



## **Installation Instructions, Stabilizer Hinge Brackets**

**Caution:** Proper alignment of the Inboard Stabilizer Hinge Brackets is critical to ensure proper horizontal stabilizer alignment and function. Improper inboard bracket alignment can cause misalignment of the stabilizer, causing it to bind during operation, preventing correct trim system function and adding stress into the structure. Additionally, the Tailcone Reinforcement Angle (a.k.a. “hockey stick”) should either be replaced with the QMI [TAIL CONE ANGLE KIT](#) (STC SA02522AK, if eligible) or with new OEM parts. This ensures that the main hinge structural components are starting with low or no fatigue cycles.

For the same reason, McFarlane recommends changing both inboard brackets even if only one inboard bracket appears to be defective. Do not remove the inboard bracket and the tailcone reinforcement angle at the same time.

**Note:** These installation instructions are written assuming McFarlane TOOL136, Stabilizer Bracket Installer is being used. Proper positioning and alignment of the inboard bracket(s) may be much more difficult without it, as its Alignment Spacers maintain proper hinge bracket spacing. If proper inboard bracket alignment is not maintained, the horizontal stabilizer could bind and the trim system would not function correctly. Additionally, TOOL136 is designed to install McFarlane inboard bracket P/Ns MC0712302-1 & -2 on various eligible Cessna 180, 182, and 185 models. TOOL136 may work to install other inboard brackets on other models, but such capability has not been explicitly designed into it.

The cognizant installer may need to adapt this process to facilitate proper positioning and alignment of TOOL136 and replacement inboard brackets on aircraft tailcone structures being repaired from states of significant damage and/or misalignment.

### System Description and Nomenclature

The Inboard Stabilizer Hinge Brackets are shown in **Figure 1** and again in **Figure 5** (left image). They are part of the structure that attaches the aft side of the horizontal stabilizer to the tailcone. All eligible aircraft use jackscrews at the forward side of the horizontal stabilizer that move the leading edge up and down to trim the aircraft. An AN4-11A bolt (AN4-10A on the earliest models) through the Inboard Stabilizer Hinge Bracket and the Tailcone Reinforcement Angle attach the Stabilizer Hinge Assembly to allow the hinging action necessary for this trim system to function.

