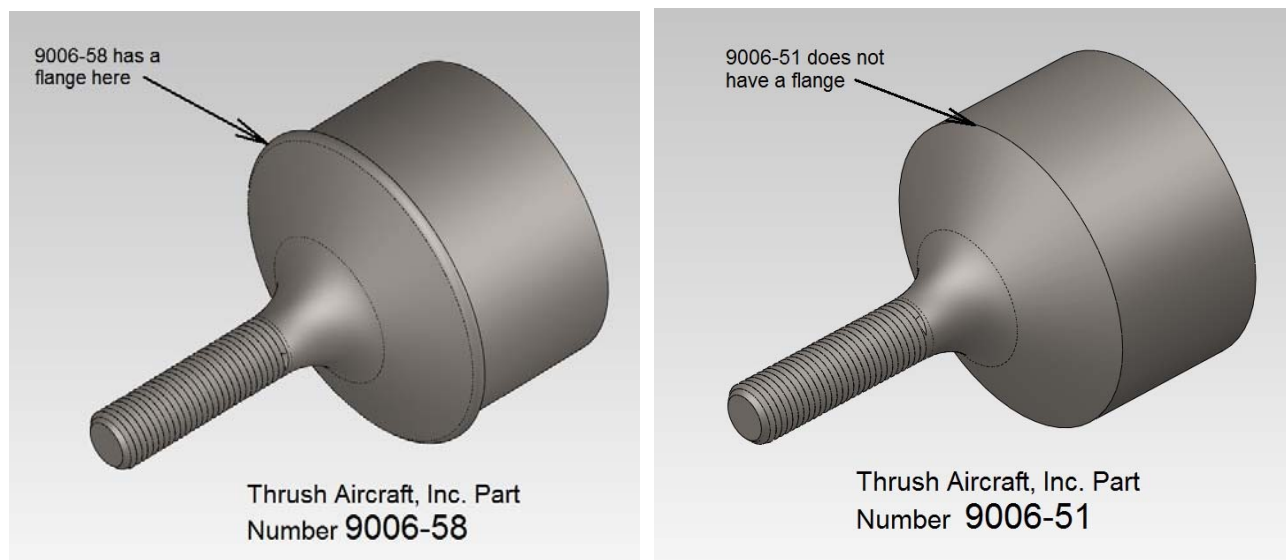
If not replaced, the threaded portion of P/N 9006-51 end fitting must be magnetic particle inspected

within 25 flight hours, and every 100 flight hours thereafter, until replaced with the P/N 9006-58 end fitting. The end fitting may be inspected in place by disconnecting the rod end bearing from the belcrank and backing it and the check nut out so as to expose 8 threads past where it was installed. Screwing the rod end bearing back in after inspection exactly the same number of turns it was backed out will make re-rigging unnecessary.

Magnetic particle inspection must be accomplished according to ASTM E 1444-01, using wet particles meeting the requirements of SAE AMS3046F. If cracks are found the part must be replaced with a serviceable part prior to further flight.

### **REPAIR:**

To replace the existing P/N 9006-51 end fitting with the new P/N 9006-58 end fitting, accomplish the following steps: See illustrations below for visible difference between 9006-58 and 9006-51.



- 1) Remove P/N 9006-51 end fitting from the front end of the elevator push-pull tube:
  - ✓ Disconnect the rod end bearing and check nut from the belcrank and remove it from the end fitting. Note the position of the rod end bearing on the fitting for reference when installing it on the new end fitting.
  - ✓ Remove both AN3-23A bolts holding the tube and end fitting together.
  - ✓ Remove the P/N 9006-51 end fitting from the aluminum tube, being careful not to distort the tube.
- 2) Install the P/N 9006-58 end fitting into the aluminum tube until the end of the tube is snug against the flange of the end fitting.
  - ✓ Being careful that the end fitting does not move in the tube, use a 3/16" transfer punch to mark the end fitting at the center of each of the four holes in the tube.
  - ✓ Remove the end fitting and, using a drill press and vice, drill two opposite marked places 3/16" diameter through one side at a time.
  - ✓ Turn the drill press off and adjust the end fitting in the vice so the drill passes through both holes. It may be necessary to turn the drill press back on briefly to open the top hole slightly so the drill passes through. With the drill press off and the vice loosened slightly, pass the drill bit through the bottom hole. If necessary, when the drill is aligned with the bottom hole, tighten the vice, turn the drill press on, and drill through the bottom hole.

- ✓ Without moving the fitting in the vice, change to a #12 drill bit and line drill through both sides.
  - ✓ Repeat this drilling procedure for the other pair of holes in the fitting.
- 3) Reinstall the end fitting into the tube and align the tube and fitting holes.
- ✓ Install an AN3-23A bolt, with a washer under the head, into each of the aligned holes.
  - ✓ Install another washer and an AN365-1032 nut on the threaded end of the bolts and tighten to 25 to 30 in# of torque.
  - ✓ Torque-stripe both the nut and the head of both bolts.
- 4) Reinstall the check nut and rod end bearing on the new end fitting to the approximate position where it was on the old end fitting. Do not tighten the check nut yet.
- ✓ Rig the elevator control system per the S2R-T660 maintenance manual.
  - ✓ Tighten and torque-stripe the check nut to the rod end bearing and tube end fitting.

**PARTS LIST:** (parts are available through your local Approved Thrush Repair Center).

| <u>QTY</u> | <u>P/N</u> | <u>DESCRIPTION</u>         |
|------------|------------|----------------------------|
| 1 ea.      | 9006-58    | Push-Pull Tube End Fitting |
| 2 ea.      | AN3-23A    | Bolt                       |
| 2 ea.      | AN365-1032 | Nut                        |
| 4 ea.      | AN960-10   | Washer                     |

**RECORD OF COMPLIANCE:**

Make the appropriate entry in airplane maintenance records as follows:

**EITHER:**

"Push-Pull Tube End Fitting P/N 9006-51 was replaced on the elevator push-pull tube (P/N 9006-54 or 9006-55) with Push-Pull Tube End Fitting P/N 9006-58 per SB-AG-54 Rev. IR at \_\_\_\_\_ total hours on aircraft. Accomplished by: \_\_\_\_\_

(name & certificate #)

(date)

P/N 9006-51 was found to be: cracked ." **or** "not cracked .

**OR:**

"Thrush Service Bulletin SB-AG-54 Rev. IR inspection requirement complied with at \_\_\_\_\_ total hours on aircraft. \_\_\_\_\_ No crack was found.

(name & certificate #)

(date)

**COMPLIANCE CONFIRMATION:**

The final step in compliance with this Service Bulletin is to notify Thrush Aircraft, Inc. that tube end fitting P/N 9006-51 has been replaced by P/N 9006-58 **OR** that the 9006-51 end fitting has been magnetic particle inspected and what the results were. Please copy, scan or photograph the record of compliance from the maintenance log book and send it as follows:

FAX to: Greg Moreland, QC Manager

229-439-9790

E-mail to: Greg Moreland, QC Manager

[gmoreland@thrushaircraft.com](mailto:gmoreland@thrushaircraft.com)

**NOTE:** Thrush Aircraft, Inc. would appreciate the return of any cracked P/N 9006-51 end fitting. Please contact Jody Bays (see below) for return instructions.

**THRUSH AIRCRAFT FACTORY CONTACT:**

Questions about this Service Bulletin should be directed to:

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