



SUBJECT: Outboard Empennage Attach Fittings on some production M20R and M20TN Aircraft and procured through Mooney Service Parts.

MODELS/ SN Mooney M20R - Serial Numbers 29-0513 thru 29-0519

AFFECTED: Mooney M20TN - Serial Numbers 31-0101 thru 31-0127

Procured Parts - Serial Numbers M20M 27-0057, M20R 29-0141, M20C 2313, M20E 761

TIME OF COMPLIANCE: **WITHIN NEXT 10 HOURS OF FLIGHT**

INTRODUCTION: During Post-Hibernation inspection of production line aircraft, three outboard empennage attach fittings, were found to be out of tolerance. These attach fittings are used on current production M20R and M20TN Airplanes, as well as through the Mooney Service Parts Department. We are issuing this Service Bulletin because we have determined these parts are not manufactured to Mooney's Type Design. This will require an inspection, and if found to be discrepant, corrective action taken. **The attached compliance card needs to be filled out and returned to Mooney International Corporation upon completion of this Service Bulletin M20-318.**

INSTRUCTIONS: **Read entire procedures before beginning work.**

NOTE:

All work to be done in accordance with FAA AC43.13-2B.

STEP 1 - Empennage Outboard Attach Fitting(s) - Inspection:

- 1.1. Turn master switch - OFF.
- 1.2. Remove LH and RH empennage fairing and inspection panel(s).
- 1.3. Remove empennage assembly per applicable Mooney Service and Maintenance Manual, (refer to Chapter 53). Stow empennage onto a cradle making sure assembly is properly secured while performing the work described in this service bulletin.
- 1.4. Measure thickness of each outer empennage attach fittings 350061-007 (LH) and 350061-008 (RH) with an appropriate micrometer or caliper. The thickness requirements are .190" +/- .010" (refer to Figure SB M20-318-2).
- 1.5. If both attach fittings are within tolerance, proceed to STEP 1.7 of this service bulletin.
- 1.6. If one or both attach fittings are out of tolerance, proceed to STEP 2 of this service bulletin.
- 1.7. Reinstall Empennage Assembly per applicable Mooney Service and Maintenance Manual refer to Chapter 53 with new mounting hardware found in the M20-318-001 Service Bulletin kit. Shim as required with NAS1149F0463P and NAS1149F0432P Washers. One minimum each end of 914081-003 Bushings, 3 total maximum per side (refer to Figures SB M20-318-1 & 2) - Proceed to Step 2.9 of this Service Bulletin.

STEP 2 - Empennage Outboard Attach Fitting(s) - Removal and Replacement:

- 2.1. Remove tailcone fairing by drilling out Avex rivets 1691-0410 per section 51 of the applicable Mooney Service and Maintenance Manual, (refer to Figures SB M20-318-1 & 3).
- 2.2. Remove tailcone skin rivets MS20470AD (as required) to access the empennage attach fittings per section 51 of the applicable Mooney Service and Maintenance Manual, (refer to Figures SB M20-318-1 & 3).

CAUTION:

Take care when removing existing rivets or huck bolts with a drill bit or huck collar splitter tool, do not damage or distort existing holes - Do not crease or bend tailcone skin when accessing attach fittings.



- 2.3. Using a huck collar splitter or equivalent tool, carefully cut and remove the existing huck bolt/collars (qty 5 per side) and MS20470AD rivets (qty 5 per side) to remove outer attach fitting(s).
- 2.4. Using the new parts from either the M20-318-002 and/or -003 kit, match drill all components to existing structure, per section 51 of the Mooney Service and Maintenance Manual (refer to Figures SB M20-318-1 & 2). It may be necessary to install AN174-20A mounting bolt, 914081-003 Bushing and NAS1149F0463P washers and/or NAS1149F0432P washers as required to keep attach fitting alignment while match drilling for huck bolt and rivet holes, use cleco fasteners as required.

NOTE:

All work to be done in accordance with FAA AC43.13-2B. Verify and adjust mounting hardware grip lengths as required.

- 2.5. Secure new parts with new rivets MS20470AD (qty 5 per side), Hi-Lok® P/N HL20PB5-10 Pins and HL86-5 collars (qty 4 per side) and Hi-Lok® HL20PB5-9 Pins and HL86-5 collars (qty 1 per side) into place as required, per the Hi-Lok® Installation instructions (refer to Figures M20-318-1 & 3).

CAUTION:

When securing new outboard attach fittings (Match Set), it is critical to ensure proper alignment with existing empennage attachment bolt holes.

- 2.6. Visually inspect all MS20470AD rivets and (10) Hi-Lok® fasteners to insure they are properly secured.
- 2.7. Reattach tailcone skin with new MS20470AD rivets and the tailcone fairing using 1691-0410 rivets as required per section 51 of the applicable Mooney Service and Maintenance Manual, (refer to Figures SB M20-318-1 & 3).
- 2.8. Reinstall Empennage Assembly per applicable Mooney Service and Maintenance Manual refer to Chapter 53 with new mounting hardware found in the M20-318-001 Service Bulletin kit. Shim as required with NAS1149F0463P and NAS1149F0432P Washers. One minimum each end of 914081-003 Bushings, 3 total maximum per side (refer to Figures SB M20-318-1 & 2)
- 2.9. Verify rigging of the flight controls and trim system per applicable MAC Service and Maintenance Manual.
- 2.10. Reinstall LH and RH empennage fairing and inspection panel(s).
- 2.11. Complete log book entry.

NOTE:

Fill out compliance card and send by MAIL, FAX or EMAIL to Mooney International Corporation as indicated on the attached Compliance Card (see to Figure M20-318-4).

- 2.12. Return aircraft to service.
- 2.13. Procedure complete.

WARRANTY: Mooney International Corporation will warrant labor 6 hours for STEP 1 and 12 hours per side (or 24 hours both) for STEP 2 when corrective action is done in accordance with procedures of this Service Bulletin for aircraft currently covered under the Mooney International Corporation factory warranty program.

REFERENCE DATA:

- 1. Mooney Service and Maintenance Manual (applicable A/C)
- 2. Hi-Lok® Installation Instructions
- 3. FAA AC43.13-2B (or current revision)



PARTS LIST: kit part number(s):

Service Bulletin Kit M20-318-001 (Hardware Kit)

<u>Item</u>	<u>P/N</u>	<u>Description</u>	<u>Qty</u>
1.	AN174-20A	Bolt	2
2.	NAS1149F0463P	Washer, (shim as required) (.063" thick)	8
3.	NAS1149F0432P	Washer, (shim as required) (.032" thick)	8
4.	MS21044-N4	Nut	2
5.	914081-003	Bushing	2
6.	AN5H-32	Bolt	1
7.	NAS1149F0563P	Washer	2
8.	AN310-5	Nut	1
9.	MS24665-151	Pin, Cotter	2
10.	440019-000	Spacer	4
11.	AN5H-15	Bolt	1
12.	NAS1149F0563P	Washer	2
13.	914017-000	Bushing	1
14.	AN310-5	Nut	1

Service Bulletin Kit M20-318-002 (Empennage Attachment Kit - Left Hand Side)

<u>Item</u>	<u>P/N</u>	<u>Description</u>	<u>Qty</u>
15.	M20-318-005	Empennage Attach Fitting Set (LH)	1
17.	HL20PB5-10	Hi-Lok® Pins	4
	HL86-5	Hi-Lok® Collars	4
18.	HL20PB5-9	Hi-Lok® Pins	1
	HL86-5	Hi-Lok® Collars	1
19.	1691-0410	Rivet, Avex	25
	NPN	Hi-Lok® Installation Instructions (copy)	1

