NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

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AIRWORTHINESS

Group Chairman's Factual Report

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Attachment 10 – Technical Orders
(30 pages)

HEADQUARTERS, ARMY AIR FORCES
WASHINGTON 25, D. C.

TECHNICAL ORDER
NO. 01-60-90

20 November 1944

AIRCRAFT AND MAINTENANCE PARTS

NORTH AMERICAN—INSTALLATION OF ELEVATOR INERTIA WEIGHT—P-51B, P-51C, P-51D, F-6C, AND F-6D

This Technical Order replaces T. O. No. 01-60J-29, dated 18 September 1944, revised to include F-6C and F-6D airplanes and to furnish information regarding the rework necessary to install the kits furnished for P-51B, P-51C, and F-6C airplanes.

NOTE As prescribed in T. O. No. 00-20A, appropriate reference to this Technical Order will be entered on AAF Forms 60-A for the aircraft affected on which this work has not already been accomplished. The work directed herein will be accomplished as soon as possible and not later than the next 100-hour inspection period by service activities with the aid of base maintenance facilities, if necessary, and by manufacturing and modification establishments when directed by Procurement Division, ATSC, in accordance with ATSC Regulation 151-1. Spare flap torque tube assemblies, part Nos. 73-52608-4 and 104-52608, in stock, will be reworked in accordance with paragraphs 2.e.(1), 2.f.(2), and 2.g. prior to issue.

1. To prevent reversal of the elevator control stick forces during maneuvers, an elevator inertia weight will be installed in accordance with the instructions contained in paragraph 2. in all of the following airplanes:

MODEL	AF SERIAL NOS.
P-51B and F-6C	42-106429 to 42-106538 inclusive
	42-106541 to 42-106978 inclusive
	43-6313 to 43-7202 inclusive
	43-12093 to 43-12492 inclusive
	43-24752 to 43-24901 inclusive
P-51C and F-6C	42-102979 to 42-103978 inclusive
	43-24902 to 43-25251 inclusive
	44-10753 to 44-11152 inclusive
P-51D and F-6D	42-106539 and 42-106540
	44-11153 to 44-11252 inclusive
	44-13253 to 44-14552 inclusive

P-51B, P-51C, P-51D, F-6C, and F-6D airplanes not listed will be modified by the contractor prior to delivery.

2. The instructions for accomplishing this change, as contained in North American Service Bulletin P-51-193, dated 27 July 1944, are as follows:

a. Remove the wing to fuselage rear fillet assembly on both the left- and right-hand sides. (See figure 1.)

b. Remove the access cover assembly just aft of the radiator air rear scoop assembly for the purpose of disconnecting the elevator control lower cable assembly.

c. Locate the two black coded elevator control cables, cut the safety wire, and disconnect the turnbuckles.

NOTE Tie a cord to each cable end to facilitate reinstallation.

d. The instructions contained in this paragraph are applicable to P-51D and F-6D airplanes only. In order to provide sufficient clearance for the bob weight installation on P-51D and F-6D airplanes, it will be necessary to reroute the pilots' relief tube just aft of the pilots' seat. Proceed as follows:

(1) Remove the pilot's seat from the airplane.

(2) Remove the pilot's armor plate installation.

(3) (See figure 2 for the following rework instructions.) Drill a 7/8-inch diameter hole in the web assembly (fuselage station 147-1/4) at a point 5-3/8 inches to the right of existing hole for the relief tube and 2-5/16 inches below the upper edge of the web assembly.

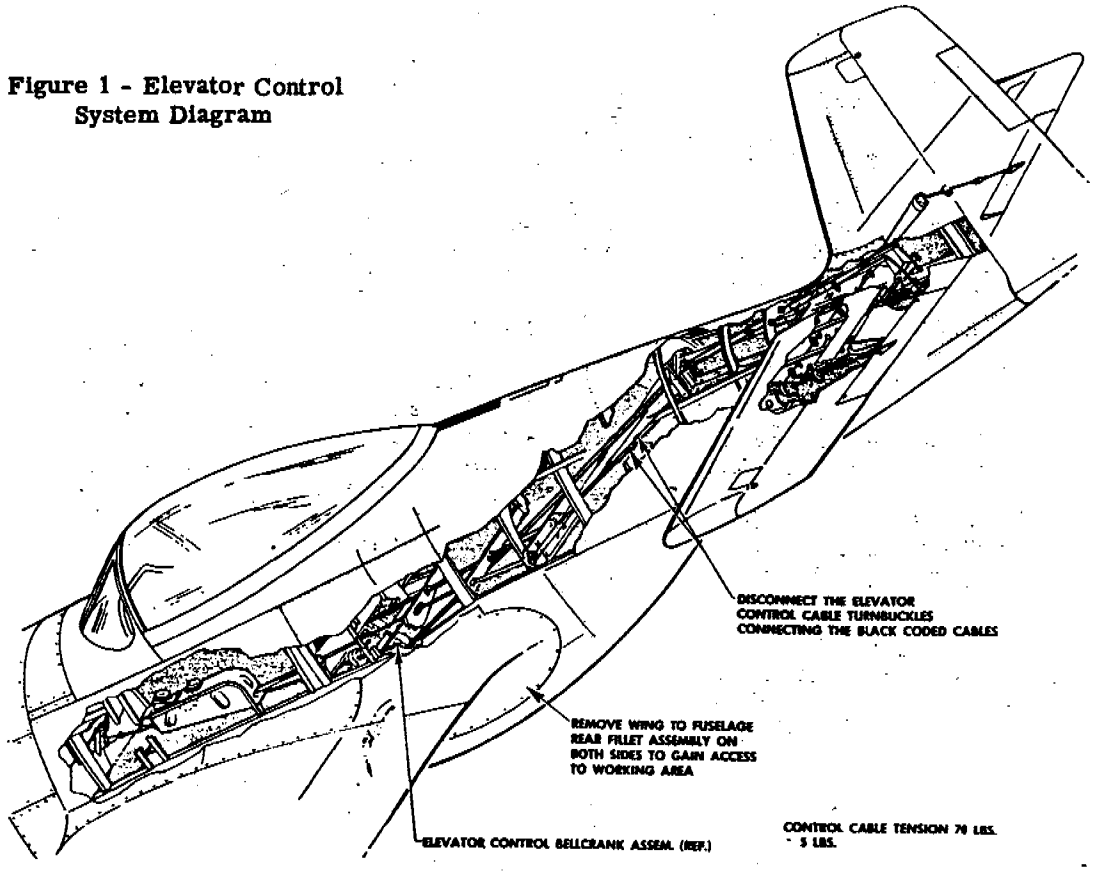
(4) Drill a No. 18 (.169-inch diameter) hole in the channel of the pilot's seat rear armor plate support assembly, as shown in figure 2, to permit installation of a supporting clip for the relief tube when rerouted.

(5) Disconnect the relief tube where it is clipped to the lower section of the pilot's seat support.

(6) Pull the pilot's relief rear tube aft through the web and reroute it through the hole previously drilled. Then pull the tube forward sufficiently to enable reconnection at the lower section of the pilot's seat support.

(7) Install the clip, part No. 755-10, spacer, part No. 4S3-8-38, screw, part No. 7S4-832-26, and nut, part No. AN365-832, to secure the relief tube to the channel as shown in figure 2.

Figure 1 - Elevator Control System Diagram



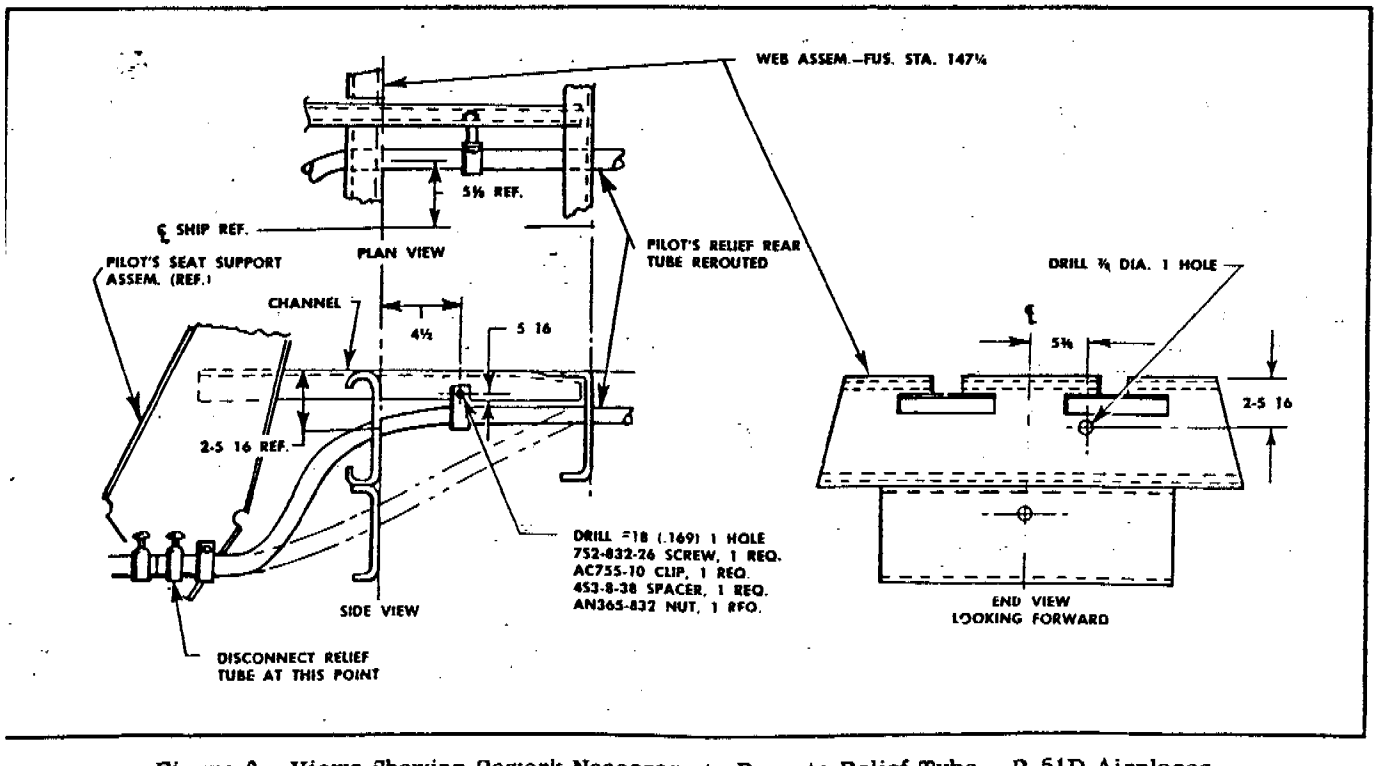


Figure 2 - Views Showing Rework Necessary to Reroute Relief Tube - P-51D Airplanes