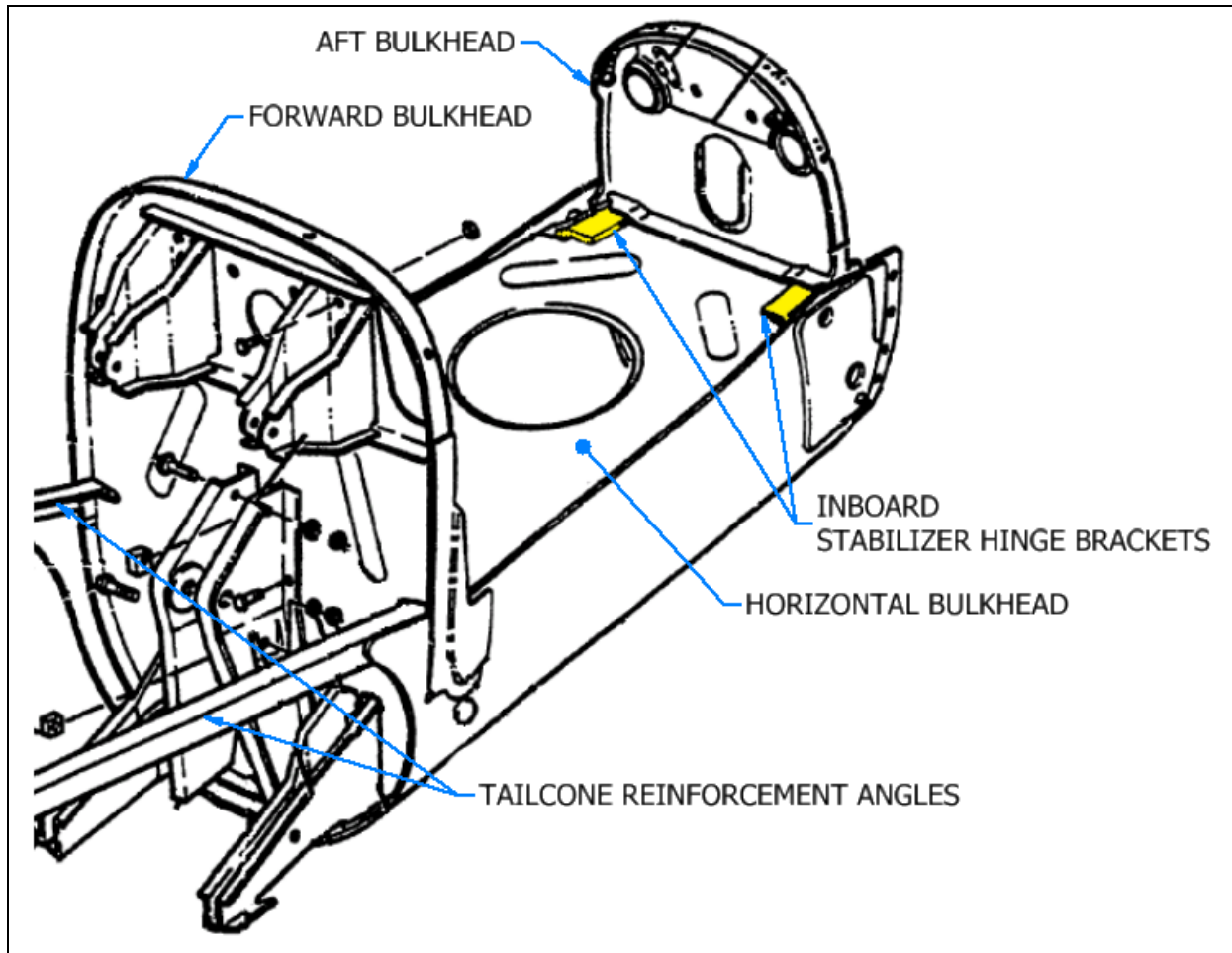
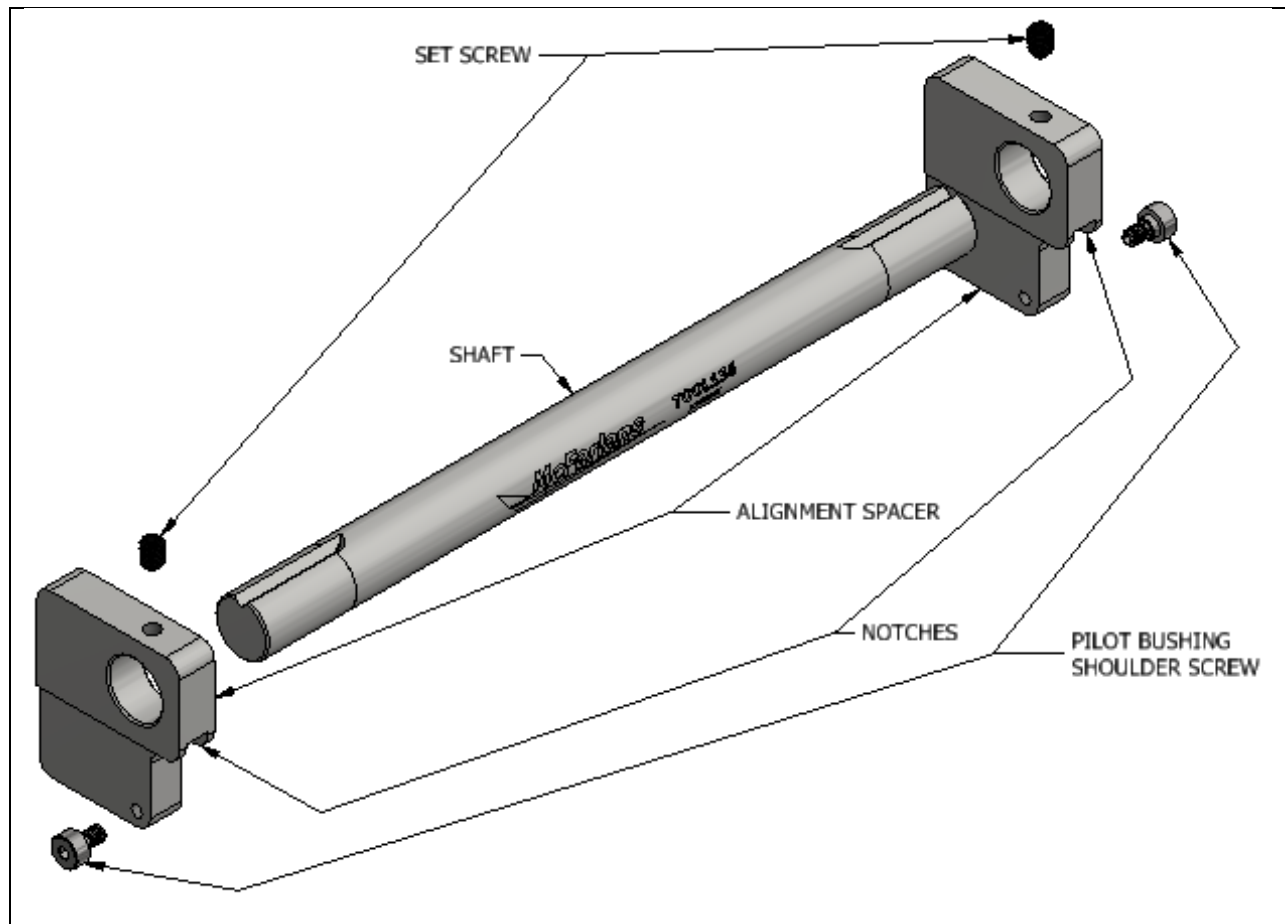