Note: MS20470AD Rivet(s) - Shop performing work to supply as required
NPN Safety Wire - as required

Service Bulletin Kit M20-318-003 (Empennage Attachment Kit - Right Hand Side)

<u>Item</u>	<u>P/N</u>	<u>Description</u>	<u>Qty</u>
16.	M20-318-004	Empennage Attach Fitting Set (RH)	1
17.	HL20PB5-10	Hi-Lok® Pins	4
	HL86-5	Hi-Lok® Collars	4
18.	HL20PB5-9	Hi-Lok® Pins	1
	HL86-5	Hi-Lok® Collars	1
19.	1691-0410	Rivet, Avex	25
	NPN	Hi-Lok® Installation Instructions (copy)	1

Note: MS20470AD Rivet(s) - Shop performing work to supply as required
NPN Safety Wire - as required

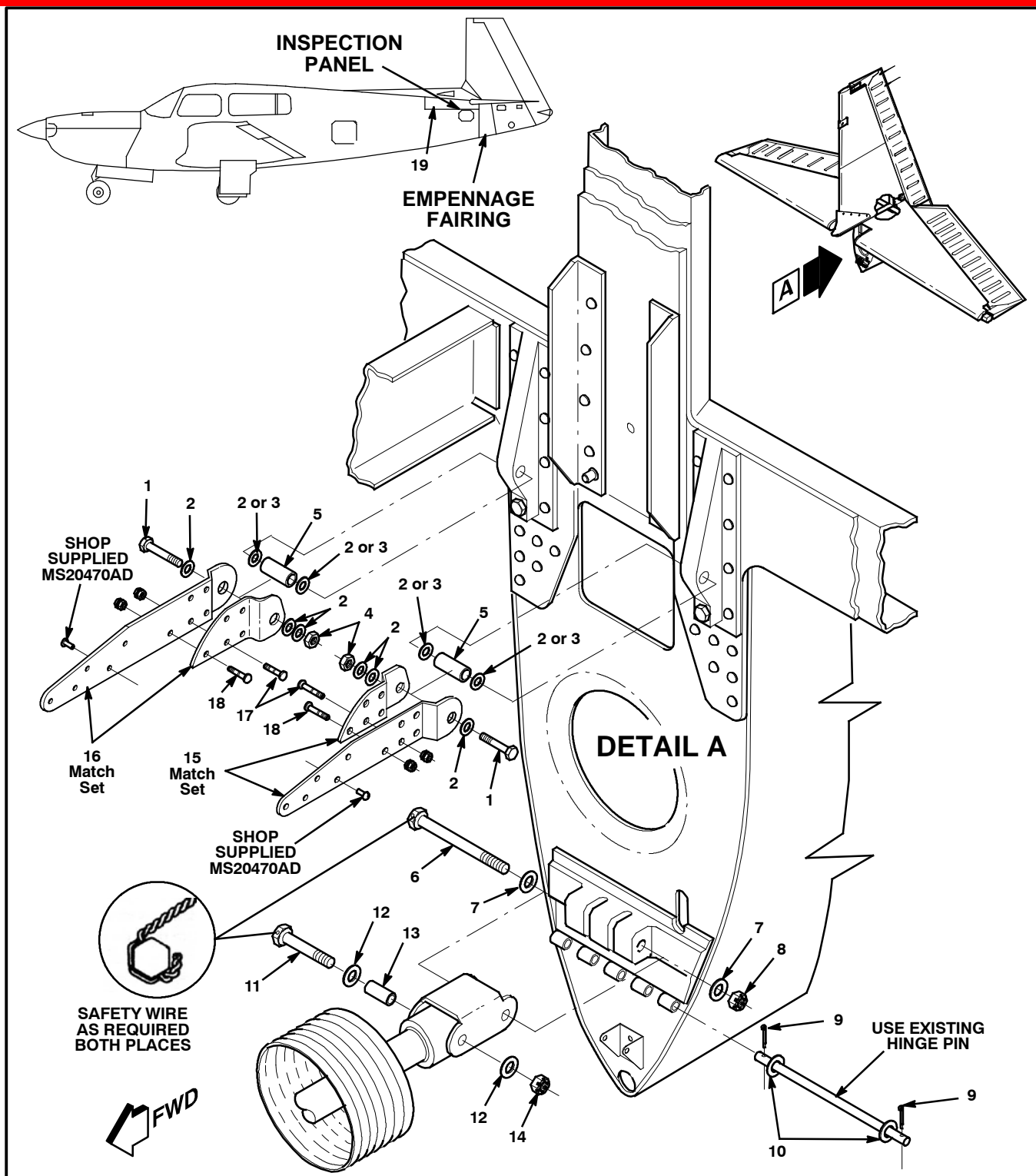


Figure SB M20-318-1 - EMPENNAGE TRIM ATTACH FITTING INSPECTION AND REPLACEMENT

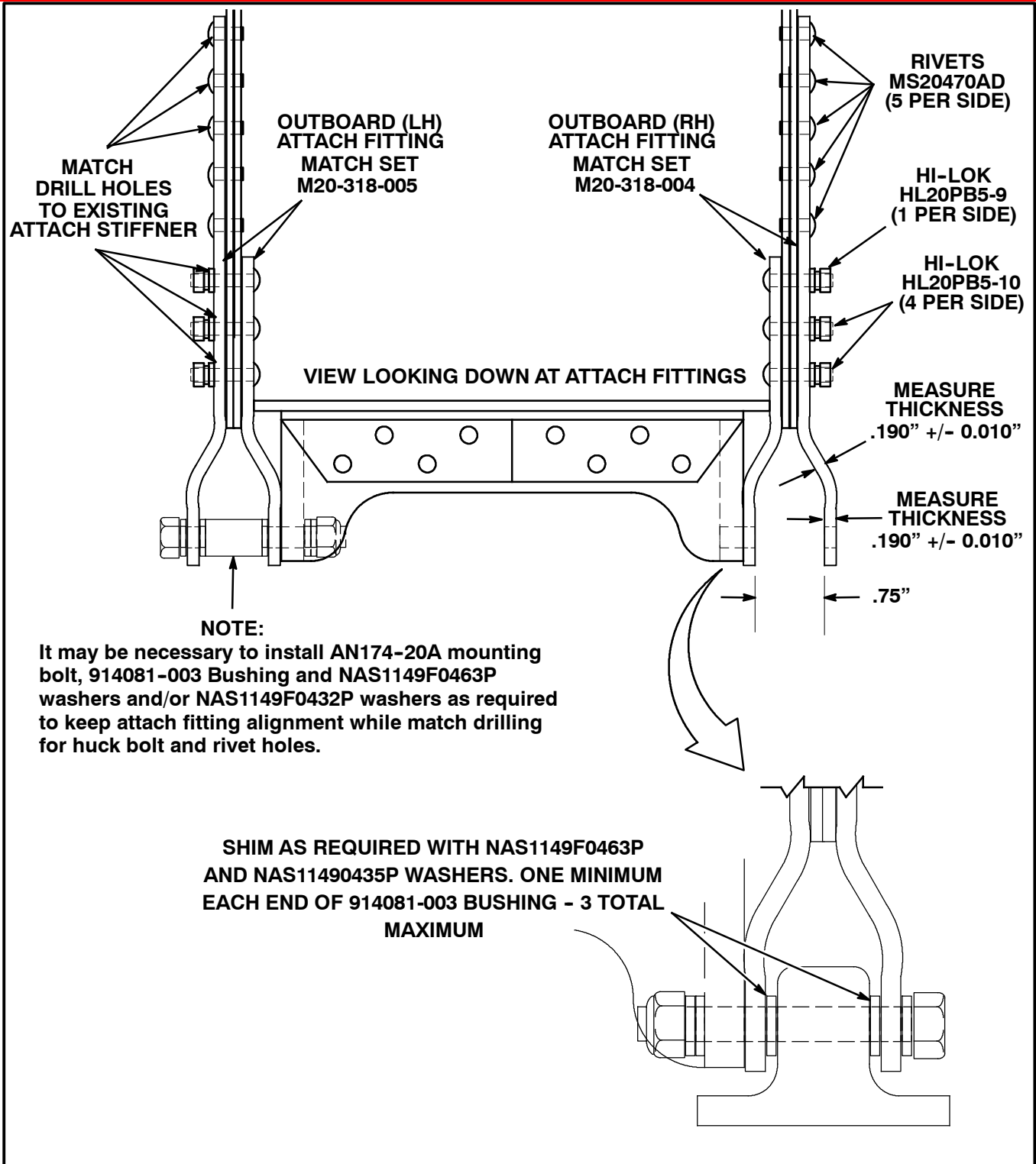