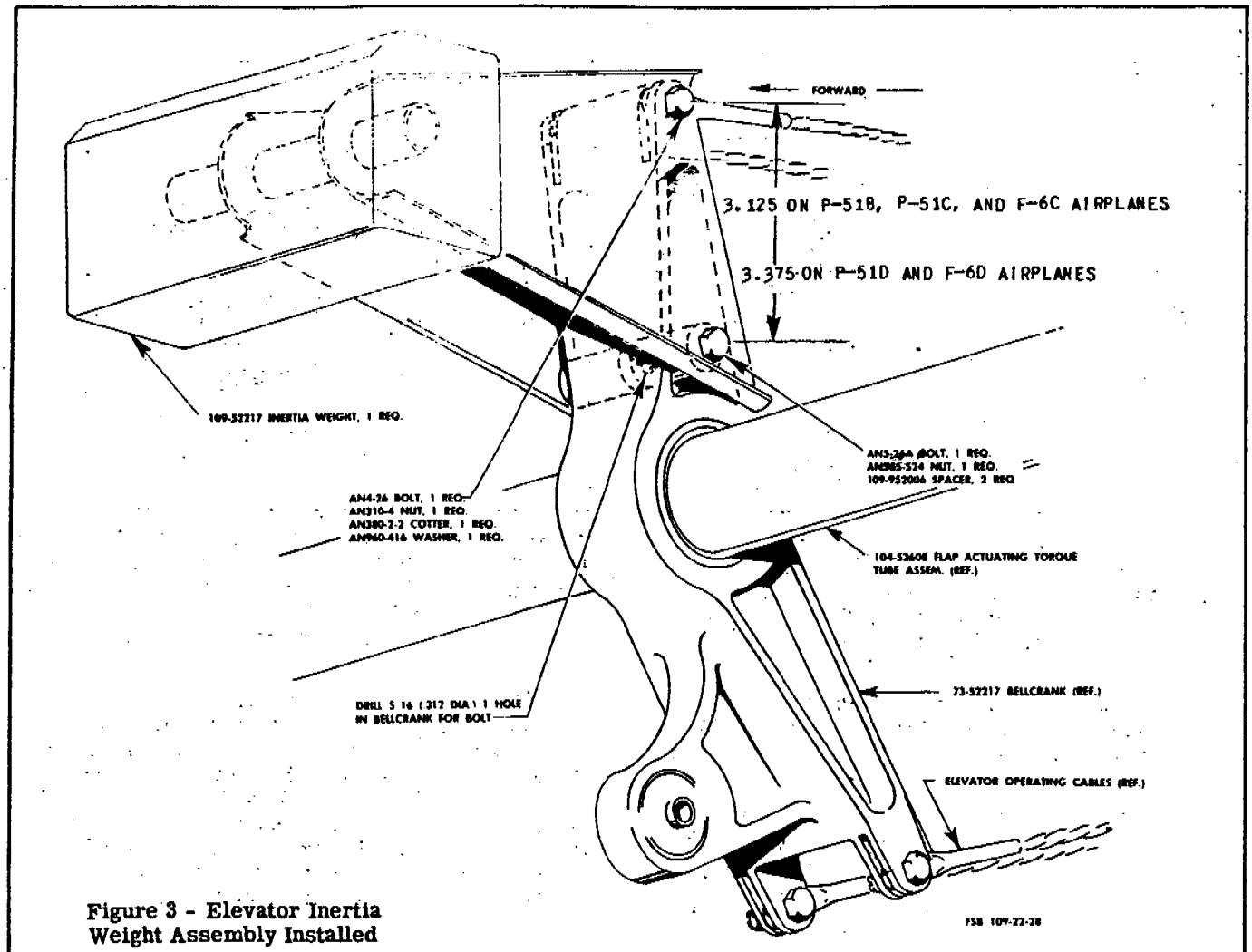


Figure 3 - Elevator Inertia Weight Assembly Installed

e. The instructions contained in this paragraph are applicable to P-51B, P-51C, and F-6C airplanes only. In order to provide sufficient clearance for the bob weight installation on these airplanes, it will be necessary to rework the kits furnished and to relocate the cold air control valve. Proceed as follows:

(1) Rework the inertia weight assembly, part No. 109-52217, by relocating the lower attaching hole in the two steel sheets (comprising the supporting bracket for the weight) as shown in figure 4A. Mark the new hole to be drilled and line drill 5/16 (.312) inch diameter two holes through the sheets. In cases where kit "B" parts are used, the steel sheets, part Nos. 109-52217-2 and 109-52217-3, may be drilled before assembly with the lead weight and tube, all of which comprise the inertia weight assembly, part No. 109-52217.

NOTE If the hole referred to in paragraph 2.f.(2) has been drilled at a point 3-3/8 inches below the top hole (figure 3) in attempting compliance with previous instructions contained in T. O. No. 01-60J-29, dated 18 September 1944, it will be necessary to locate the lower hole in the steel sheets of the inertia weight as shown in figure 4B.

(2) Fabricate the two new clamps, part Nos. -2 and -3, required for the relocation of the cold air control valve as shown in figure 6.

(3) Relocate the cold air control valve, part No. 102-53328, by moving it forward approximately 4 inches as follows: (See figure 5.)

(a) Remove the pilot's seat to facilitate access to the working area from the cockpit.

(b) Disconnect the cold air valve connecting shaft at the forward end by removing the screws securing the sector to the floor and removing the cotters securing the handle and sector. Temporarily slide the handle and sector back on the shaft. (See figure 5, detail A.)

(c) Working from the right-hand side of the airplane, release the clamp securing the scoop-to-valve duct to the control valve and move the duct to one side.

(d) Disconnect the shaft from the valve and remove the two clamps securing the cold air control valve to the web assembly.

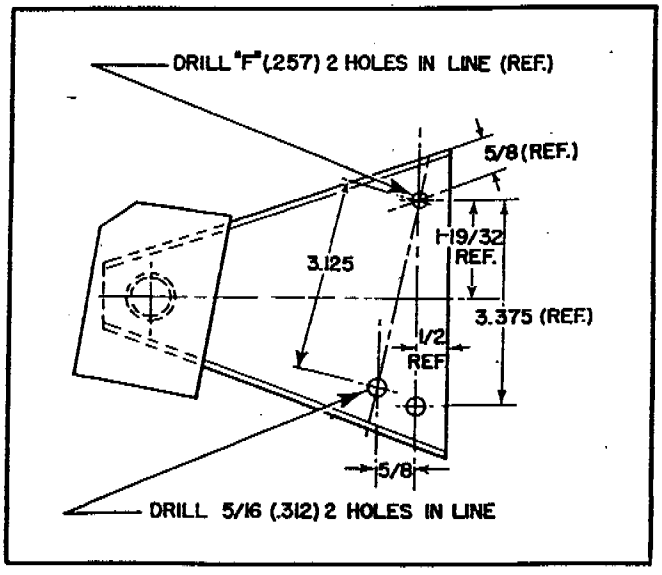


Figure 4A - View Showing Location of Additional Hole to Be Drilled in the Elevator Inertia Weight Assembly for Use on P-51B, P-51C, and F-6C Airplanes

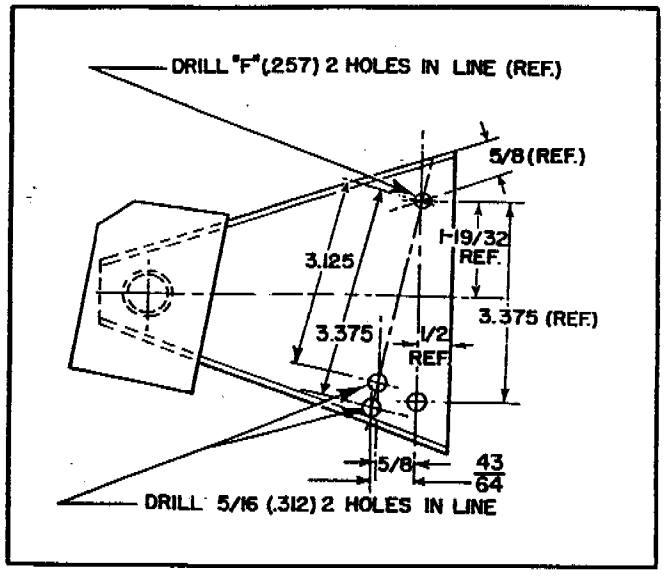


Figure 4B - View Showing Location of Additional Hole to Be Drilled in the Elevator Inertia Weight Assembly for Use on P-51B, P-51C, and F-6C Airplanes if Lower Hole in Bell Crank Has Been Drilled 3-3/8 Inches From Upper Hole

(e) Mark the two holes to be drilled in the floor for the clamps as shown in figure 6. Drill two 3/16-inch diameter holes through the floor.

(f) Reattach the cold air control valve in its new location (figure 6) using the two new clamps, part Nos. -2 and -3, screws, part No. AN526-1032R16, washers, part No. AN960-10L, nuts, part No. AN365-1032, and plywood spacers. Reconnect the shaft to the valve.

(g) Reposition the cold air valve connecting shaft at the forward end, and after making allowance for the sector and handle, cut off the portion of the shaft not required. Drill the No. 48 (.076-inch diameter) two new holes in the shaft for the cotter pins. Reposition the handle and sector on the shaft and secure them with the cotter pins. Reattach the sector to the floor with the screws previously removed. (See figure 5.)

f. Install the elevator inertia weight assembly, part No. 109-52217, on the elevator control bell crank as follows:

(1) Remove the bolt securing the two cables at the top of the bell crank. (See figure 3.)

(2) Since there is no provision in the bell crank for installing the lower attaching bolt for the elevator inertia weight assembly, it will be necessary to drill through the casting. Mark the hole to be drilled in the center of the bell crank at a point 3.375 inches below the top hole in P-51D and F-6D airplanes (3.125 inches in P-51B, P-51C, and F-6C airplanes) as shown in figure 3. Drill a 5/16 (.312) inch diameter hole using a snake drill. It is important that the hole be drilled in the center of the web of the bell crank since the location of the hole affects the position of the bob weight.

NOTE Due to difficulties encountered in working in this area, it is probable that perfect alignment of this hole will not be achieved at the first effort. It is therefore recommended that a 3/16 (.1875-inch diameter) drill be used to start and the hole then checked for alignment. Larger drill sizes may then be used and the hole checked until the desired 5/16-inch hole, perfectly aligned, is obtained.

g. Install the elevator inertia weight assembly and reinstall the two cables as shown. Use the bolt, part No. AN4-26, nut, part No. AN310-4, cotter pin, part No. AN380-2-2, and washer, part No. AN960-416, at the upper attaching point, and the bolt, part No. AN5-26A, nut, part No. AN365-524, and spacers, part No. 109-952006, at the lower attaching point of the bell crank. (See figure 3.)

h. Reconnect the lower cable assemblies inside the opening just aft of the radiator air rear scoop assembly.

i. Tighten the elevator control cables to a tension of 70 pounds (± 5 pounds). Safety the turnbuckles.

j. Reconnect the scoop-to-valve duct and reinstall access covers, fillets, armor plate, and pilots' seat.

3. a. The following parts are required per airplane to accomplish this change. These parts except as noted are furnished as complete kits for initial installation and will be requisitioned in accordance with T. O. No. 00-35A-15. Parts required for maintenance after initial installation and for modification of spares in stock will be requisitioned from the property classes as indicated.

