



SAFETY DIRECTIVE 00001

Date Released:	July 8, 2020 (Revision 1 – Added servo tray identification) May 14, 2020 (Initial Release)
Date Effective:	July 8, 2020
Subject:	Pitch trim assembly inspection and modification
Affected Models:	RV-12, RV-12iS SLSA: Serial Numbers 12001 to 12086 ELSA: Any aircraft including an Empennage Kit shipped on or before 05/12/2020
Required Action:	Inspect the pitch trim motor shaft for straightness. Determine the model number of the installed trim motor. Determine the part number of the installed servo tray. Examine and ensure the F-1294B-1 lower tailcone fairing does not contact the trim servo linkage. If an ES MSTs-T3-7A-2 trim unit is installed, replace with the newer model unit, bushing, and F-1287A-1 Servo Tray once the life limit is reached, per the time of compliance below. Bag 2670 is also required. If an ES MSTs-B6-7T-165 is installed with F-1287A-1, add part BUSH-BS.188X.313X.222 per the time of compliance below. If an ES MSTs-B6-7T-165 is installed with F-1287A, replace F-1287A with F-1287A-1, and add part BUSH-BS.188X.313X.222 per the time of compliance below. Bag 2670 is also required.
Time of Compliance:	Aircraft with ES MSTs-T3-7A-2: Inspect the trim motor shaft for straightness before further flight. Replace if bent or if trim unit time in service exceeds 1000 flight hours. Aircraft with ES MSTs-B6-7T-165 and F-1287A-1: Inspect the trim motor shaft for straightness before

further flight. Van's recommends installing BUSH-BS.188X.313X.222 at or before the next annual condition inspection and mandates its replacement if bent or if trim unit time-in-service exceeds 1000 flight hours.

Aircraft with ES MSTS-B6-7T-165 and F-1287A: Inspect the trim motor shaft for straightness before further flight. Van's recommends replacement of F-1287A with F-1287A-1 and installing BUSH-BS.188X.313X.222 at or before the next condition inspection and mandates replacement of trim motor and tray and installing the bushing if shaft is bent, or if trim motor time-in-service exceeds 1000 flight hours.

Supersedes Notice: SD-00001 Initial Release

Labor Required / SLSA Warranty Allowance: 2.5 Hours

Level of Certification: SLSA: LSA Repairman Maintenance or A&P
ELSA: Owner (certification not required)

Synopsis:

A high-time aircraft operated in a training environment experienced a complete failure of the pitch trim motor shaft, which resulted in a disconnected stabilator anti-servo tab while in-flight. The aircraft landed safely without damage after the failure.

The Emergency Procedures section of the RV-12/12iS POH describes what may happen in the event of a trim tab failure: "Pitch forces will become very light, nonexistent or even self-driven. Pitch control commands will need to be based solely on visual pitch attitude and Indicated Airspeed references, not on normal control stick pressures."

For this reason and considering the limited experience of students and pilots in emergency maneuvering flight, this service information has been released in the form of a Safety Directive, which is mandatory in nature.

The described failure occurred in the threaded portion of the trim motor shaft, flush with the nut that tightens against the clevis. See Figure 1 below.

Van's Aircraft contracted a laboratory to perform a mechanical failure analysis and material testing. Using data from those test as well as known RV-12 structural loads, Van's Aircraft designed a fatigue test to replicate real-world loading conditions and evaluate the trim motor components.

Test results for a properly installed trim motor were inconclusive. Other components of the system failed before the shaft after an unrealistically high number of cycles, at maximum load.

A test was then conducted in which the shaft was bent prior to starting the load cycle test. The bent shafts failed after a very high number of cycles at maximum load, in a manner similar to the failure of the trim motor in the field. As a result, Van's has determined that all trim motor shafts must be inspected for straightness before further flight. If the shaft is found to be bent, the trim motor unit must be replaced. A bent shaft should not be straightened and left in service. Analysis has shown that once a shaft is bent, small microcracks can occur in the base of the threads, which would eventually grow and result in a complete failure of the shaft.