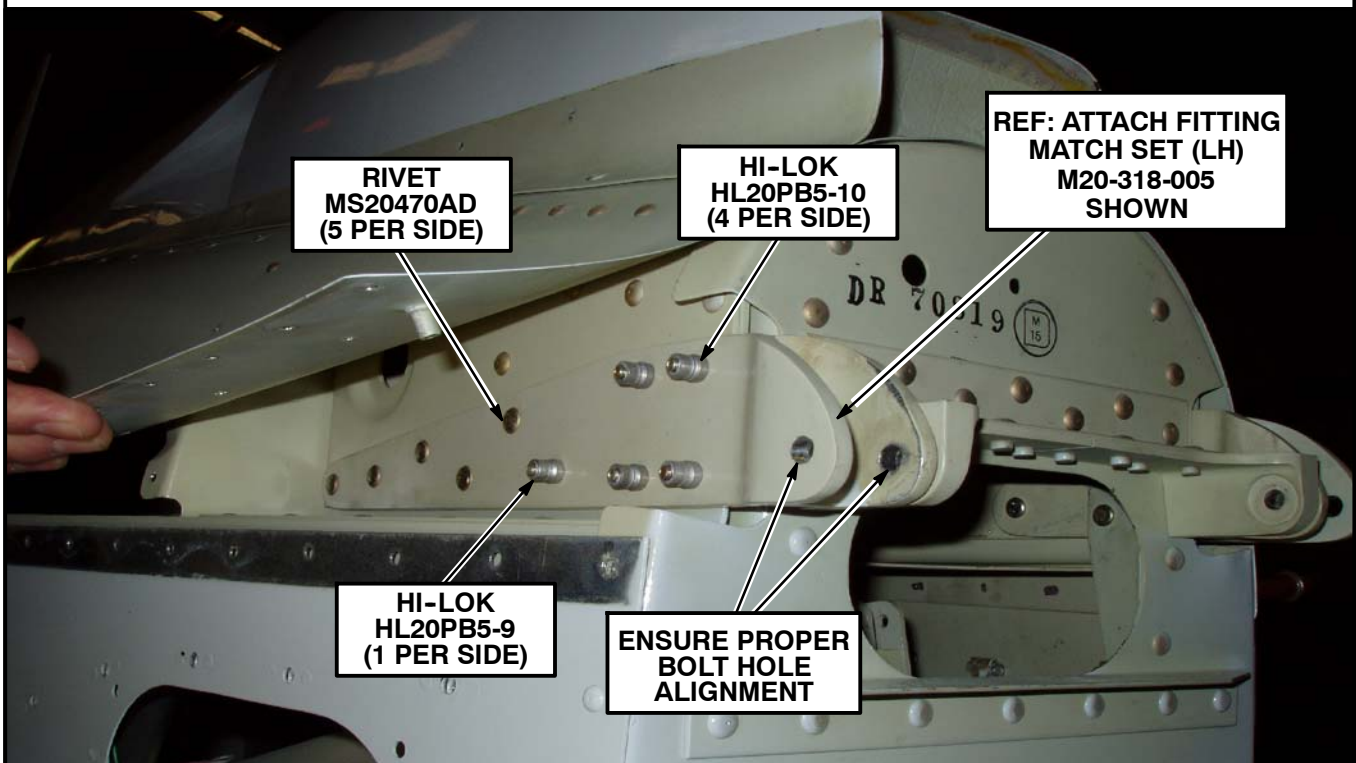


Figure SB M20-318-2 - EMPENNAGE TRIM ATTACH FITTING MEASUREMENT AND FIXTURE



CAUTION:

Take care when removing existing rivets or huck bolts with a drill bit or huck collar splitter tool, do not damage or distort existing holes - Do not crease or bend tailcone skin when accessing attach fittings.



CAUTION:

When securing new outboard attach fittings, it is critical to ensure proper alignment with existing empennage attachment bolt holes.

Figure SB M20-318-3 - TAILCONE SKIN REMOVAL



MOONEY INTERNATIONAL CORPORATION

KERRVILLE, TEXAS 78028 - FAX 830-257-4635

SERVICE (BULLETIN) (INSTRUCTION) NO. _____ HAS BEEN COMPLIED

WITH ON AIRCRAFT MODEL _____ SERIAL NUMBER _____

Tach. Time: _____ N-Number _____ (Reg. No.)