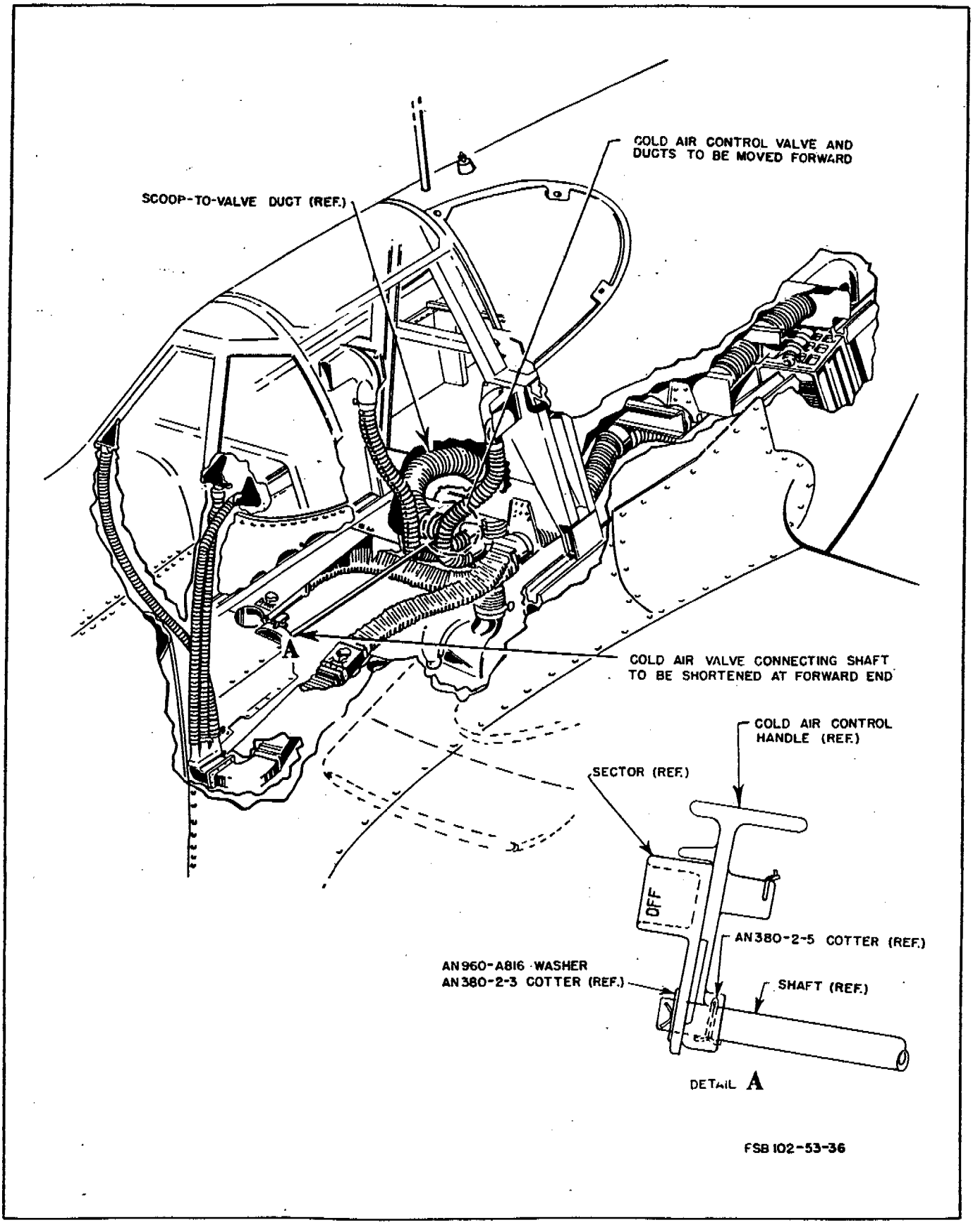


Figure 5 - Heating and Ventilating System - P-51B and P-51C Airplanes

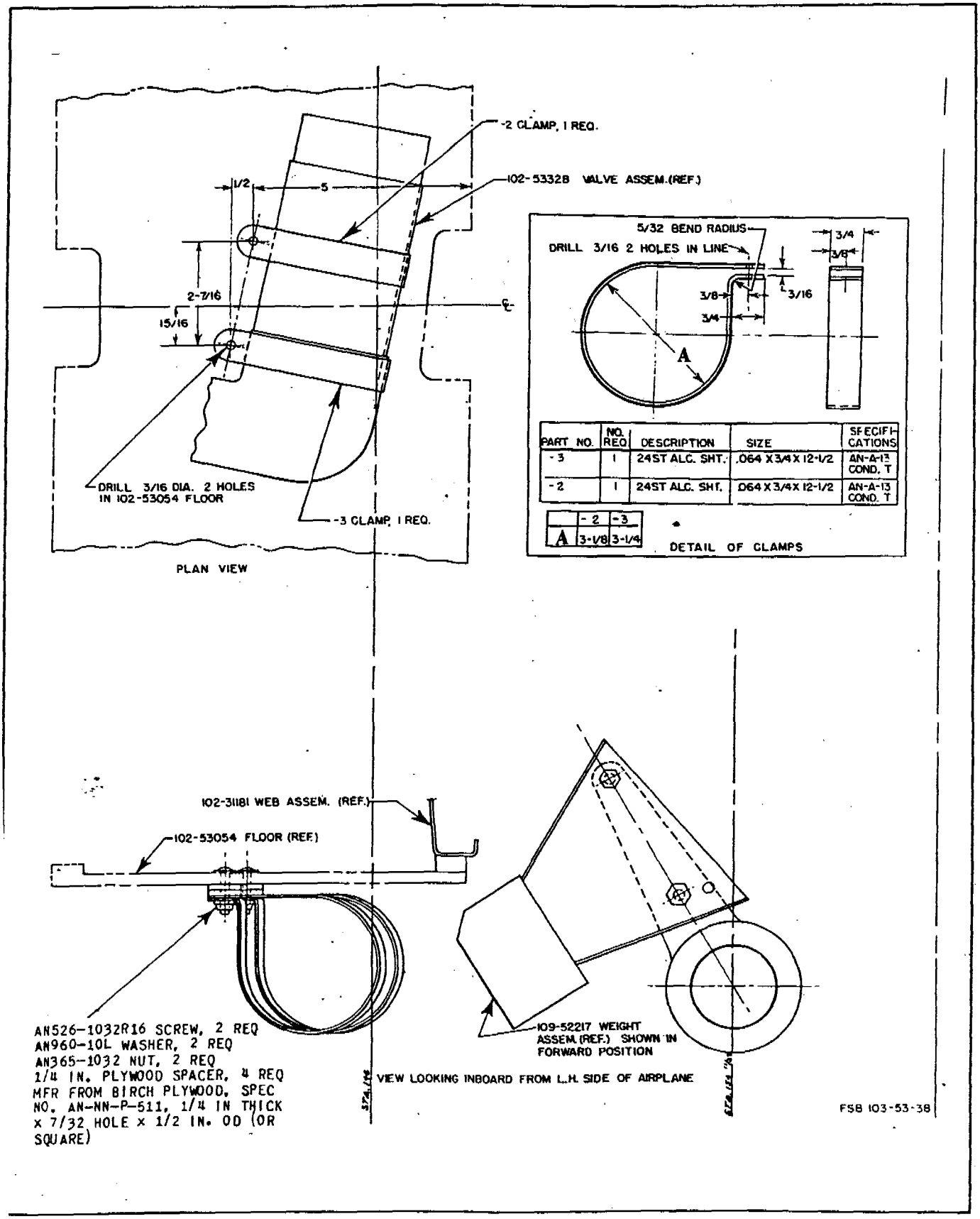


Figure 6 - Relocation of Cold Air Control Valve - P-51B and P-51C Airplanes

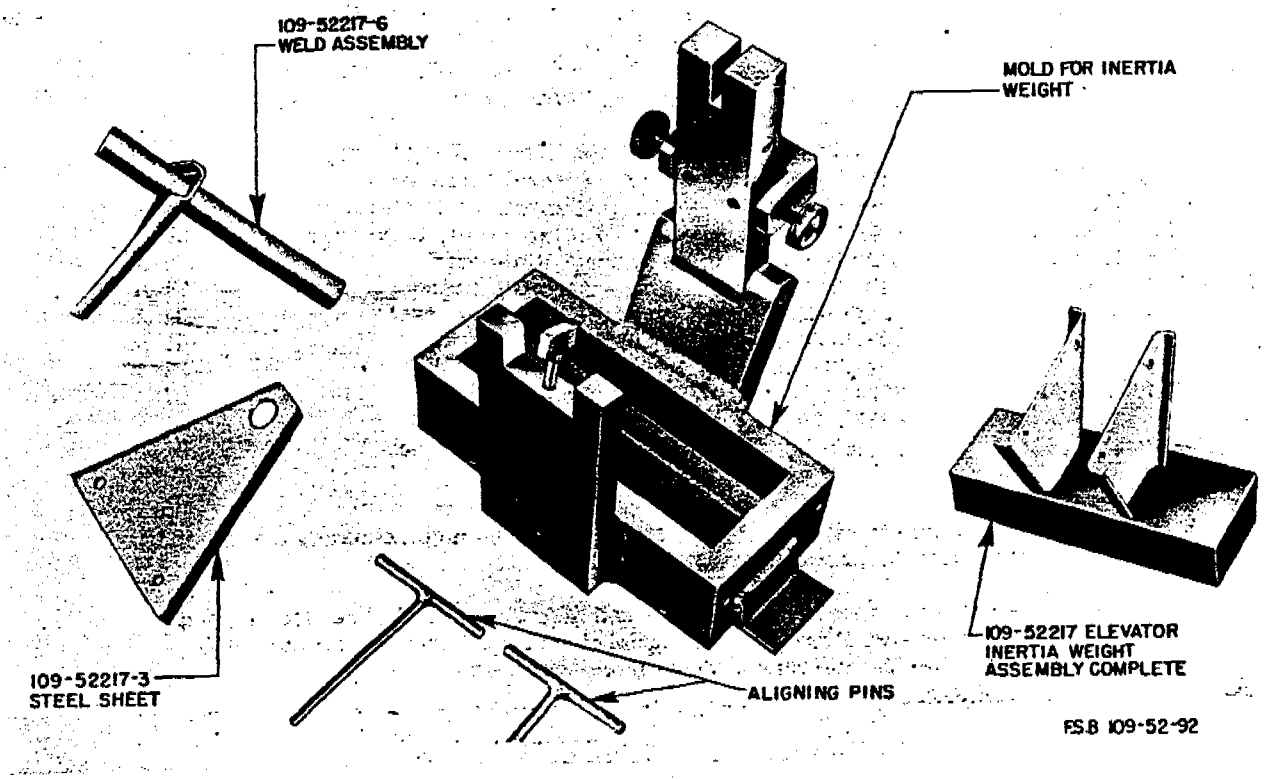


Figure 7

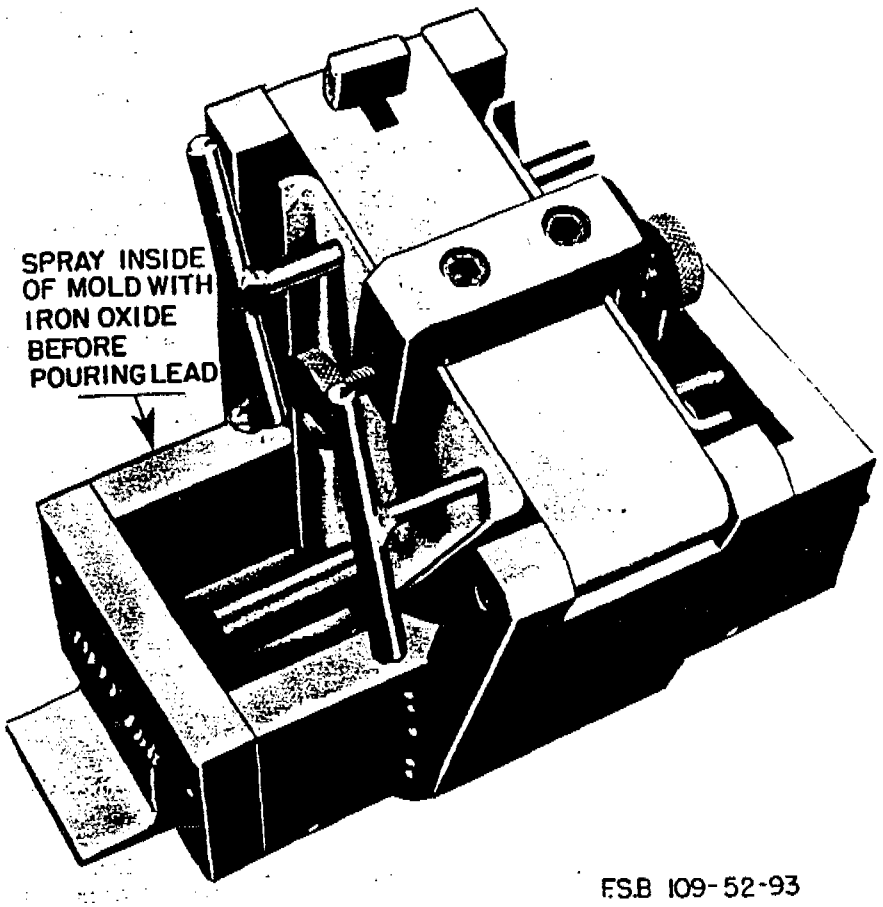


Figure 8 - View Showing Bracket Clamped Securely in Mold and Ready for Pouring

QTY	STOCK NO.	PART NO.	NOMENCLATURE	CLASS	SOURCE
1	1300TO-01-60-90		*KIT "A," "Installation of Elevator Inertia Weight - P-51B, P-51C, P-51D, F-6C, and F-6D," consisting of the following parts:	15	AF Stock
1		109-52217	Elevator Inertia Weight Assy	01-M	
1	6500-015290	AN4-26	Bolt - Aircraft drilled	04-A	
1	6500-472300	AN310-4	Nut - Aircraft castle steel	04-A	
1	6700-396350	AN380-2-2	Pin - Cotter, steel, 1/16 x 1/2 in.	29	
1	6500-984200	AN960-416	Washer - Plain steel	04-A	
1	6500-033183	AN5-26A	Bolt - Aircraft plain	04-A	
1	6500-514300	AN365-524	Nut - Self-locking steel	04-A	
2		109-952006	Spacer	01-M	
1		7S4-832-26	Screw	01-M	
1	6500-325550	755-10	Clip - Loop type	04-A	
1		4S3-8-38	Spacer	01-M	
1	6500-513700	AN365-832	Nut - Self-locking steel	04-A	

b. One complete kit of parts (kit "A") measures approximately 8 x 8 x 10 inches and weighs approximately 21 pounds.

4. a. In order to expedite manufacture and distribution and to reduce shipping weight, the following listed kit is being furnished the European Theater of Operations and the Mediterranean Theater of Operations:

QTY	STOCK NO.	PART NO.	NOMENCLATURE	CLASS	SOURCE
1	1300TO-01-60-90		*KIT "B," "Installation of Elevator Inertia Weight - P-51B, P-51C, P-51D, F-6C, and F-6D," consisting of the following parts:	15	AF Stock
1		109-52217-4	Tube	01-M	
1		109-52217-2	Steel Sheet	01-M	
1		109-52217-3	Steel Sheet	01-M	
1	6500-015290	AN4-26	Bolt - Aircraft drilled	04-A	
1	6500-472300	AN310-4	Nut - Aircraft castle steel	04-A	
1	6700-396350	AN380-2-2	Pin - Cotter, steel 1/16 x 1/2 inch	29	
1	6500-984200	AN960-416	Washer - Plain steel	04-A	
1	6500-033183	AN5-26A	Bolt - Aircraft plain steel	04-A	
1	6500-514300	AN365-524	Nut - Self-locking steel	04-A	
2		109-952006	Spacer	01-M	
1		7S4-832-26	Screw	01-M	
1	6500-325550	755-10	Clip - Loop type	04-A	
1		4S3-8-38	Spacer	01-M	
1	6500-513700	AN365-832	Nut - Self-locking steel	04-A	

*The following parts are not included in either kit "A" or kit "B," however, these parts are required for P-51B, P-51C, and F-6C airplanes only and will be obtained as indicated.