Note that normal operational aircraft loading does not cause the shaft to bend. Damage to the shaft could potentially occur during assembly or inspection of the aircraft (for example, due to the application of a side load or if the trim motor was dropped) or if an individual pushed on the anti-servo tab with significant and substantial force (note that this area is marked "NO PUSH" via a placard located on the AST).

To resolve this potential risk, a bushing must be installed between the clevis and the shoulder on the ES MSTS-B6-7T-165 trim motor shaft. This bushing will transfer any bending load in the clevis safely to the shoulder of the shaft, which will prevent the threaded portion of the shaft from flexing and potentially fatiguing locally at the thread behind the nut. Van's strongly recommends installation of this bushing before or at the next condition inspection, and mandates that it be installed no later than 1,000 hours time in service.

If ES-MSTS-B6-7T-165 was installed in a F-1287A Servo Tray during a previous servo replacement, stabilator to anti-servo tab interference will result if the described bushing is installed. Therefore, F-1287A must be replaced by F-1287A-1 when the bushing is installed. To identify F-1287A-1 see Figure 3 below.

Older ES MSTS-T3-7A-2 trim motors incorporate a shaft without a shoulder. In addition, the entire shaft is threaded. As a result use of the new bushing mentioned above is not applicable. Through this Safety Directive, Van's is instituting a 1000-hour time-in-service life limit on the ES MSTS-T3-7A-2 trim motor design when installed in the RV-12/12iS. This limit is based on the results of the extensive fatigue testing that was conducted at Van's Aircraft. Any aircraft incorporating this older trim motor unit where the shaft is bent or the unit has reached 1000 hours accumulated flight time in service is directed to replace the unit with part number ES MSTS-B6-7T-165, F-1287A-1 Servo Tray, and bushing described in this document. The manufacturer of the trim motor unit, Ray Allen Company, has established a lower-cost return/exchange program for RV-12/12iS customers with a damaged or timed-out T3-7A trim unit. Cost to the owner is \$90 plus shipping. You may contact info@rayallencompany.com to arrange an exchange.

Van's staff also examined the potential for the trim servo linkage to contact the bottom of F-1294B-1 Lower Tailcone Fairing due to a misplaced or missing Trim Servo Linkage Hole (See KAI 12iS/U-10 for the RV-12iS and KAI 12-10 for the RV-12). Van's analyzed this scenario using FEA (Finite Element Analysis) tools. The analysis showed that in an incorrect installation where contact is allowed a significant increase in stress levels could occur and further reduce the fatigue life of the shaft. Therefore, the assembly should be checked to confirm the linkage is not contacting the fairing. This should be verified any time the fairing is removed and reinstalled.

Empennage kits shipped from Van's Aircraft after the release date of this service bulletin are not affected by this service bulletin.

Materials Required:

The following materials are required to complete the steps necessary to achieve compliance with this Safety Directive.

Qty 1 BUSH-BS.188X.313X.222

Qty 1 AN315-3R

Additional Materials Required for ES MSTS-T3-7A-2 Installations:

Qty 1 F-1287A-1 SERVO TRAY

Qty 1 Bag 2670

Method of Compliance - ES MSTS-T3-7A-2 installations:

NOTE: Download the latest version of KAI Section 11iS/U from the RV-12iS service information page.

Step 1: Remove the F-1294A Upper Tailcone Fairing and F-1294B-1 Lower Tailcone Fairing. See KAI Section 12 for the RV-12 or KAI Section 12iS/U for the RV-12iS.

Step 2: Inspect the threaded portion of the trim motor shaft. Determine if the shaft is bent. See Figure 1 below and KAI Section 11 for the RV-12 or KAI Section 11iS/U for the RV-12iS. If the shaft is bent, remove and replace the trim motor, add the bushing and replace F-1287A servo tray with the F-1287A-1. If the trim motor has accumulated 1000 hours time in service, replace the trim motor and tray with part number ES MSTS-B6-7T-165 and F-1287A-1, add the bushing, and ensure installation is compliant with the remaining steps in this document below.