Owner: _____ Date of Compliance: _____

Complied By: _____

Inspection Report: _____

Form 07-0001

PLACE
STAMP
HERE

MOONEY INTERNATIONAL CORPORATION

ATT'N: TECHNICAL SUPPORT

165 Al Mooney Road, North

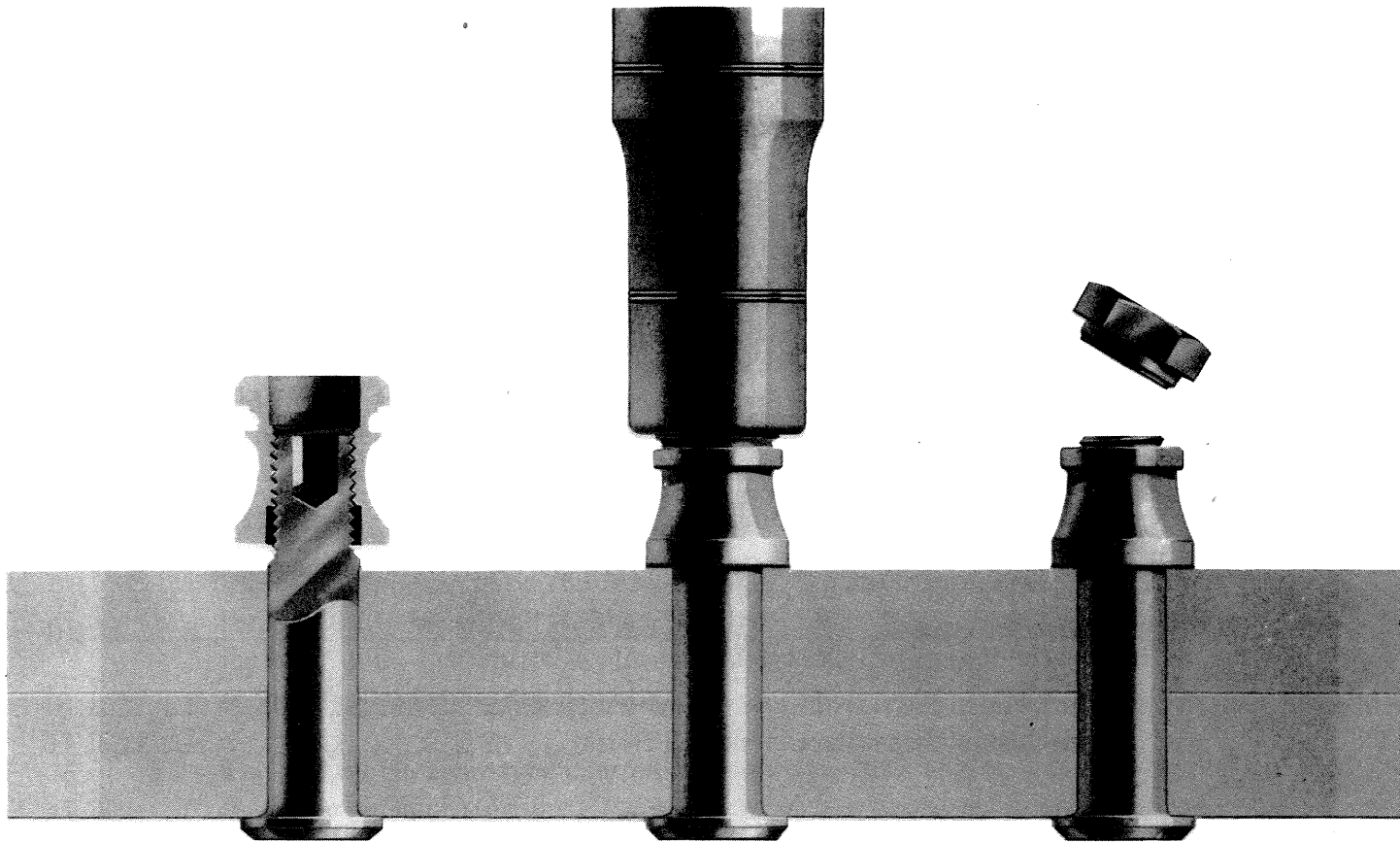
Kerrville, Texas 78028

**SEND TO: Mooney International Corporation
165 Al Mooney Road North
Kerrville, TX 78028
FAX: (830) 257-4635 or EMAIL support@mooney.com**

Figure SB M20-318-4 - Compliance Card



FASTENING SYSTEMS INSTALLATION INSTRUCTIONS



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registered trademarks of Hi-Shear Corporation.
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2-1520

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Telephone: (213) 326-8110
FAX: (213) 784-4144

Hi-Shear Fasteners Europe Ltd.
Butlers Leap, Rugby
Warwickshire CV21 3RQ, England
Telephone: (0788) 560916
FAX: (0788) 568183

HI-LOK[®] AND HI-LOK[®]/HI-TIGUE[®] FASTENERS

INSTALLATION INSTRUCTIONS

A. GENERAL DESCRIPTION

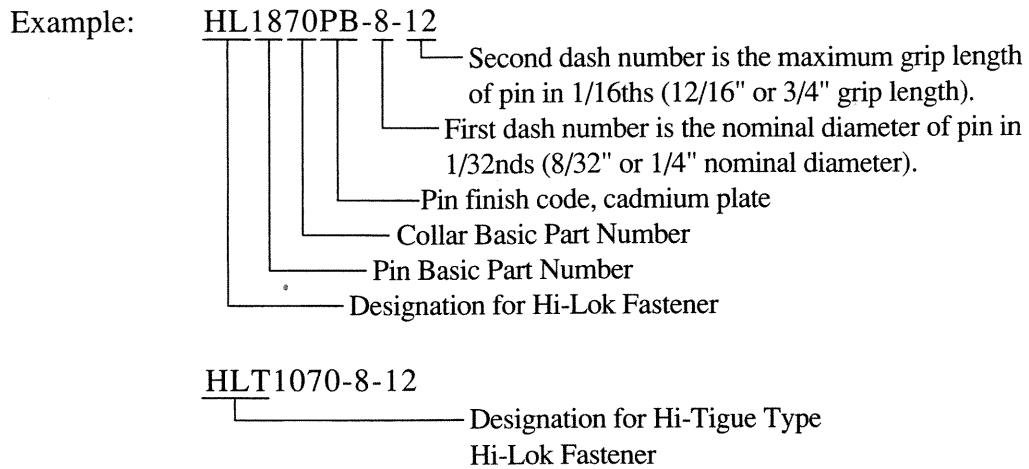
1. The patented, high strength Hi-Lok or Hi-Lok/Hi-Tigue is basically a threaded fastener which combines the best features of a rivet and bolt. Three primary design advantages include:
 - a. A controlled preload or clamp-up is designed into the fastener.
 - b. Minimum size and weight.
 - c. Simple, quiet and rapid installation.
2. The threaded end of the Hi-Lok pin contains a hexagonal shaped recess. The hex wrench tip of the Hi-Lok driving tool engages the recess to prevent rotation of the pin while the collar is being installed. The pin recess also offers a secondary benefit, weight savings.

The pin is designed in two basic head styles. For shear applications, the pin is made in the lightweight, "Hi-Shear" countersunk style and in a compact protruding head style. For tension applications, the MS24694 (AN509) flush and protruding head styles are available.

3. The Hi-Lok/Hi-Tigue type interference fit pin provides improved fatigue benefits to the airframe structure. The Hi-Tigue feature on the end of the pin shank makes it possible to use a straight shank interference fit fastener in a standard straight drilled hole to obtain the maximum fatigue life of the structure. For complete description see brochure 2-159920.
4. The self-locking, threaded Hi-Lok collar has an internal counterbore at the base to accommodate variations in material thickness. At the opposite end of the collar is a wrenching device which is torqued by the driving tool until it shears off during installation; this shear-off point occurs when a predetermined preload or clamp-up is attained in the fastener during installation. Removal of the collar wrenching surfaces after installation saves additional weight.

B. SELECTING THE FASTENER ASSEMBLY

The basic part number indicates the assembly of the pin and the collar part numbers.



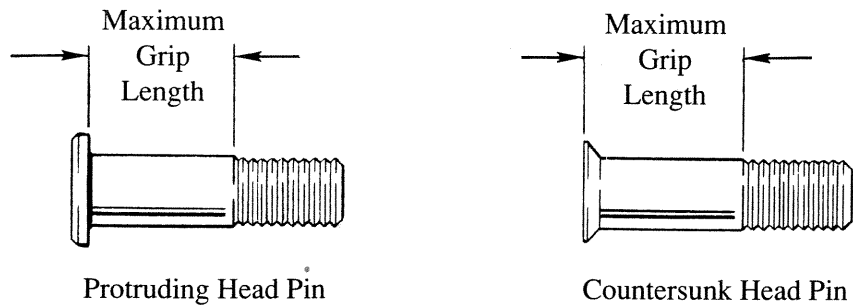
C. MATCHING COLLAR MATERIALS TO PIN HEAD STYLES

1. It is very important that the proper Hi-Lok collar be used with the selected Hi-Lok pin head style (shear or tension types) to maintain a proper design balance between the pin and collar. Refer to Hi-Lok or Hi-Lok/Hi-Tigue standards pages for recommended pin-collar combinations or contact your Standards Engineer.
2. In general, the following pin-collar combinations are acceptable:
 - a. Use aluminum collars (such as HL79 or HL70) with shear head pins made from materials such as alloy steel or titanium.
 - b. In some cases low torque-off type steel collars (such as HL94) are used with shear head pins.
 - c. Where tensile strength is a factor, use tension head pins with higher torque-off collars such as HL86.
 - d. When the Hi-Tigue version of the Hi-Lok system is used, a Hi-Tigue type collar should be used with a Hi-Tigue type pin. The Hi-Tigue collar has a deeper internal counterbore to mate with a Hi-Tigue pin which has the Hi-Tigue feature at the end of its cylindrical shank.