QTY	STOCK NO.	PART NO.	NOMENCLATURE	CLASS	SOURCE
1		-2	Clamp Mfr. from:	01-M	Local Mfr (See figure 8.)
As req			Sheet - Alum.-alloy condition T, heat-treated .064-inch, Specification No. AN-A-13, stock No. 6800-142020	23-A	AF Stock

QTY	STOCK NO.	PART NO.	NOMENCLATURE	CLASS	SOURCE
1		-3	Clamp Mfr from:	01-M	Local Mfr (See figure 8.)
As req			Sheet - Alum.-alloy condition T, heat-treated .064 inch, Specification No. AN-A-13, stock No. 6800-142020	23-A	AF Stock
2	6700-620507	AN526-1032R16	Screw - Button head, steel, recessed head, No. 10-32 x 1 inch	29	AF Stock
2	6500-985300	AN960-10L	Washer - Plain, steel light	04-A	AF Stock
2	6500-514000	AN365-1032	Nut - Self-locking steel	04-A	AF Stock
4			Plywood Spacer (7/32 inch hole x 1/2 inch square) Mfr from:		Local Mfr
As req			Plywood - Birch face, birch core, 5 ply, 1/4-inch 45-degree grain, Specification No. AN-NN-P-511 or equivalent, stock No. 7200-696900	22	AF Stock
1	6700-396600	AN380-2-5	Pin - Cotter, steel	29	AF Stock
1	6700-396450	AN380-2-3	Pin - Cotter, steel	29	AF Stock

b. The approximate size of this kit (kit "B") is 6 x 8 x 8 inches and the approximate weight is 2 pounds.

c. Depots in the affected theaters are to manufacture the elevator inertia weight assembly by casting the lead weight around the weld assembly and steel sheet. The molds required have already been furnished. The instructions for pouring lead are as follows:

(1) Spray the inside of the mold with iron oxide to facilitate removal of the weight assembly after pouring. Heat the mold with a blow torch before starting to pour since the lead has a tendency to "wrinkle" when poured into a cold mold.

CAUTION The workman should wear asbestos gloves during all operations to prevent burns and blisters. It is imperative that SAFETY GOGGLES be worn during the actual pouring operations to preclude possibilities of serious injury to the eyes.

(2) Preparatory to placing the parts in the mold, assemble the steel sheets, part Nos. 109-52217-2 and 109-52217-3, and the tube, part No. 109-52217-4, by sliding the sheets over the tube. (See figure 4.)

NOTE This should be an easy fit. If not, it will be necessary to ream out the hole in the sheet. It is important that this precaution be observed, since any binding of the sheet on the tube may result in improper alignment of the sheets and cause difficulties upon installation.

(3) Place the assembly in the mold, place the two aligning pins in their respective positions, and clamp securely by tightening the two knurled nuts. (See figure 5.)

NOTE The vent hole in the tube must be vertical in order to prevent air and gases from becoming trapped.

(4) If a scale large enough to accommodate the mold is available, the mold may be placed on it and a sufficient amount of lead poured into it so that the complete inertia weight assembly will weigh 20.15 plus or minus .50 pounds. Without benefit of a scale, the lead may be poured slightly past flush with the top of the mold and checked for weight after it has cooled.

NOTE The lead, when poured, should be heated to approximately 850°F. However, after the mold has been used for a while and is thoroughly heated, the lead may be poured at 750°F, thereby decreasing the waiting period for cooling.

(5) Permit the lead to stand in the mold for approximately 5 minutes, at the end of which time it should have hardened sufficiently to permit removal for cooling. (After continued use, the mold will become heated, and a longer hardening period may be required.)

NOTE It will take about an hour for the lead to cool sufficiently to be handled with bare hands.

(6) If a scale has not been employed during the pouring operation, weigh the complete inertia weight assembly to ascertain that it is within the required limits, namely 20.15 plus or minus .50 pounds. If it exceeds the limit, file off enough lead to obtain the desired tolerance. If it is underweight, melt the top of the lead with a blow torch and add more lead.

By Command of General ARNOLD:

Prepared by Aircraft Section,
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HEADQUARTERS, ARMY AIR FORCES
WASHINGTON 25, D. C.

TECHNICAL ORDER
NO. 01-60-90A

★ SUPPLEMENT TO BASIC TECHNICAL ORDER ★

3 April 1945

AIRCRAFT AND MAINTENANCE PARTS

NORTH AMERICAN—INSTALLATION OF ELEVATOR INERTIA WEIGHT—P-51B, P-51C, P-51D, F-6C, AND F-6D

NOTE This Technical Order supplements T. O. No. 01-60-90, dated 20 November 1944, to make correction as indicated herein. A SUITABLE REFERENCE TO THIS SUPPLEMENT WILL BE MADE ON PAGE 1 OF THE BASIC TECHNICAL ORDER AND THE AFFECTED FIGURE CORRECTED ACCORDINGLY.

1. Figure 4B of T. O. No. 01-60-90, dated 20 November 1944, is corrected as follows:

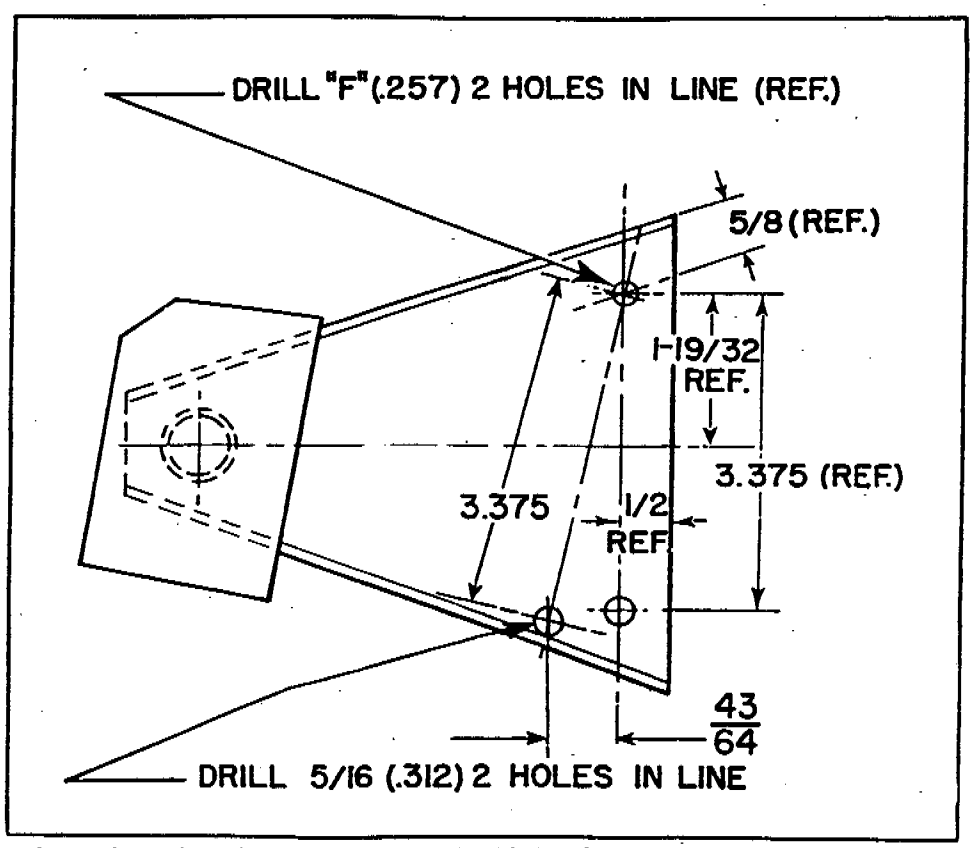

Figure 4B - View Showing Location of Additional Hole to Be Drilled in the Elevator Inertia Weight Assembly for Use on P-51B, P-51C, and F-6C Airplanes if Lower Hole in Bell Crank Has Been Drilled 3-3/8 Inches From Upper Hole

BY COMMAND OF GENERAL ARNOLD:

Prepared by
Aircraft Section,
Maintenance Div,
Hq, ATSC.

B. E. MEYERS
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Deputy Director
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RESTRICTED

HEADQUARTERS, ARMY AIR FORCES
WASHINGTON 25, D. C.

TECHNICAL ORDER
NO. 01-60-100

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This copy for T. O. Compliance Only. Desired copies will be distributed.

AIRCRAFT AND MAINTENANCE PARTS

REVISED

NORTH AMERICAN—INSTALLATION OF METAL-COVERED ELEVATORS—P-51D, P-51K, F-6D, AND F-6K + MORE TO 1/2°

NOTE As prescribed in T. O. No. 00-20A, appropriate reference to this Technical Order will be entered on AAF Forms 60-A for the aircraft affected. The work directed herein will be accomplished as soon as possible and not later than the next 100-hour inspection period by service activities with the aid of base maintenance facilities, if necessary. Spare vertical stabilizers, part Nos. 73-23001-100 and 73-23001-300, and spare horizontal stabilizers, part No. 73-21001-200, in stock, will be reworked as outlined in paragraph 4.

1. a. During dives in which the pilots' indicated air speed, corresponding to 75 percent of the speed of sound is approached or exceeded, and during dives to very high indicated air speeds, the airplane may be subjected to severe longitudinal oscillations. (Also termed pitching or porpoising.) This phenomenon has been attributed to bulging of the fabric on the elevators. In order to improve the dive characteristics, metal-covered elevators will be installed, and the angle of incidence of the horizontal stabilizer will be reduced to 1/2 degree on the following listed airplanes in accordance with the instructions contained in paragraph 2.

MODEL	AF SERIAL NOS.
P-51D and F-6D	44-11153 to 44-11352 inclusive
	44-13253 to 44-15752 inclusive
	44-63160 to 44-64159 inclusive
	44-72027 to 44-73826 inclusive
P-51K and F-6K	44-11353 to 44-12752 inclusive

b. The following airplanes, and all subsequent P-51D and P-51K airplanes, will be modified by the contractor prior to delivery:

MODEL	AF SERIAL NOS.
P-51D and F-6D	44-12853 to 44-13252 inclusive
	44-73827 to 44-75026 inclusive
	44-84290 to 44-84989 inclusive
P-51K and F-6K	44-12753 to 44-12852 inclusive

2. The instructions for accomplishing this change, as contained in North American Service Bulletin P-51-296, are as follows:

a. REMOVAL OF ELEVATORS AND RUDDER.

NOTE Paragraphs 2.a.(1) to (5) inclusive apply to both elevators.

(1) Disconnect the elevator trim tab actuating rod at the trim tab.

(2) Remove all stabilizer fillets and the dorsal fin from the airplane.

(3) Disconnect the elevator from the elevator horn assembly located between the elevators by removing the three attaching bolts and nuts.

(4) Remove the bolt from the elevator outboard hinge fitting. Support the elevator and remove the bolt from the elevator center hinge fitting.

(5) Guide the elevator straight aft from the horizontal stabilizer until it clears the trim tab rod.

(6) Disconnect the rudder trim tab actuating rod at the trim tab and remove the rod fairing from the rudder.

(7) Remove the metal cap from the bottom of the rudder and disconnect the rudder actuating rod at the lower hinge casting.

(8) Remove the bolt from the upper and lower hinge fittings. Support the rudder, remove the bolt from the center hinge fitting, disconnect the navigation light wire, and guide the rudder straight aft from the vertical stabilizer until it is clear of the trim tab rod.

b. REMOVAL OF VERTICAL AND HORIZONTAL STABILIZERS.

(1) Disconnect the transmitter antenna at the top of the vertical stabilizer.

(2) Tape the rudder trim tab cables to the drum in the vertical stabilizer and in the cockpit to facilitate reinstallation. Disconnect the trim tab drum and lower it through the lightening holes in the vertical stabilizer.

(3) Disconnect the elevator upper control cable at the elevator horn. Tie the cables to maintain the proper tension.

(4) Remove the bolts and nuts securing the front spar of the vertical stabilizer to the horizontal stabilizer.