Method of Compliance - ES MSTS-B6-7T-165 installations:

NOTE: Download the latest version of KAI Section 11iS/U from the RV-12iS service information page.

Step 1: Remove the F-1294A Upper Tailcone Fairing and F-1294B-1 Lower Tailcone Fairing. See KAI Section 12 for the RV-12 or KAI Section 12iS/U for the RV-12iS.

Step 2: Inspect the threaded portion of the trim motor shaft. Determine if the shaft is bent. See Figure 1 below and KAI Section 11 for the RV-12 or KAI Section 11iS/U for the RV-12iS. If the shaft is bent, remove, and replace the trim motor.

Step 3: Disconnect the trim motor electrical connector (D-sub or Micro Molex) as shown on KAI Section 11 or KAI Section 11iS/U.

Step 4: Using KAI Section 11 or KAI Section 11iS/U remove the servo tray connections to the aft tailcone bulkhead.

Step 5: Remove the trim servo and tray from the clevis rod end. Save the AN315-3R nut.

Remove the clevis rod end from the Trim/Servo Pushrod Assembly. See KAI Section 11 or KAI Section 11iS/U.

NOTE: Excess or incorrect application of threadlocker can inhibit the proper operation of the trim motor. It is important to refer to 11iS/U-07 Rev 2 or higher for proper application of threadlocker and a test procedure.

Step 6: Using the new KAI Section 11iS/U downloaded from the Van's Aircraft web site install the BUSH-BS.188X.313X.222 and clevis rod end onto the ES MST5-B6-7T-165 Trim Motor shaft. If the F-1287A Servo Tray was previously being used it must now be replaced with the F-1287A-1 Servo Tray. Re-attach the clevis rod end to the Trim/Servo Pushrod Assembly.

Step 7: Repeat Steps 3, 4 and 5 in reverse order to reassemble the aircraft.

Test the trim motor for proper function by following the steps in Section G2 of the Production Acceptance Procedures (PAP).

After verifying the proper function reinstall the empennage fairing per Step 1 of this document. Check that the Trim/Servo Pushrod Assembly does not contact the bottom of F-1294B-1 Lower Tailcone Fairing due to a misplaced or missing Trim Servo Linkage Hole. See KAI 12iS/U-10 for the RV-12iS and KAI 12-10 for the RV-12.

Step 8: Make a logbook entry indicating compliance with SD-00001 Rev 1 per the requirements of the controlling authority.

Place a copy of this notification in the back of the maintenance manual for your aircraft. Note the addition of this notification to the bottom of the Maintenance Manual table of contents.