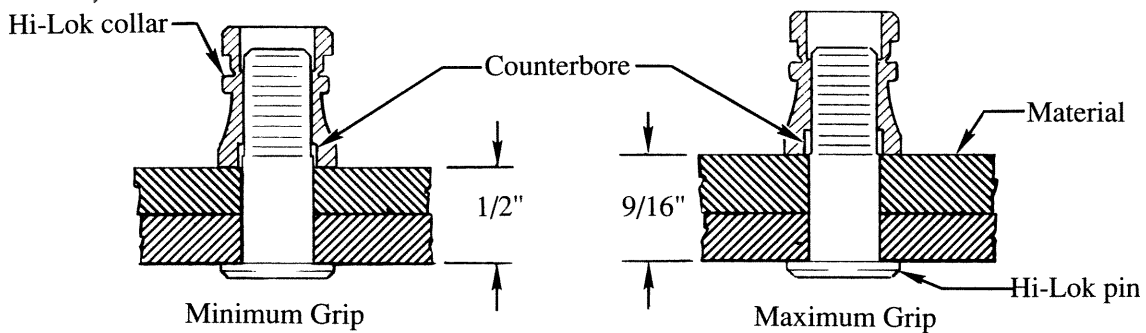
D. SELECTING THE PIN GRIP LENGTH

1. The standard Hi-Lok Fastening System offers pin lengths which are graduated into 1/16" increments.

D. SELECTING THE PIN GRIP LENGTH (continued)



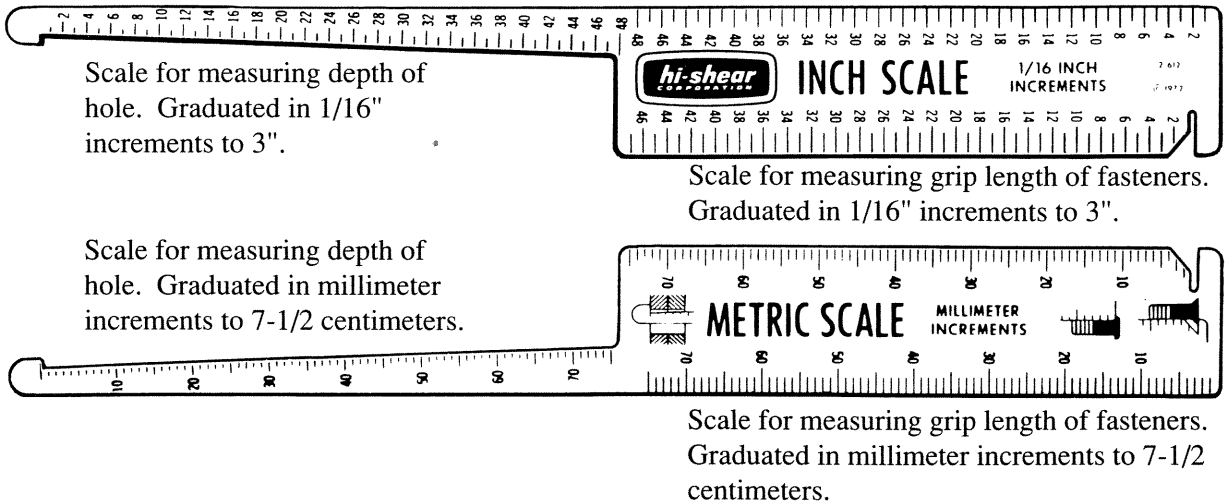
2. The material thickness can vary $1/16$ " without changing pin lengths. Adjustment for variations in material thickness in between the pin $1/16$ " graduations is automatically made by the counterbore in the collar.



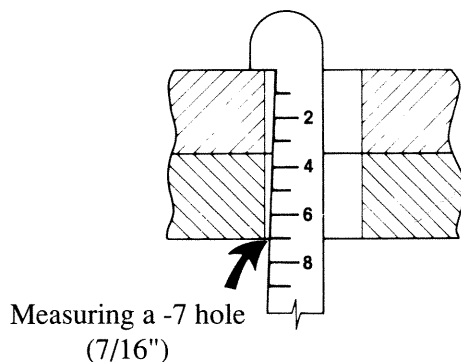
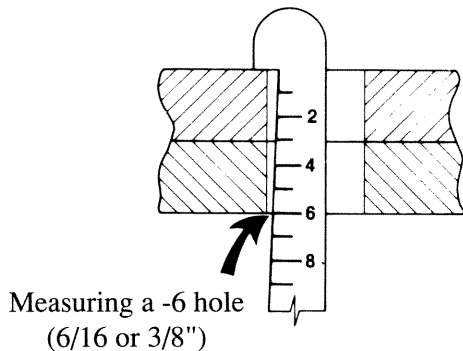
3. In the pin part number, HL18PB-8-9, the last dash number, -9, is used to specify the maximum grip length of the pin shank. In this instance a $9/16$ " grip length is required, indicating use of a -9 pin. Grip scales as shown are used as an aid to measure hole depth and to check the pin shank for correct grip length.

D. SELECTING THE PIN GRIP LENGTH (continued)

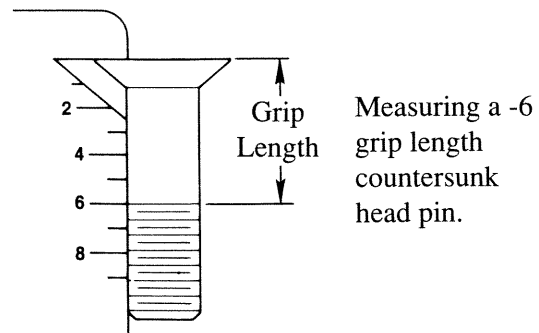
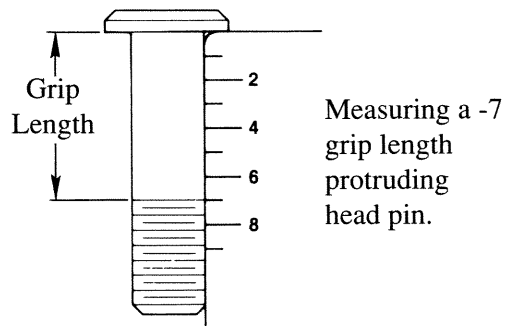
To save shop time for riveters and inspectors, Grip Scales measure the grip length of countersunk and flathead HI-SHEAR pins and work thickness or rivet hole depths in increments corresponding to the HI-SHEAR dash number system of pin grip lengths. The Scale is 0.020 spring temper stainless steel and 3/4" x 6-1/4" in size. The finish is satin with red and black lettering.



To measure hole depth, hook on bottom of hole, read highest number even with structure on other end.