Compliance with this instruction is MANDATORY by authorized United States Air Force

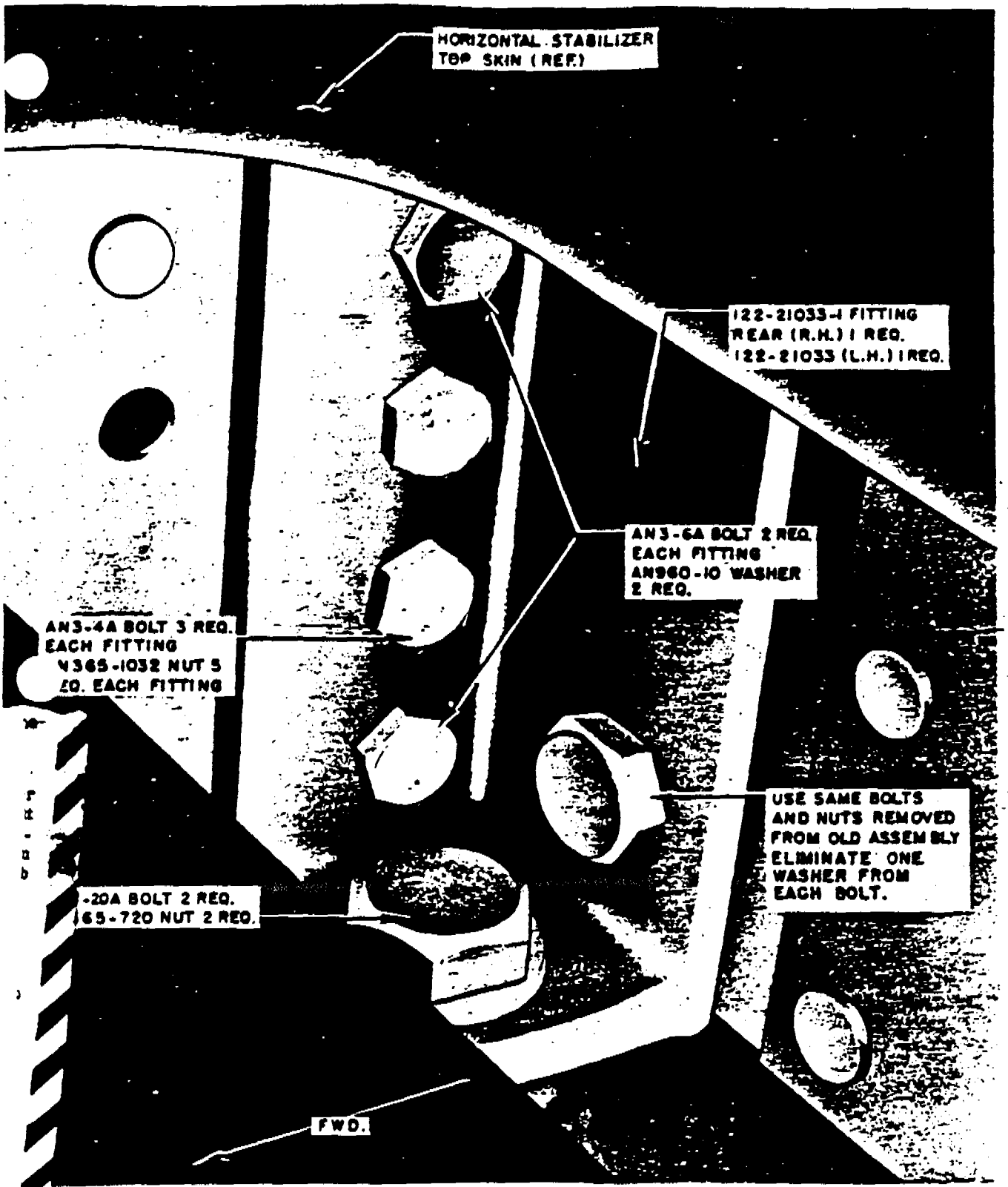

Figure 1 - View Showing Rear Casting Installed - Horizontal Stabilizer

(5) Remove the bolts and nuts securing the vertical stabilizer to the fuselage and remove the stabilizer from the airplane.

Remove the access covers from the upper surface of the horizontal stabilizer and tape the trim tab cables to the drums. Also tape cables to drum in cockpit.

(7) Ascertain that the elevator trim tab cables are identified at both ends of the turnbuckles in the aft section of the fuselage; then disconnect the cables

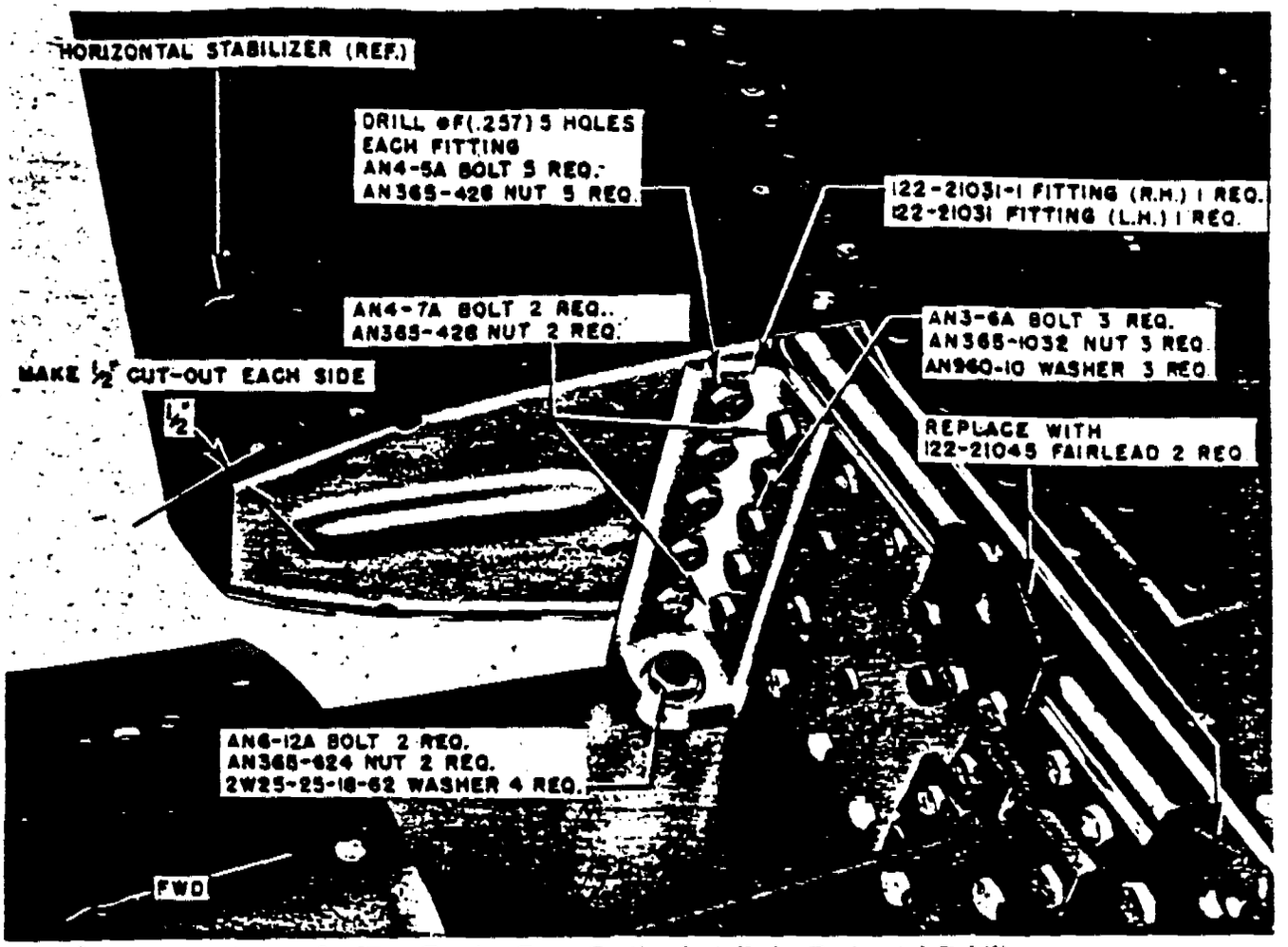

Figure 2 - View Showing Front Casting Installed - Horizontal Stabilizer

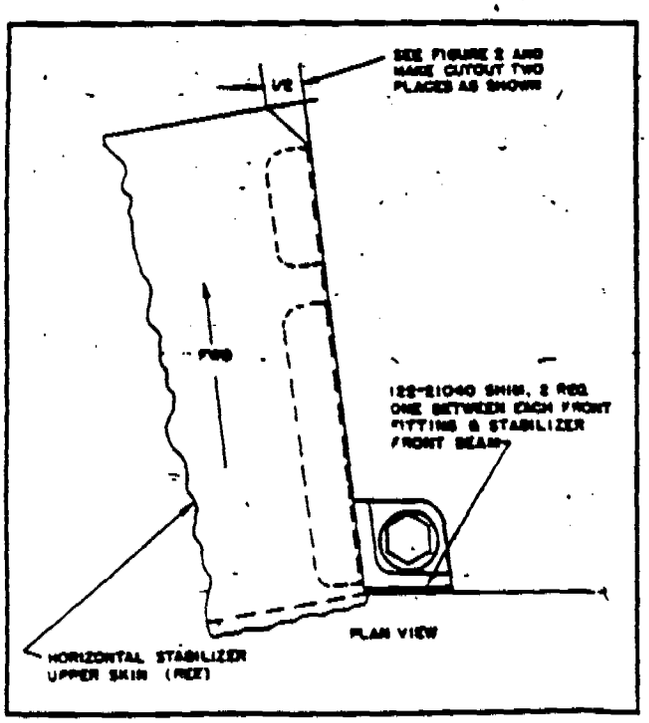

Figure 3 - Front Fitting Installed

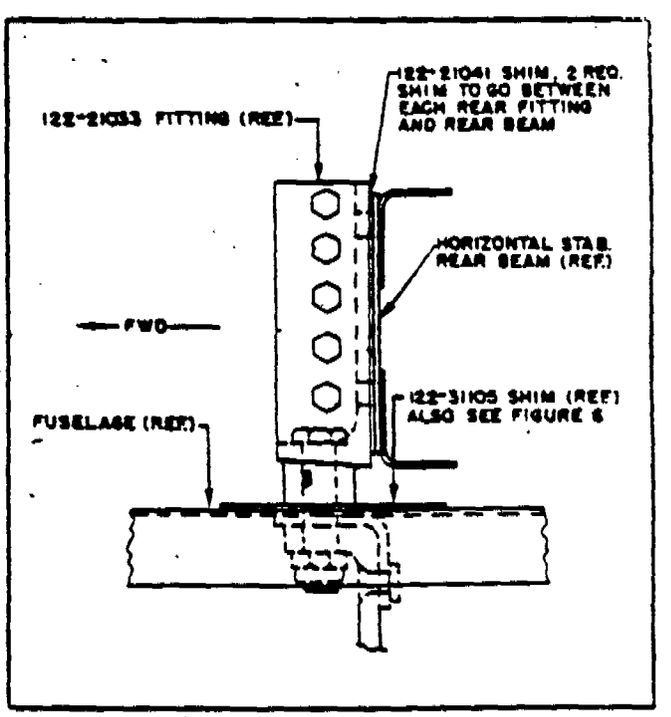

Figure 4 - Looking Inboard - Rear Fitting Installed

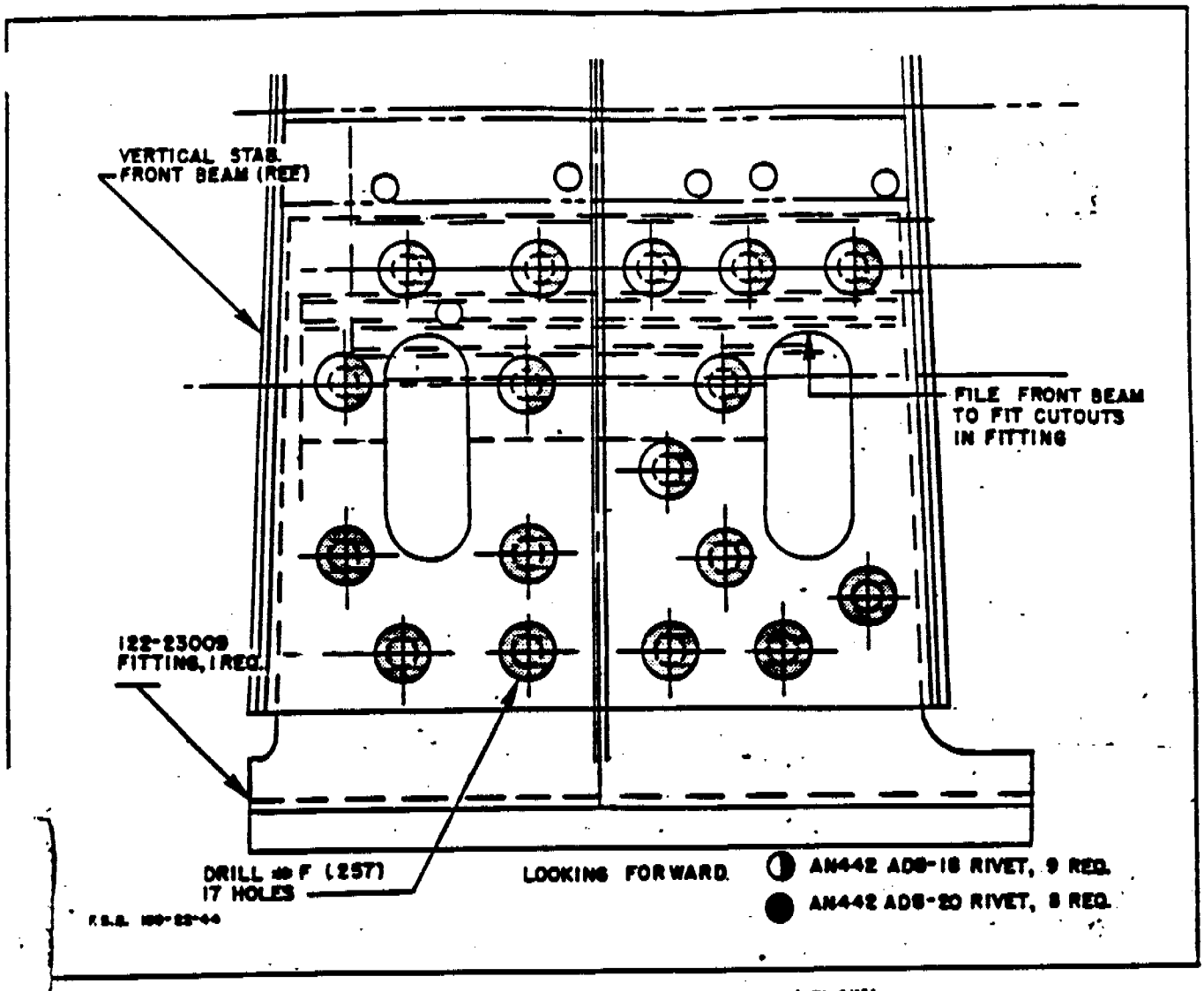

Figure 5 - Looking Forward - Fitting, Vertical Stabilizer

...he turnbuckles. Pull the cables out of the fuselage ...l coil them to prevent damage of the cables.