Figure 1: Tailcone and Nomenclature

## Overview: McFarlane TOOL136, STABILIZER BRACKET INSTALLER

McFarlane TOOL136 (**Figure 2**) is designed to facilitate proper positioning and alignment of the Inboard Stabilizer Hinge Brackets. It can also be used to help position and align the splices in the QMI TAIL CONE ANGLE KIT (STC SA02522AK). It consists largely of a shaft and two Alignment Spacers that ride on the shaft. This tool also effectively serves as a stand-in for the aircraft's stabilizer during inboard bracket installation, mimicking the spacing and thicknesses of the stabilizer hinges.



**Figure 2: TOOL136 Subcomponents**

After the horizontal stabilizer is removed, the Alignment Spacers are adjusted along the shaft until their notches can be aligned with the hinges on the stabilizer. This is most easily accomplished by flipping the stabilizer upside down and placing it on a secure work surface. Then, the set screws are tightened to lock the Alignment Spacers in place. The threaded holes in the Alignment Spacers become aligned once the set screws are tightened into the shaft grooves.

After TOOL136 is in place the inboard bracket can be positioned and the shoulder screw used as a drill guide for a pilot hole in the inboard bracket.



## Inboard Bracket Replacement Steps

**Note:** In addition to replacing the Inboard Stabilizer Hinge Brackets, these steps cover repair of the Tailcone Reinforcement Angle with the QMI TAIL CONE ANGLE KIT (STC SA02522AK), as damage to the Tailcone Reinforcement Angles often precedes damaged Inboard Stabilizer Hinge Brackets.

If the Tailcone Reinforcement Angles have already been replaced with the QMI TAIL CONE ANGLE KIT (STC SA02522AK) and are in good alignment per **Step 2**, then skip to **Section 4** after performing **Step 2**.