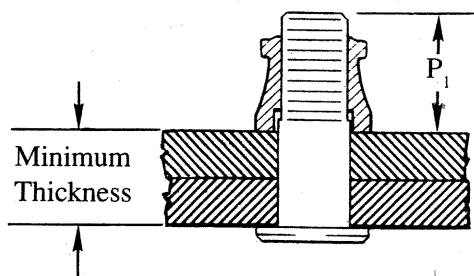


To measure fastener grip length, place fastener against gage as shown. Read highest number opposite last point of full shank diameter.

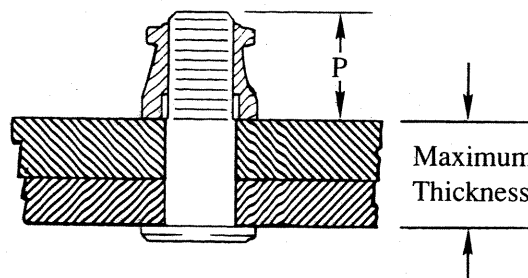


D. SELECTING THE PIN GRIP LENGTH (continued)

4. For standard Hi-Lok and Hi-Lok/Hi-Tigue pins, the protrusion of the threaded end shall be within the limits as indicated in the table below. For pins with different thread lengths such as mechanical lock pins, oversize diameter pins, and pins with lock wire holes contact your Standards Engineer.



MINIMUM GRIP
(Maximum Protrusion)



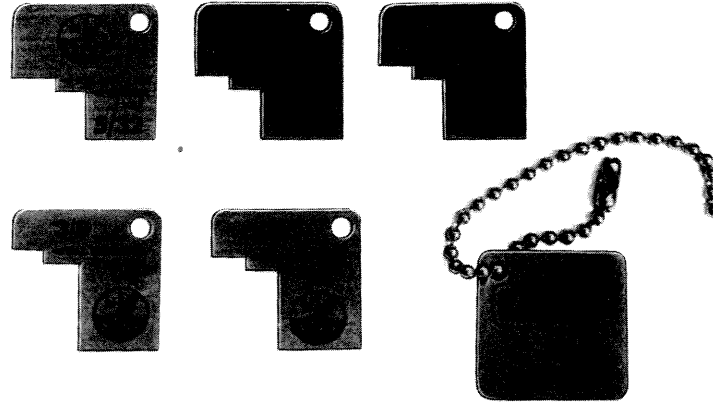
MAXIMUM GRIP
(Minimum Protrusion)

Standard Hi-Lok Pin		Minimum Protusion P	Maximum Protusion P ₁
First Dash Number	Nominal Diameter		
-5	5/32	.302	.384
-6	3/16	.315	.397
-8	1/4	.385	.467
-10	5/16	.490	.572
-12	3/8	.535	.617
-14	7/16	.625	.707
-16	1/2	.675	.757
-18	9/16	.760	.842
-20	5/8	.815	.897
-24	3/4	1.040	1.122
-28	7/8	1.200	1.282
-32	1	1.380	1.462

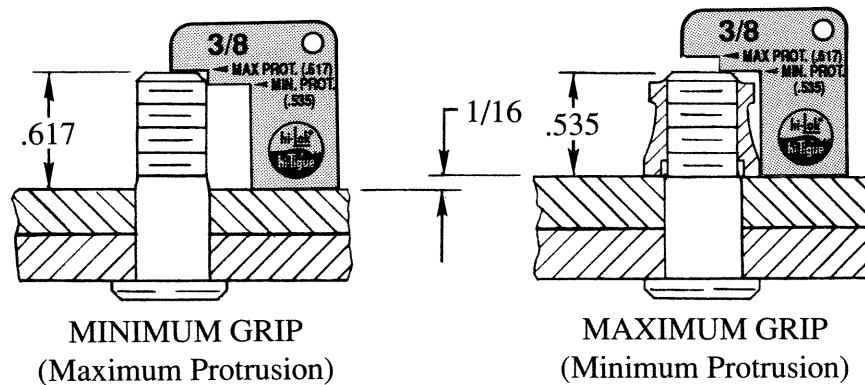
Table showing installed Hi-Lok Pin protrusion limits.

D. SELECTING THE PIN GRIP LENGTH (continued)

5. The Hi-Lok Protrusion Gages (Part No. 2-1522) offer a convenient method to check Hi-Lok pin protrusion limits after the Hi-Lok pin has been inserted in the hole and before or after collar installation. Individual gages accommodate Hi-Lok pin diameter sizes 5/32, 3/16, 1/4, 5/6, and 3/8. Gages are made of .012 stainless steel and are assembled as a set on a key chain.



Standard Hi-Lok Protrusion Gages



For Standard Hi-Lok Pins

In the above example measurement, the 3/8 gage is used to check the protrusion of a -12 or 3/8 diameter Hi-Lok pin. Left sketch shows the minimum grip condition with an allowable protrusion limit of .617. Right sketch shows how the gage can extend over an assembled Hi-Lok; in maximum grip the minimum protrusion limit is .535. Any protrusion between .535 and .617 is satisfactory.

E. SELECTING THE PIN DIAMETER

1. The pin diameters are graduated in 1/32" increments.
2. In the pin part number HL18PB-8-10, the first dash number, -8, is used to specify the nominal diameter of the pin. In this instance an 8/32" or 1/4" diameter pin is required, indicating use of a -8 pin.
3. The shank diameters of the pins conform to the dimensions given in NAS618.

E. SELECTING THE PIN DIAMETER (continued)

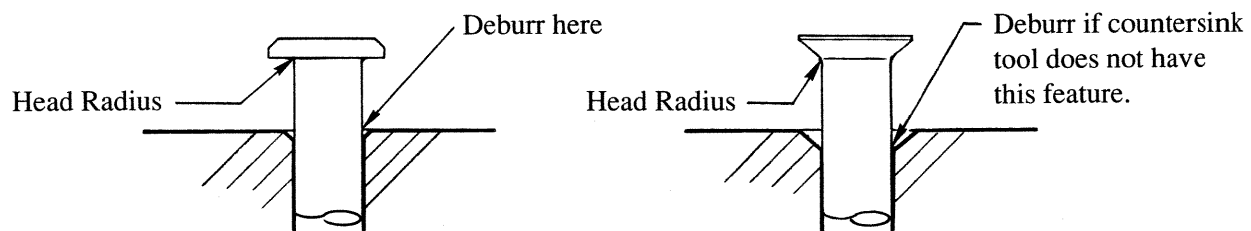
4. The major diameter of the thread has been reduced from the shank diameter (reference "TD" dimension on Standards Pages) to prevent damage to the threads when the pin is installed into an interference fit hole.

F. SELECTING THE COLLAR

1. In the collar part number HL70-8, the dash number indicates the inside nominal diameter of the collar in 1/32" increments. In this instance an 8/32" or 1/4" inside diameter collar is designated, indicating use of a -8 collar for a .125" diameter pin.
2. Also see paragraph C, "Matching Collar Materials to Pin Head Styles."

G. HOLE PREPARATION

1. The straight wall drilled holes shall be prepared in accordance with NAS618. For standard Hi-Lok pins in aluminum structure, it is generally recommended that the maximum interference fit shall not exceed 0.0015 inch. Standard Hi-Lok pins are not recommended for interference fit in steel, titanium or other hard materials. The Hi-Tigue type Hi-Lok pin is normally installed in a hole at 0.002 to 0.004 inch diametral interference.
2. The Hi-Lok pin has a slight radius under its head. After drilling, deburr the edge of the hole. This permits the head to fully seat in the hole. See appropriate Hi-Lok Standards Pages for head radius dimension. For instance, the 3/16 protruding head has a .015/.025 radius while the 3/16 flush head has a .025/.030 radius.