(8) Disconnect the elevator horn assembly from ...e bracket on the rear spar of the horizontal stabiliz... ...r.

(9) Remove the two bolts and nuts securing the front spar of the stabilizer to the fuselage. Remove the two bolts and nuts securing the rear spar of the stabilizer to the fuselage and lift the stabilizer from the airplane.

c. REWORK OF HORIZONTAL STABILIZER.

(1) Remove the elevator horn assembly bracket from the center of the rear spar of the horizontal stabilizer by removing the four bolts and nuts securing it to the beam.

(2) Remove the two bolts and nuts securing each ...e two rear castings to the horizontal stabilizer. Remove the three rivets securing each casting. (See figure 1.)

CAUTION Use a No. 21 (.159-inch diameter) drill and drill only the heads of the rivets. Then remove heads and use punch to remove remainder of rivets.

(3) Remove the five bolts and nuts securing each of the two front castings to the horizontal stabilizer. Remove the five rivets securing each casting. (See figure 2.)

NOTE On a few P-51D airplanes, each front casting may be found secured with 10 rivets rather than 5 bolts and 5 rivets.

CAUTION Use a No. 12 drill and drill only the heads of the rivets. Then remove heads and use punch to remove remainder of rivets.

(4) Make a 1/2-inch cut-out in both leading edge center corners as shown in figure 2. This will provide an opening through which a wrench may be inserted to install the new castings. (See figures 2 and 3.)

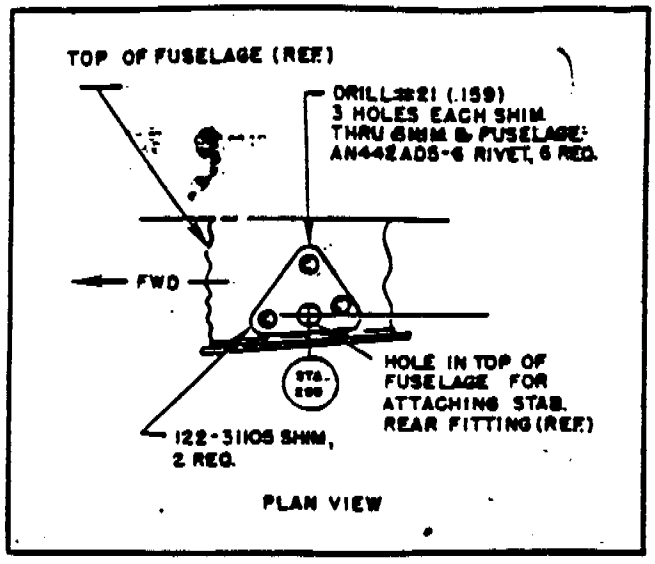

Figure 6 - Installation of Shims - Fuselage Rear Section

(5) Temporarily bolt the fitting, part No. 73-21031, and the new fitting, part No. 122-21031, back to back with a new shim, part No. 122-21040, between the fittings. In this manner the holes in the old fitting will act as pilots when drilling holes in the new fitting. Use a No. 12 (.189-inch diameter) drill for holes in leg of fitting attaching to front beam of stabilizer. Follow the same procedure for the fitting, part No. 122-21031-1. (See figures 2 and 3.)

(6) Secure the left-hand fitting, part No. 122-21031 (right-hand fitting, part No. 122-21031-1), and the shim, part No. 122-21040, to the front beam of the horizontal stabilizer at the top and bottom holes with two each bolts, part No. AN4-7A, and nuts, part No. AN365-428. Install three each bolts, part No. AN3-6A, washers, part No. AN960-10, and nuts, part No. AN365-1032, in the remaining holes through fitting and beam. Nuts shall be on aft side of beam. Enlarge the five holes in the stabilizer rib through the holes in the fitting with a No. F (.257-inch diameter) drill. Install five each bolts, part No. AN4-5A, and nuts, part No. AN365-428. Nuts shall be on outboard side of rib. (See figures 2 and 3.)

(7) Follow the instructions given in paragraph 2.c.(5) and drill the No. 12 (.189-inch diameter) holes in the new left-hand fitting, part No. 122-21033 (right-hand fitting, part No. 122-21033-1), and shim, part No. 122-21041. Secure the fittings and shims to the forward side of the stabilizer rear beam. Use the bolts, nuts, and washers formerly removed from this point. These bolts also attach the elevator horn assembly bracket on the aft side of the beam. This bracket is to be installed at this time. (See figures 1 and 4.)

(8) Install two each bolts, part No. AN3-6A, washers, part No. AN960-10, and nuts, part No. AN365-1032, through two of the holes of the fitting and the stabilizer rib. Enlarge the three remaining holes in the rib through the holes in the fitting with a No. 12 (.189-inch diameter) drill. Install three each bolts, part No. AN3-4A, washers, part No. AN960-10, and nuts, part No. AN365-1032. Remove the shim located on top of the stabilizer over the rear beam. Use a No. 30 (.1285-inch diameter) drill. Plug these holes with rivets, part No. AN426AD4-5. Countersink holes 100-degree x 7/32-inch diameter.

d. REWORK OF FUSELAGE REAR SECTION.

(1) Install a new shim, part No. 122-31105, over each horizontal stabilizer rear fitting attaching hole in the fuselage. Secure each shim with three rivets, part No. AN442AD5-6, as shown in figure 6. (See figures 4 and 6.)

(2) Locate the two holes in the fuselage station 291 beam where the elevator control cables pass through. (See figure 7.)

(3) Install a new bracket and roller assembly over each hole on the forward side of the beam in the position shown. (See figure 7.)

(4) Remove the two bearings from the lower end of the right-hand elevator horn and replace them as shown with a new roller assembly, part No. 122-21034. Secure with one clevis bolt, part No. AN24-28, and one nut, part No. AN320-4. (See figure 8.)

(5) Remove the two fair-leads as shown on figure 2 and replace with two fair-leads; part No. 122-20148. Attach with two each bolts, part No. AN3-7A, washers, part No. AN960-10, and nuts, part No. AN365-1032.

e. REWORK OF VERTICAL STABILIZER.

(1) Secure the horizontal stabilizer to the airplane with two each bolts, part No. AN7-20A, and nuts, part No. AN365-720, at the rear fittings and two each bolts, part No. AN6-12A, and nuts, part No. AN365-624, at the front fittings. Secure the elevator trim tab cables at the turnbuckles and safety with .032 brass wire. Remove the tape from the cable drums in the stabilizer and cockpit. Secure the elevator horn assembly to the bracket on the rear spar of the horizontal stabilizer.

(2) Remove the rivets securing the fitting, part No. 73-23009, to the lower end of the vertical stabilizer front beam. Use a 1/4-inch (.250-inch diameter) drill and drill only the heads of the rivets off. Carefully punch the remainder of each rivet out. DO NOT ENLARGE HOLES.

(3) Secure the new fitting, part No. 122-23009, in place of the one removed in the following manner: (See figure 5.)

(a) Secure the fitting, part No. 122-23009, in place on the horizontal stabilizer using the four bolts, nuts, and washers which secured the old one.

(b) Place the vertical stabilizer on the airplane and secure it at the rear attachment points (rear beam to fuselage), using the original attaching parts.

(c) Procure two 1/4-inch rivets and drill a No. 40 (.098-inch diameter) hole down through the cente:

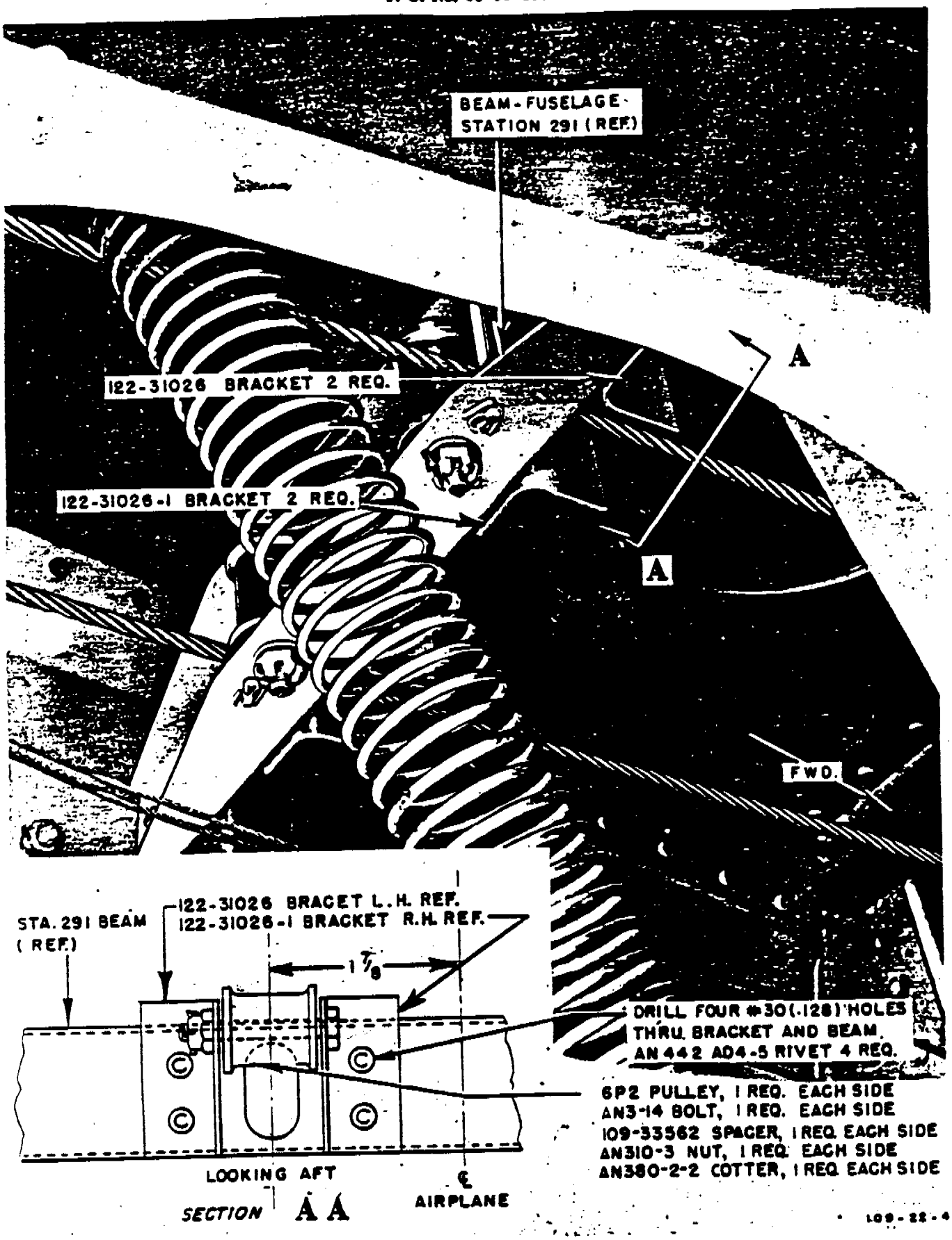

Figure 7 - Installation of Bracket and Roller Assemblies

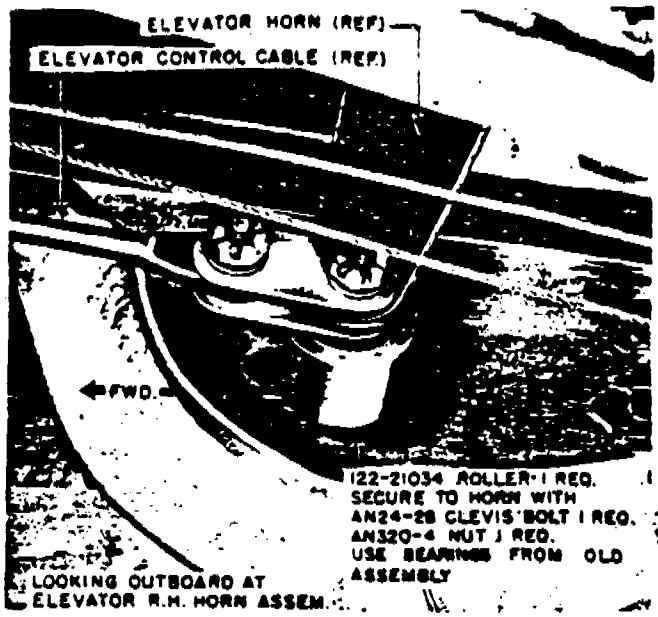

Figure 8 - Installation of Roller Declutching Mechanism

of each rivet. These two rivets and a long piece of string may be used to assure alignment of rudder hinge points on stabilizer. Insert the rivets in upper and lower hinge fittings. Insert string through holes drilled in rivets. When string is pulled tight and runs through exact center of center hinge point, they are aligned.