### **1. Gain access to the Inboard Stabilizer Hinge Brackets.**

- Gaining access to the Inboard Stabilizer Hinge Brackets is slightly different across aircraft models. This will require removal of many other components (like the horizontal stabilizer), which is not covered by these instructions. See Textron Single Engine Service Letter SEL-55-01 for this information.
- The aircraft must be securely supported during this entire process – especially tailwheel aircraft.
- **Note:** Upon accessing the Inboard Stabilizer Hinge Brackets, McFarlane recommends inspecting the area per Textron Single Engine Service Letter SEL-55-01, addressing any issues as required.

### **2. Set the width of the TOOL136 Alignment Spacers.**

- As noted in the Overview of these instructions, the TOOL136 Alignment Spacers must be aligned to the width of the stabilizer's hinges. This is easier to accomplish with the stabilizer flipped upside-down.
- To do this, loosen the set screws slightly, then slide them along the shaft until their notches align with the hinges. Approximately center the shaft, then tighten the set screws.
  - **Figure 3** (next page) shows how the notches should be aligned over the hinges on the stabilizer. This figure shows the hinges mounted to a flat plate; the actual stabilizer may require the tool to be shimmed or tilted to engage the notches on the hinges.
- Thickness of the stabilizer hinges will vary and fit the notches in the TOOL136 Alignment Spacers differently. The objective of **Step 2** is to adjust the Alignment Spacers so they are approximately centered with the stabilizer hinges.



**Figure 3: Setting Alignment Spacers' width**

Proceed with **Section 3** if:

- The Tailcone Reinforcement Angles (a.k.a. “hockey sticks”) are to be replaced, AND
- The Inboard Stabilizer Hinge Brackets are to be replaced.

Proceed with **Section 4** if:

- The Tailcone Reinforcement Angles (a.k.a. “hockey sticks”) have been recently replaced with the QMI [TAIL CONE ANGLE KIT](#) (STC SA02522AK, if eligible) or with new OEM parts, AND
  - These parts are in good alignment, spacing, and condition.
    - To check the alignment and spacing, insert TOOL136 (set to width per **Step 2**) in between the angles or splices, as applicable, then insert a Shoulder Screw Drill Bushing in through one angle or splice and then thread it into the Alignment Spacer.
    - On the other side, insert a Shoulder Screw Drill Bushing in through the other angle or splice and then thread it into its adjacent Alignment Spacer.
    - If the second Shoulder Screw Drill Bushing:
      - Threads in readily and both Alignment Spacers are touching the angle or splice as seen in **Figure 4**, then the alignment and spacing are acceptable.
      - Is not able to be threaded in or if TOOL136 must be firmly pushed/pulled to align the holes prior to threading it in, or if the Alignment Spacers are not contacting both angles/splices, then adjustment or replacement of the tailcone reinforcement angle or QMI kit is required.
- If the QMI kit was installed recently, then determine which splice to replace per **Step 3.2** and contact McFarlane for a standalone replacement splice piece.

If only the QMI Tail Cone Angle Kit is to be installed, then follow the instructions that come with that kit. TOOL136 may be used with its shoulder screws installed on the inside of the Inboard Stabilizer Hinge Brackets (opposite of that shown in **Figure 4**) to help ensure the spacing and alignment between the inboard brackets and the QMI kit are correct.



### **3. Instructions for installing the QMI Tail Cone Angle Kit just prior to replacing the inboard brackets**

#### **3.1. Install the QMI Tail Cone Angle Kit on one side**

- Follow the QMI Tail Cone Angle Kit installation instructions to install the reinforcement splice on one side.
  - **Note:** It is preferable to start with the side whose Inboard Stabilizer Hinge Bracket is in the best condition, position, and alignment.