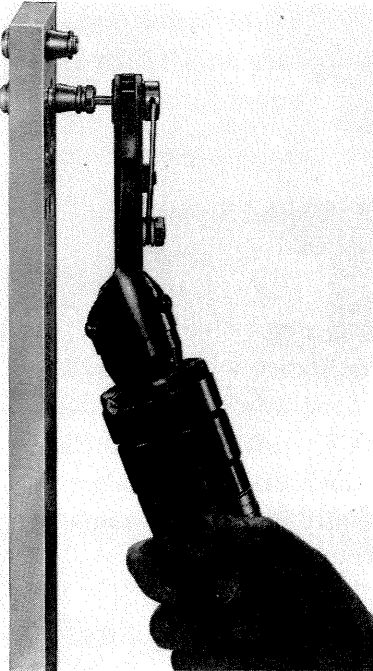
H. TOOLING

1. Hi-Loks are rapidly and quietly installed by one person working from one side of the work using standard power or hand tools and Hi-Lok adaptor tools.
2. Hi-Lok adaptor tools are fitted to high speed, pistol grip and ratchet wrench drivers in straight, 90°, offset, extension and automatic collar-feed configurations. Refer to Hi-Shear Corporation's Hi-Lok/Hi-Tigue Tool Catalog for a complete description of a wide variety of Hi-Lok drivers and accessories.

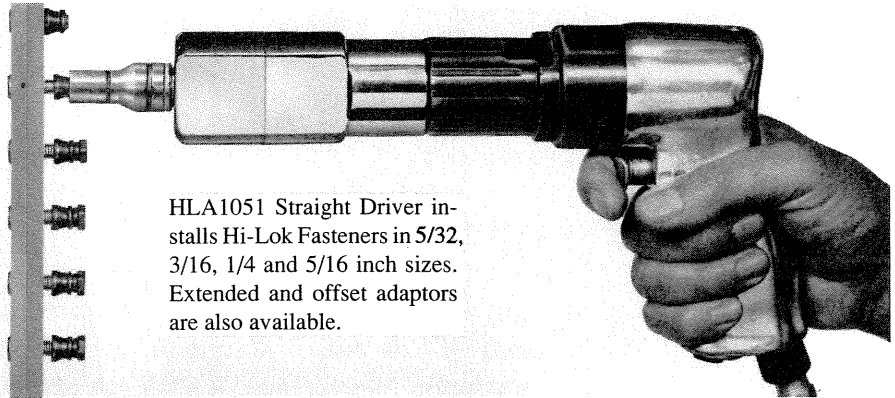
H. TOOLING (continued)

1. STANDARD POWER DRIVERS

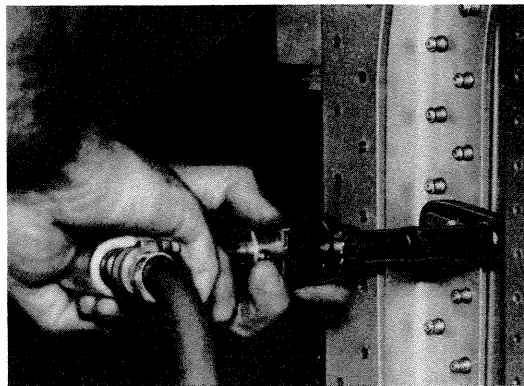
With light weight, compact tooling, HI-LOKS are easily installed and require the minimum of employee training. HI-LOK adaptor tools can be fitted to high speed power air drivers. The installation is fast and quiet without conventional riveting noise.



HLA2008 20° Offset Ratchet Wrench Driver installs Hi-Lok Fasteners in 5/32, 3/16 and 1/4 inch sizes. Extended sockets are available. Larger drivers will install larger size Hi-Loks.



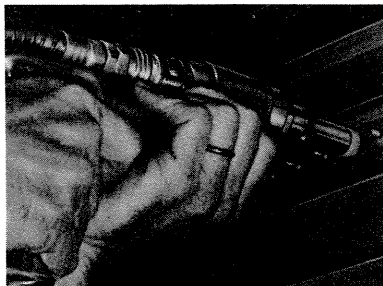
HLA1051 Straight Driver installs Hi-Lok Fasteners in 5/32, 3/16, 1/4 and 5/16 inch sizes. Extended and offset adaptors are also available.



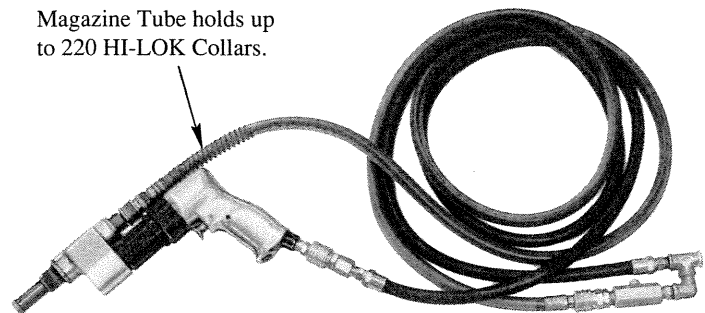
Left:
HLA1076 2" Offset Driver simplifies the installation of Hi-Loks into wide flanged beams and in otherwise inaccessible areas. In one instance, the offset driver reduced a 2-man, 32-hour job to a 1-man, 4-hour job.

2. AUTOMATIC COLLAR-FEEDING DRIVERS

The HI-LOK Automatic Feed Driver assembles HI-LOK collars (3/16 and 1/4 dia.) onto HI-LOK pins without reloading and at an assembly rate of up to 45 per minute.



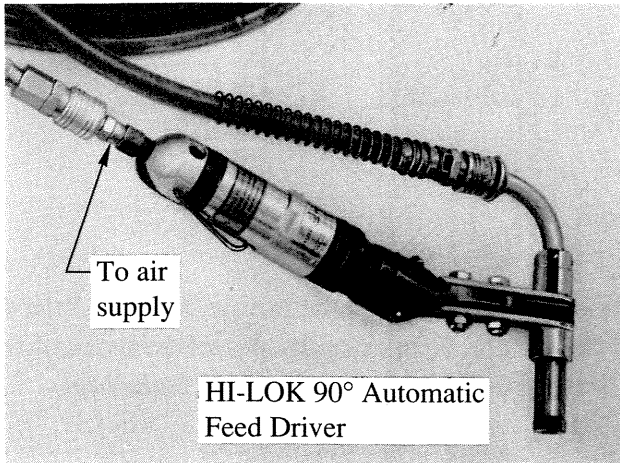
Above:
Automatic Driver assembles HI-LOK Collar on Pins. Interference fit holes can be prepared and HI-LOK Pins inserted by Drivmatic Riveter method.