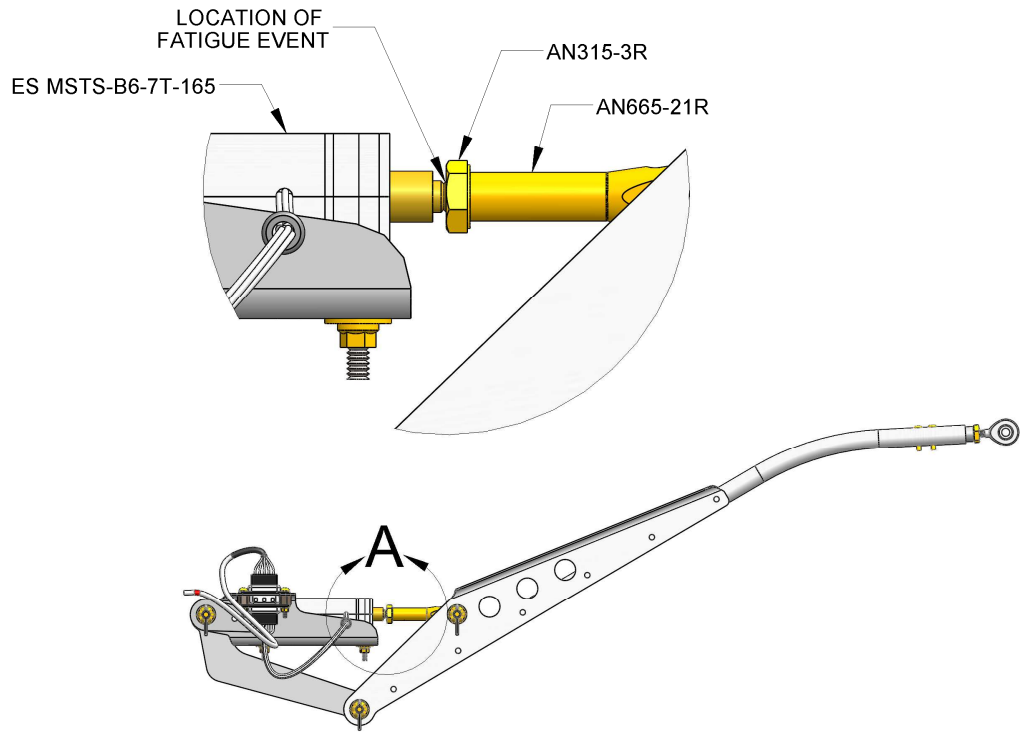


FIGURE 1: FATIGUE LOCATION

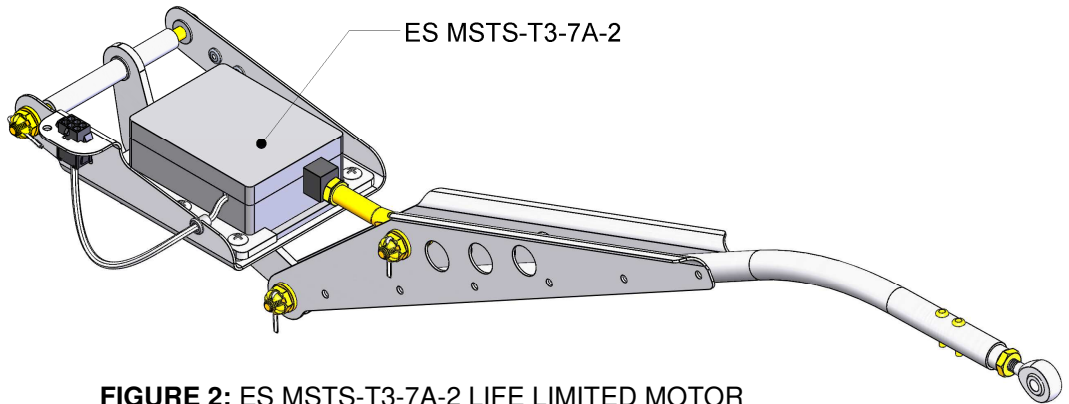


FIGURE 2: ES MSTs-T3-7A-2 LIFE LIMITED MOTOR

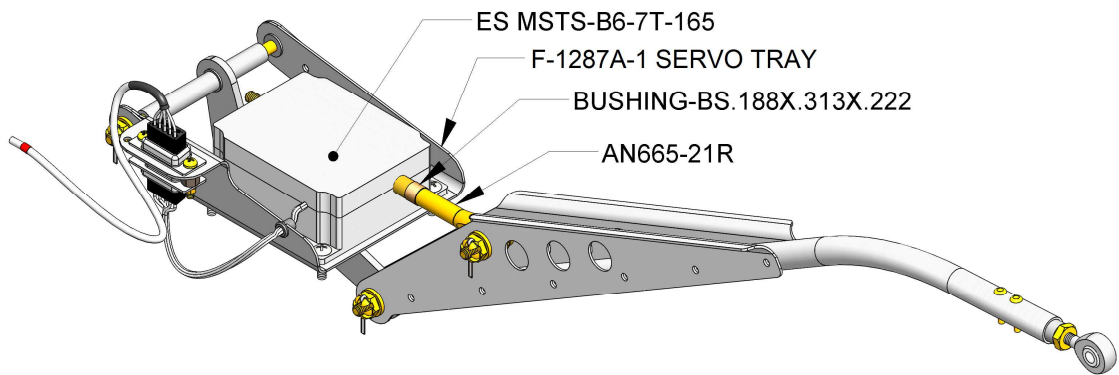


FIGURE 3: MODIFIED CONFIGURATION