#### **3.2. Temporarily install the QMI Tail Cone Angle Kit on the other side and align TOOL136**

- On the other side, cut the old and/or damaged Tailcone Reinforcement Angle per the QMI kit instructions.
- Temporarily install the reinforcement splice on the other side, as with clamps or Cleco fasteners.
- With TOOL136 set to the stabilizer hinge spacing (see **Step 2**), attach it to the reinforcement splice that was installed in **Step 3.1**.
- Using various tools such as a bubble protractor and standard measuring equipment, adjust the position of the TOOL136 Shaft so that it is pointing directly across the aircraft. The Shaft must be parallel to the rear bulkhead, and laterally aligned with the aircraft's leveling surface.
  - **Note:** This step is important to establish the position of the second pivot location and ensure that the stabilizer is not positioned askew.
- Before drilling the pivot hole in the second reinforcement splice, perform checks and measurements as appropriate to ensure the horizontal stabilizer will be positioned properly in the aircraft and will pivot properly without binding or contacting obstructions.

#### **3.3. Fully install the second reinforcement splice**

- Working on the second side, remove the Inboard Stabilizer Hinge Bracket.
- Again working on the second side, install the TOOL136 shoulder screw into the Alignment Spacer from the inside-out.
- Using the shoulder screw as a drill guide, drill a pilot hole through the reinforcement splice from the inside-out.
- Expand the hole per the QMI instructions.

#### **3.4. Install the Inboard Stabilizer Hinge Brackets**

- Follow the steps in **Section 4** to install both Inboard Stabilizer Hinge Brackets.