HLA1008 Straight Collar Automatic-Feed Driver

H. TOOLING (continued)

2. AUTOMATIC COLLAR-FEEDING DRIVERS (continued)

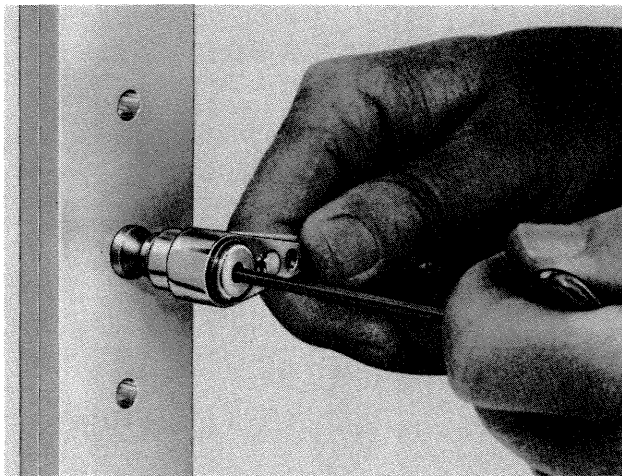


Left:

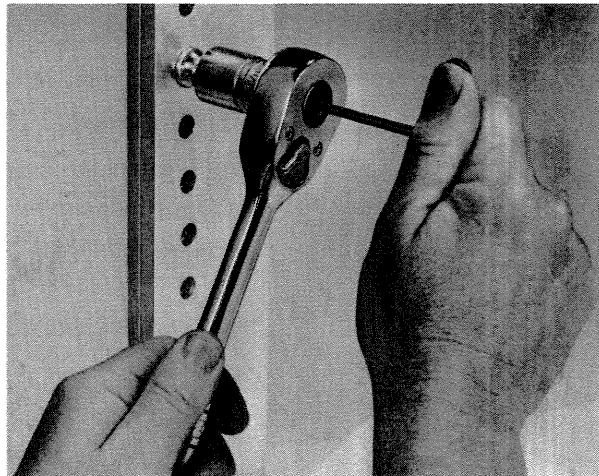
HLA2015 Automatic-Feed Ratchet Wrench Driver for interference fit Hi-Lok installation. Collars (3/16 or 1/4 dia.) are magazine tube fed through Driver. Larger Drivers for larger Hi-Loks are available.

3. HAND TOOLS

- a. The Hi-Lok fastener may be installed with hand tools, Allen hex keys and open-end or ratchet type wrenches. See photos below. Refer to Hi-Lok/Hi-Tigue Tool Catalog for complete description of hand tools available.
- b. Follow installation steps as outlined in paragraph I1 following.



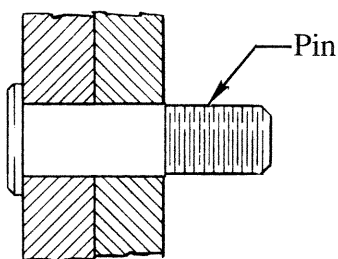
HLH311
HAND TOOL ASSEMBLY



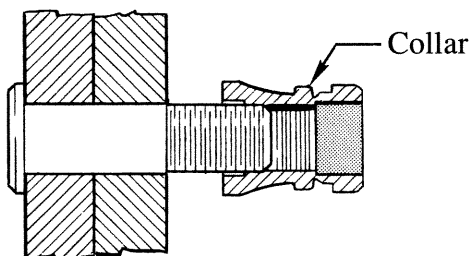
HLH110
HAND TOOL ASSEMBLY

I. FASTENER INSTALLATION

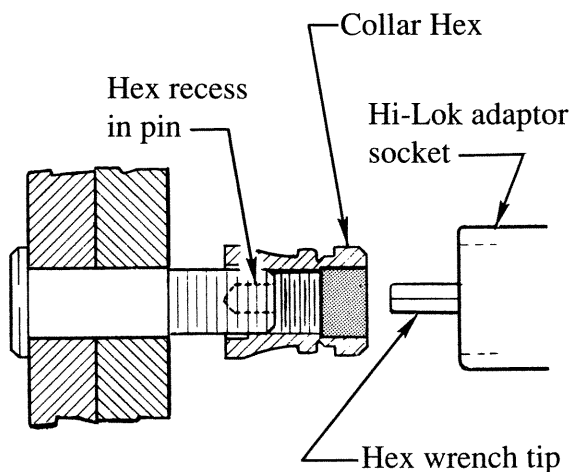
1. INSTALLATION STEPS (HI-LOK PIN IN NON-INTERFERENCE FIT HOLE)



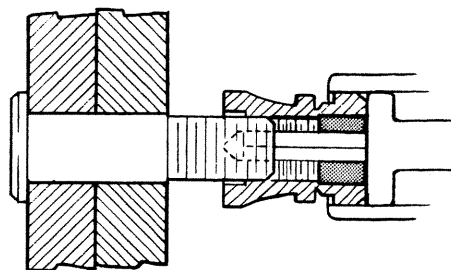
- a. Insert the pin into the prepared non-interference fit hole.



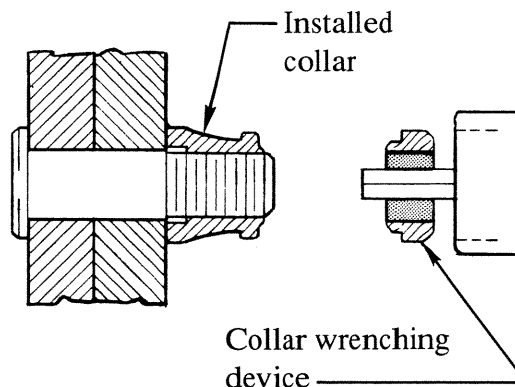
- b. Manually thread the collar onto the pin.



- c. Insert the hex wrench tip of the power driver into the pin's hex recess, and the socket over the collar hex. This prevents rotation of the pin while the collar is being installed.

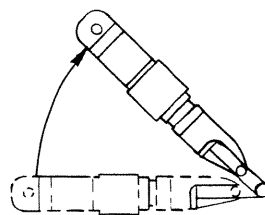


- d. Firmly press the power driver against the collar, operate the power driver until the collar's wrenching device has been torqued off.

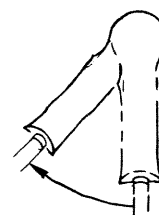


- e. This completes the installation of the Hi-Lok Fastener Assembly.

NOTE:



Ratchet Wrench Driver

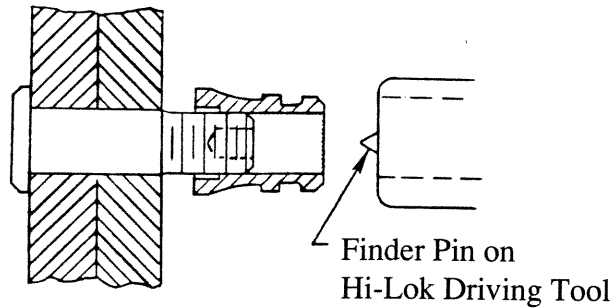


Pistol Grip Driver

To ease the removal of the driving tool's hex wrench tip from the hex recess of the pin after the collar's wrenching device has sheared off, simply rotate the entire driver tool in a slight clockwise motion.

I. FASTENER INSTALLATION (continued)

2. INSTALLATION STEPS (HI-LOK PIN IN INTERFERENCE FIT HOLE)



When Hi-Lok pins are pressed or driven into interference fit holes, the fit is sufficiently tight to grip the pin to prevent it from rotating during assembly with the collar. This means that the driving tool hex wrench tip engagement is not required to keep the pin from rotating. Hi-Lok driver tools are available using a finder pin instead of the hex wrench tip to locate the tool on the collar and pin. Except for this difference, the fastener installation is the same as described in paragraph 1 above.

Refer to Hi-Lok Tool Catalog for further details.

J. INSPECTION AFTER INSTALLATION

Hi-Lok fasteners are visually inspected. No inspection tools or torque wrenches are required.