(d) Clamp the front beam of vertical stabilizer to the front fitting and remove the bolts securing fitting to horizontal stabilizer. Remove the vertical stabilizer from the airplane and proceed as follows:

(e) Drill 17 holes through the new fitting with a No. F (.257-inch diameter) drill. Use the holes in the beam as pilots.

NOTE It is suggested that 1/4-inch (.250-inch diameter) holes be drilled first; then these enlarged to No. F (.257-inch diameter).

(f) Drive eight rivets, part No. AN442AD8-20, and nine rivets, part No. AN442AD8-18, in the positions as shown in figure 5.

NOTE Angle removed from front beam will be reinstalled.

(g) File the cable cut-outs in the beam to fit those in the new fitting.

f. REINSTALLATION OF STABILIZERS, RUDDER, AND ELEVATORS.

(1) Secure the vertical stabilizer to the airplane with all the original attaching parts. Reconnect the elevator upper control cables to the horn assembly. Reinstall the trim tab drum in the vertical stabilizer. Remove the tape from the drum and from the one in the cockpit.

(2) Reconnect the transmitter antenna to the top of the vertical stabilizer.

(3) Reinstall the rudder on the vertical stabilizer with the original attaching parts. Reconnect the navigation light wire. Reconnect the rudder actuating rod at the lower hinge casting and reinstall the metal cap on the bottom of the rudder. Reconnect the rudder trim tab rod and reinstall the rod fairing.

(4) Remove the counterbalance weights from the old fabric-covered elevators and install them on the new metal elevators, part No. 122-22001. Install two new metal-covered elevators, part No. 122-22001, on the horizontal stabilizer, using the same attaching bolts and nuts which held the old ones. Reconnect the elevator trim tab actuating rod.

NOTE Use old trim tabs on new elevators.

(5) Reinstall the fillets and dorsal fin. Reform the fillets and fin to fit the newly positioned stabilizers.

3. a. The following parts are required per airplane to accomplish this change. These parts are furnished as complete kits for initial installation, and will be requisitioned in accordance with T. O. No. 00-35A-15. Parts required for replacement purposes after the initial installation and for rework of spare stabilizers upon installation to replace damaged or defective stabilizers, will be requisitioned as individual parts from property supply classes as indicated:

QTY	STOCK NO.	PART NO.	NOMENCLATURE	CLASS	SOURCE
1	1300TO-01-60-100		KIT, "Installation of Metal-covered Elevators - P-51D, P-51K, F-6D, and F-6K," consisting of the following parts:	15	AF Stock
1		122-21031	Fitting - Left-hand	01-M	
1		122-21031-1	Fitting - Right-hand	01-M	
4		AN4-7A	Bolt - Aircraft plain, steel (1/4-28) 7/8-inch length	04-A	
14		AN365-428	Nut - Self-locking steel (1/4-28)	04-A	
10		AN4-5A	Bolt - Aircraft plain, steel (1/4-28) 5/8-inch length	04-A	
10		AN3-6A	Bolt - Aircraft plain, steel (No. 10-32) 3/4-inch length	04-A	

QTY	STOCK NO.	PART NO.	NOMENCLATURE	CLASS	SOURCE
		AN3-4A	Bolt - Aircraft plain, steel (No. 10-32) 1/2-inch length	04-A	
1		122-21033	Fitting - Left-hand	01-M	
1		122-21033-1	Fitting - Right-hand	01-M	
2		122-21041	Shim	01-M	
2		122-21040	Shim	01-M	
1		122-23009	Fitting	01-M	
8		AN442AD8-20	Rivet - Alum.-alloy flathead type AD, 1/4 x 1-1/4 inches	29	
9		AN442AD8-18	Rivet - Alum.-alloy flathead type AD, 1/4 x 1-1/8 inches	29	
2		122-31105	Shim	01-M	
6		AN442AD5-6	Rivet - Alum.-alloy flathead type AD, 5/32 x 3/8 inch	29	
1		122-21034	Roller	01-M	
1		AN24-28	Bolt - Clevis (1/4-28) 1-3/4 inches long	04-A	
1		AN320-4	Nut - Aircraft castle shear, steel, 1/4-28	04-A	
2		122-21045	Fair-lead	01-M	
4		AN3-7A	Bolt - Aircraft plain steel (No. 10-32) 7/8-inch length	04-A	
20		AN960-10	Washer - Plain, steel No. 10 bolt size	04-A	
20		AN365-1032	Nut - Self-locking steel 10-32	04-A	
2		AN7-20A	Bolt - Aircraft plain, steel (7/16-20) 2-inch length	04-A	
2		AN365-720	Nut - Self-locking steel (7/16-20)	04-A	
-		AN6-12A	Bolt - Aircraft plain, steel (3/8-24) 1-1/4 inch length	04-A	
-		AN365-624	Nut - Self-locking steel (3/8-24)	04-A	
2		122-22001	Elevator Assembly	01-M	
2		122-31026	Bracket - Left-hand	01-M	
2		122-30126-1	Bracket - Right-hand	01-M	
2		109-33562	Spacer	01-M	
2		6P2	Pulley	01-M	
2		AN3-14	Bolt - Aircraft drilled, steel (No. 10-32) 1-1/2 inch length	04-A	
2		AN310-3	Nut - Aircraft castle, steel (No. 10-32)	04-A	
2		AN380-2-2	Pin - Cotter, steel 1/16 x 1/2 inch	29	
4		2W25-25-18-62	Washer	01-M	
8		AN442AD4-5	Rivet	29	
2		AN426AD4-5	Rivet	29	

b. One complete kit of parts packed for shipment measures 120 x 12 x 15 inches and weighs 35 pounds.

4. The following spare parts in stock will be reworked as follows:

a. Spare horizontal stabilizer assemblies:

PART NO.	NOMENCLATURE	CLASS
73-21001-200	Stabilizer Assembly - Horizontal	01-M

TO BE TAGGED, "This part to be reworked, when installed on any P-51D, P-51K, F-6D, or F-6K airplane, in accordance with paragraph 2.c. of T. O. No. 01-60-100."

b. Spare vertical stabilizer assemblies:

PART NO.	NOMENCLATURE	CLASS
73-21001-100	Stabilizer Assembly - Vertical	01-M
73-21001-300	Stabilizer Assembly - Vertical	01-M

TO BE TAGGED, "This part to be reworked, when installed on any P-51D, P-51K, F-6D, or F-6K airplane, in accordance with paragraph 2.g. of T. O. No. 01-60-100."

5. Parts removed and not reinstalled in accordance with the preceding instructions will be disposed of as follows:

a. The following parts will be inspected and returned to stock if found to be serviceable:

PART NO.	NOMENCLATURE	CLASS
73-23009	Fitting	01-M
73-21031	Fitting	01-M
73-21031-1	Fitting	01-M
73-21033	Fitting	01-M
73-21033-1	Fitting	01-M
73-22001	Elevator	01-M

NOTE Any of the afore-mentioned items, which are not serviceable without repair or reconditioning, will be condemned at once and so tagged for disposition as condemned property.

b. Fair-leads, part No. 73-21045, and all other parts not reinstalled (except those listed previously), will be condemned and so tagged for disposition as condemned property.

6. WEIGHT CHANGE.

a. Weight empty: Increase of 3 pounds at 346 inches aft of reference datum.

b. Useful load: No change.

c. Special equipment: No change.

7. Approximately 24 man-hours are required to effect this change.

BY COMMAND OF GENERAL ARNOLD:

Prepared by
Aircraft Section,
Maintenance Div,
Hq. ATSC.

B. E. MEYERS
Major General, U.S.A.
Deputy Director
Air Technical Service Command

RESTRICTED

HEADQUARTERS, ARMY AIR FORCES
WASHINGTON 25, D. C.

TECHNICAL ORDER
NO. 01-60J-25

10 July 1944

AIRPLANES AND MAINTENANCE PARTS

NORTH AMERICAN - DIVE LIMITATIONS - P-51B, P-51C, AND P-51D

NOTE The publication of this Technical Order has been expedited as the instructions contained herein are of vital importance and should be disseminated to all affected personnel without delay. As prescribed in T. O. No. 00-20A, appropriate reference to this Technical Order will be entered on AAF Forms 60-A for the airplanes affected. The work directed in paragraph 5. will be accomplished as soon as possible and not later than the next 25-hour inspection period by service activities with the aid of base maintenance facilities, if necessary. Commanding Officers will be responsible for bringing this Technical Order to the attention of all pilots cleared for operation of subject aircraft as well as those undergoing Transition Flying Training as contemplated in AAF Regulation 50-16.

1. All modern high speed, high altitude airplanes are affected by compressibility to a varying degree. Compressibility phenomena are caused by the formation of compression waves or shock waves in the air flowing over the wings and other parts of the airplane when the true air speed of the airplane approaches the speed of sound. These phenomena may be evidenced by occurrence of instability, uncontrollable rolling or pitching, or stiffness of controls, or combinations of these effects. The exact speed at which compressibility effects are noticed varies with different airplane models and with the condition of the airplane with respect to fit of cowling, cover fairings, fillets, inspection doors, etc, and with surface finish.

2. The first compressibility effects occur on the P-51 series airplanes at a speed approximately 75 percent of the speed of sound and are evidenced by a tendency of the airplane to porpoise. The pilot's indicated air speed corresponding to 75 percent of the speed of sound at various altitudes on the P-51B, P-51C, P-51D airplanes is shown in the following tables in the form of limit diving speeds versus altitude. Note, however, that at the lower altitudes the speed of sound does not govern, and the limiting air speed becomes a structural consideration only; hence, the present red line value of 505 mph is shown in the charts for the lower altitudes. The difference in speeds between the P-51B and P-51C chart and the P-51D chart is caused by the difference in the pitot tube installations.

3. Flight tests have been conducted during which the speeds noted in the charts were exceeded and porpoising was encountered. This porpoising starts at approximately the speeds shown above and increases in intensity as the air speed is further increased. At the present time, tests with airplanes completely instrumented so as to accurately determine air speed and altitude have not exceeded the above speeds beyond approximately 30 mph at the lower altitudes and approximately 20 mph at the higher altitudes. The airplane did not exhibit any unusual characteristics in these tests other than the previously described porpoising. However, the above-listed limits should not normally be exceeded, since compressibility effects may be evidenced in a more violent manner if allowed to progress. If through necessity or inadvertence the above speeds are exceeded and pronounced compressibility effects in one or more of the above-described forms are experienced, recovery

P-51B, P-51C

Limit Diving Speeds

Pressure Altitude (feet)	Pilot's Indicated Air Speed (mph)
40,000	270
35,000	305
30,000	340
25,000	385
20,000	420
15,000	465
10,000	505
5,000	505
0	505

See Technical Order 01-60J-25

P-51D

Limit Diving Speeds

Pressure Altitude (feet)	Pilot's Indicated Air Speed (mph)
40,000	260
35,000	290
30,000	325
25,000	365
20,000	400
15,000	440
10,000	480
5,000	505
0	505

See Technical Order 01-60J-25

should be effected by gradual reduction in power and gradual pull-up. CARE MUST BE EXERCISED IN PULL-OUTS, SINCE THE STICK FORCES ARE RELATIVELY LIGHT AND ABRUPT PULL-OUT MAY CAUSE STRUCTURAL FAILURE. THE ELEVATOR TRIM TAB WILL NORMALLY NOT BE REQUIRED TO AID RECOVERY. HOWEVER, IF FOUND NECESSARY IT SHOULD BE USED WITH CARE AND IN SMALL INCREMENTS.