## 4. Instructions for replacing the Inboard Stabilizer Hinge Brackets

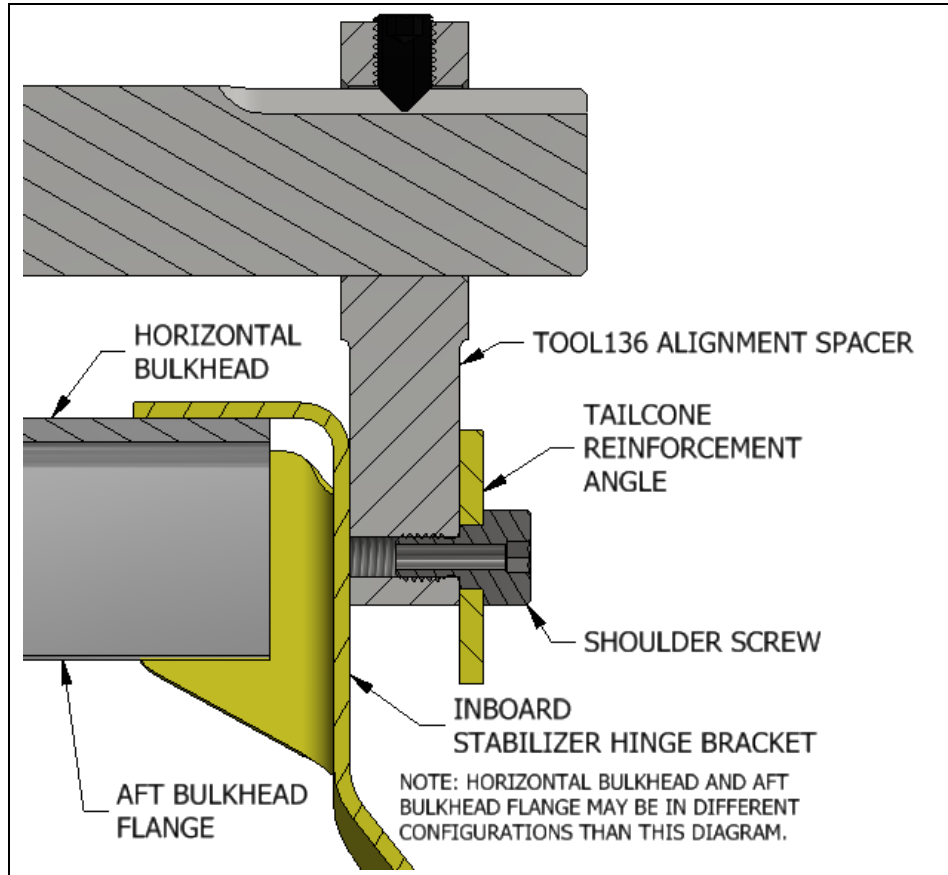
### 4.1. Removal of old inboard bracket

- Start on the side of the tail that is in the worst condition and alignment, as it will be aligned with the other, better-condition side.
  - **Note:** This does not apply if the steps in **Section 3** were just performed.
- Remove the old Inboard Stabilizer Hinge Bracket, noting the rivet diameters and head types as they are removed. Remove one inboard bracket at a time if replacing both. Discard inboard bracket(s) after replacement is complete.
- FAA AC 43.13-1B, Table 4-8 can be used to help identify the rivets. This document can be downloaded from the following FAA website. [https://www.faa.gov/regulations\\_policies/advisory\\_circulars/](https://www.faa.gov/regulations_policies/advisory_circulars/)

### 4.2. Inboard bracket Insertion and Initial TOOL136 Positioning

- Fit the new inboard bracket into place loosely, without clamping.
- Deleted.
- Insert TOOL136 in place in the tailcone with the Alignment Spacers just inboard of the tailcone reinforcement angles. The offset of the Alignment Spacers must be oriented forward.
- Insert each shoulder screw through the hinge bolt hole in the tailcone reinforcement angle and screw them into the TOOL136 Alignment Spacers as shown in **Figure 4**.

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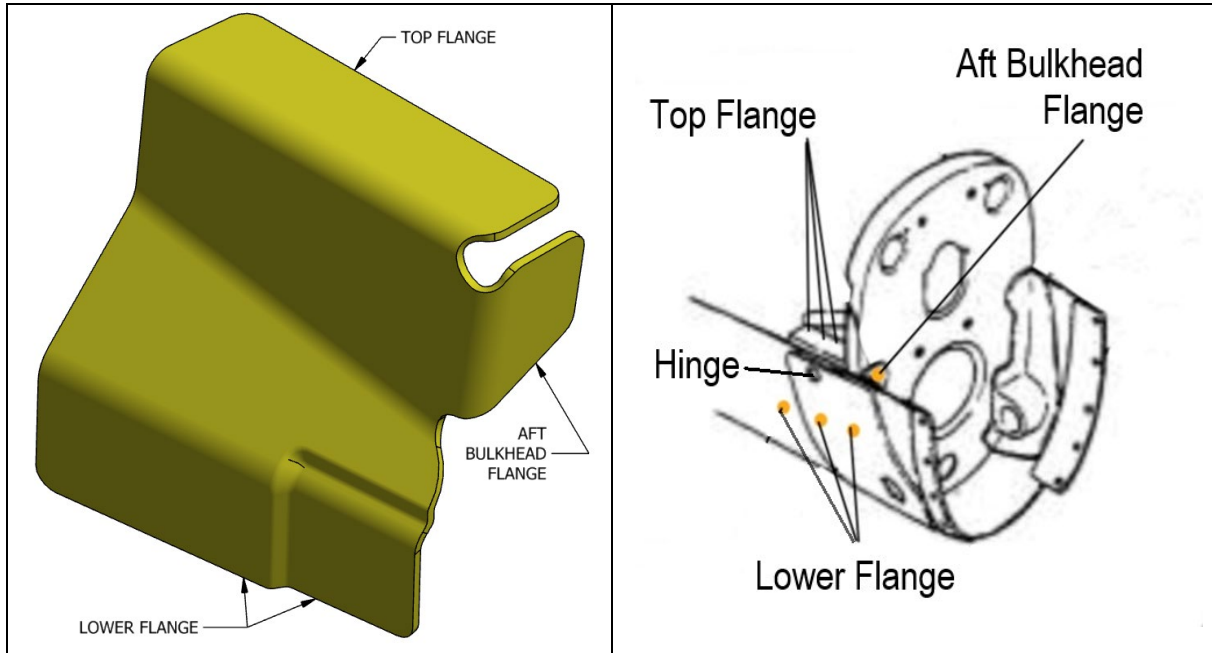


**Figure 4: TOOL136 and Inboard Bracket Positioning (left side, looking aft, skin & aft bulkhead not shown)**

#### 4.3. Inboard Bracket Positioning and Marking

- Position the Inboard Stabilizer Hinge Bracket in place. Its side face must be vertical, held against the Alignment Spacer (see **Figure 4**), ideally 90° to the horizontal bulkhead AND 90° to the aft bulkhead.
  - In other words, the Inboard Stabilizer Hinge Bracket's outboard face must fit flat to the TOOL136 Alignment Spacer, as shown in **Figure 4**.
  - Any minor fitment adjustments to flanges must not affect the side face's positioning.
- The inboard bracket's top flange rests on top of the horizontal bulkhead. Its lower flange contacts the skin and the aft bulkhead flange, and the inboard bracket's aft flange goes against the aft bulkhead. If the original removed inboard bracket's aft flange was in between the horizontal bulkhead's flange (if equipped) and the aft bulkhead, then install the replacement inboard bracket the same way.
- After the inboard bracket is firmly held or clamped in place, mark it for all of its fastener holes (but not the hinge bolt hole). This will likely require reaching through the aft bulkhead.





**Figure 5: Inboard bracket Nomenclature (left side shown)**

- The horizontal bulkhead (**Figure 1**, with large circular hole), if it was removed, will need to be reinstalled with Cleco fasteners so holes on the inboard bracket's top flange can be marked.
- Aft tailcone bulkhead stiffeners (not visible in **Figure 1**), if removed, will likely need to be reinstalled with Cleco fasteners so the hole on the inboard bracket's aft bulkhead flange can be marked.
  - **Note:** The configuration of stiffeners varies across eligible aircraft models.

#### **4.4. Inboard Bracket Mounting Hole Drilling, Reaming, and Deburring**

- Remove the Inboard Stabilizer Hinge Bracket and with a #40 (0.0980") drill bit, pilot drill the marked holes in the top flange.
  - **Note:** TOOL136 may need to be removed before removing the inboard bracket.
- Upsize said holes with a #21 (0.1590") drill bit, then countersink as required using a 100° countersink bit.
- Reinsert the inboard bracket and Cleco in place. Hold or clamp the other flanges as before.
  - **Note:** If TOOL136 was removed, reinstall it and align the inboard bracket to it before attaching Clecos.
- Pilot drill the lower holes, then upsize using a #21 (0.1590") drill bit and Cleco in place.
- Pilot drill rear hole and upsize with a #30 (0.1285") drill bit if a 1/8" rivet is to be used, or upsize with a #21 (0.1590") drill bit if a 5/32" rivet is to be used.
- Deleted.
- Remove part from aircraft and deburr the inboard bracket.



#### 4.5. Inboard Bracket Installation

- With TOOL136 still in place, install inboard brackets using solid shank rivets of identical material and diameter.
  - In most cases, this will be MS20470AD series universal head and MS20426AD series countersunk 100° head rivets. Per the service manuals, the next larger diameter is to be used if the original hole is enlarged, deformed, or otherwise damaged.

#### 4.6. Inboard Bracket Hinge Hole Drilling and Reaming

- Using the hole in the shoulder screw as a guide, pilot drill the hinge bolt hole using a #40 (0.0980") drill bit.
- Remove TOOL136.
- Enlarge the hinge bolt hole, first drilling it undersize with a C (0.2420") or 6mm (0.2362") drill.
- Finish the hole with a 1/4" ream.
- Perform a light deburring of the hole in the inboard bracket and, as needed, the hole in the tailcone reinforcement angle.

#### 4.7. Completion

- With the previous step complete, the inboard bracket is installed. Repeat these steps in **Section 4** to install a new inner bracket on the other side.
  - **Note:** After both inner brackets are replaced, it should be possible to insert a ¼" diameter (or slightly undersize) rod completely through both tailcone reinforcement angles and both inboard brackets without much difficulty. This indicates the axes of the bolt holes on both the left and right sides are aligned. Proper alignment of the hinge axis will reduce stress induced in the connections and facilitate smooth stabilizer operation.

– END –