5. All P-51B and P-51C airplanes and P-51D airplanes shall have the applicable placard containing flight restrictions as listed in paragraph 2., placed in the airplane where it can be readily seen by the pilot.

By Command of General ARNOLD:

Prepared by Aircraft Section,
Maintenance Div, Hq, ASC.

WALTER H. FRANK,
Major General, U.S.A.,
Commanding General, Air Service Command.

IMMEDIATE ATTENTION

~~RESTRICTED~~

HEADQUARTERS, ARMY AIR FORCES
WASHINGTON 25, D. C.

TECHNICAL ORDER
NO. ~~01-60-126~~ 1F-51-20

23 November 1945

AIRCRAFT AND MAINTENANCE PARTS

NORTH AMERICAN—FLIGHT CHARACTERISTICS AND RESTRICTIONS—P-51D, P-51K, F-6D, AND F-6K

This Technical Order replaces T. O. No. 01-60J-28, dated 17 August 1944.

NOTE The publication of this Technical Order has been expedited as the instructions contained herein are of vital importance and should be disseminated to all affected personnel without delay. Commanding Officers will be responsible for bringing this Technical Order to the attention of all pilots cleared for operation of subject aircraft as well as those undergoing Transition Flying Training as contemplated in AAF Regulation 50-16, and also to the attention of all Weight and Balance Officers under their jurisdiction.

1. In order to reduce the possibility of structural failures of wings on P-51D, P-51K, F-6D, and F-6K airplanes, two commonly held misconceptions regarding fighter type aircraft must be corrected. These are:

a. The belief that fighter airplanes are designed to such high load factors ("G's") that they are practically indestructible by any readily applied air load.

b. That since the possible loading conditions are relatively few, that unbalance resulting in instability is impossible.

2. The early P-51 type airplanes (P-51, P-51A, and A-36A) in the combat condition weighed approximately 8000 pounds. At this weight the limit load factor for the structure was 8. Due to tactical requirements, namely the installation of a more powerful engine, the addition of extra internal fuel, armament, armor, and navigation and radio equipment, the weight was increased so that P-51D, P-51K, F-6D, and F-6K airplanes may weigh in excess of 10,000 pounds. Limit load factors in the neighborhood of 5.0 may result under overload conditions when external fuel, bombs, or rockets are carried.

NOTE The limit load for a structure is the load at which the elastic limit of the structure is exceeded so that when the load is removed the structure does not return to its original shape but remains bent. The limit load factor is a number expressing the number of times the normal load supported by the structure must be increased (or multiplied) to reach the limit load. An airplane structure in normal flight supports only the weight of the airplane. The number of "G's" applied to an airplane multiplies the load which the structure must support. Therefore, the number of "G's" applied to the structure is equal to the number of "factors."

3. Due to the fuselage fuel tank installed in P-51D, P-51K, F-6D, and F-6K airplanes the center of gravity may be located anywhere between 21 percent and 33 percent of the mean aerodynamic chord depending on the amount of fuel in the fuselage tank and on the weight and location of other items of equipment installed. The center of gravity on these airplanes moves forward as fuel is consumed from the fuselage tank; each 17 gallons of fuel consumed causing a forward center of gravity shift of about 1 percent of the mean aerodynamic chord. The location of the center of gravity of an airplane has a definite influence on the longitudinal stability and control characteristics of the airplane. Forward center of gravity positions result in high longitudinal stability. The longitudinal stability of P-51 series airplanes is satisfactory for combat, dive bombing, or acrobatics at all altitudes when the center of gravity is at or forward of 27-1/2 percent mean aerodynamic chord. The longitudinal stability of P-51 series airplanes is acceptable for level flight in smooth air when the center of gravity is at or forward of 31 percent mean aerodynamic chord.

NOTE An airplane is longitudinally stable if an increasing stick pull force is required to increase the "G" acceleration of a maneuver, that is, when more pull force must be exerted to go to higher "G's." Instability exists if the stick force required to go to higher "G's" stops increasing. As long as some pull force (even if very small) is required to increase "G" acceleration the pilot's ability to control the airplane is not seriously affected. However, when reversal occurs and the stick tends to continue to the rear and has to be restrained to prevent the maneuver from "tightening" the pilot may lose control.

4. In addition to the effect of center of gravity location, other factors may influence longitudinal stability. The shape or contour of the elevators on P-51D, P-51K, F-6D, and F-6K airplanes is an important factor affecting the stability as measured by the stick forces. Due to the manner in which the airflow

over the elevators is affected when the "G" acceleration applied to the airplane is increased the stick forces tend to lighten and reverse. This tendency increases or augments the stick force reversal tendency caused by aft center of gravity location. The following diagrams illustrate the effects of both:

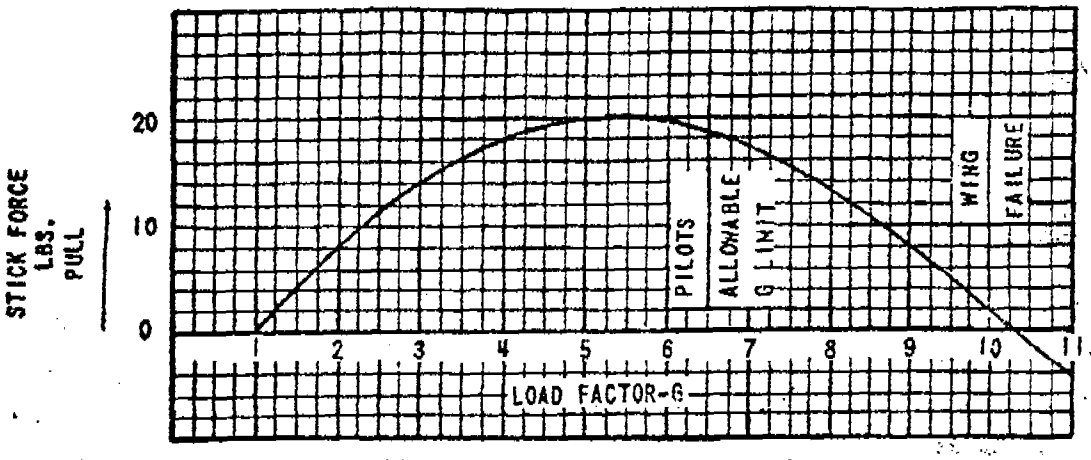

Diagram 1 - Center of Gravity at 26.4 Percent Mean Aerodynamic Chord
(Center of Gravity Position Does not Cause Stick Force Reversal)

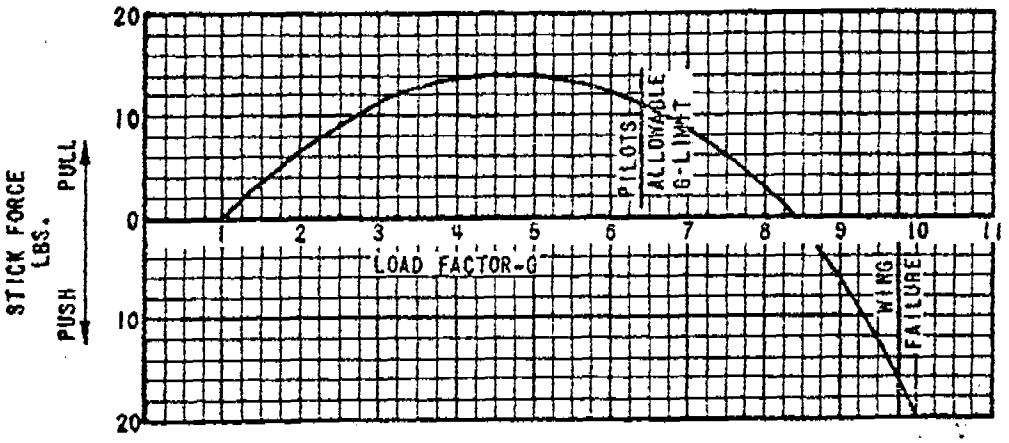

Diagram 2 - Center of Gravity at 29.1 Percent Mean Aerodynamic Chord

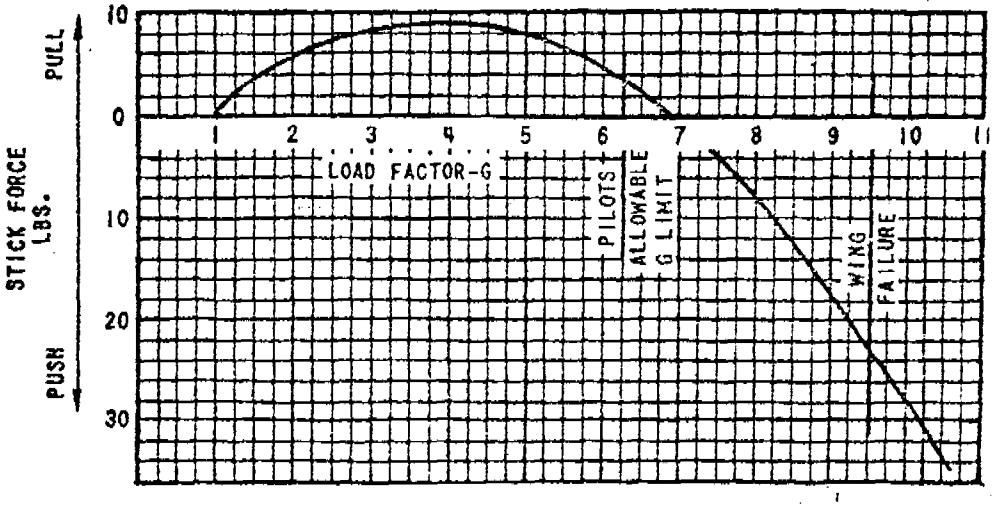

Diagram 3 - Center of Gravity at 31.3 Percent Mean Aerodynamic Chord.

T O. No. 01-60-126

5. FLIGHT RESTRICTIONS ON P-51D, P-51K, F-6D, AND F-6K AIRPLANES.

CENTER OF GRAVITY IS AFT OF	RESTRICTION
27-1/2 percent mean aerodynamic chord	a. Acrobatics and pull-ups are prohibited ABOVE 15,000 feet pressure altitude. b. Instrument Flying and issuance of flight clearances for flights under instrument conditions at pressure altitudes ABOVE 15,000 feet are prohibited.
28-1/2 percent mean aerodynamic chord	a. Acrobatics, dive bombing, and pull-ups are prohibited AT ALL ALTITUDES. b. Instrument Flying and issuance of flight clearance for flights under instrument conditions are prohibited AT ALL ALTITUDES. c. Flight in rough or turbulent air is to be avoided.
31 percent mean aerodynamic chord	a. Release of the airplane for flight is prohibited.

BY COMMAND OF GENERAL ARNOLD:

Prepared by
Aircraft Section,
Maintenance Div,
Hq, ATSC.

H. J. KNERR
Major General, U.S.A.
Commanding General
Air Technical Service Command

Restricted

Air Force Head-Quarters

Technical Order

MUSTANG ORDER NO. 78

Application: See paragraph 2

Classification: Class.2

ELEVATOR AND RUDDER TRIMTAB SYSTEMS - MODIFICATION OF

Introduction

1. This order provides for the fitment of additional guide bearings which will be used for the trim tab actuating rod assemblies from the trim tab drums. These bearings will minimize the backlash, the vertical free play movement and bending of the actuating rods.

General

2. (a) This modification is to be incorporated in the following aircraft not later than the next minor inspection after receipt of parts:-

A68-1 to A68-4 inclusive, A68-6 to A68-9 inclusive, A68-11 to 19 inclusive, A68-21 to A68-31 inclusive, A68-33, A68-35, A68-36, A68-47 inclusive, A68-49 to A68-56 inclusive, A68-58 to A68-65 inclusive, A68-67 to A68-75 inclusive, A68-77 to A68-78, A68-80 to A68-117 inclusive, A68-119 to A68-146 inclusive, A68-148 to A68-182 inclusive, and A68-184 to A68-192 inclusive. Aircraft A68-5, A68-10, A68-30, A68-32, A68-34, A68-37, A68-48, A68-57, A68-66, A68-76, A68-79, A68-118, A68-147, A68-183 and A68-193.

(b) Subsequent aircraft are to be modified by the manufacturer.

(c) Modification will take approximately 20 man-hours.

(d) No special tools are required.

Supply

3. The following parts will be required to complete one modification set:-

Item No.	Ident. No.	Part No.	Nomenclature.	No. off per A/C.	Class of Store
1	A68/18-21062	18-21062	Guide-Bearing	2	C
2	A68/18-23014	18-23014	Guide-Bearing	1	C
3	A68/17-23036-3	17-23036-3	Channel	1	C
4	H128F/30022	5B22-6A	Bolt	10	C
5	H128F/30568	1N6-1032	Nut	4	C
6	H128F/30568	1N76-1032	Nut	6	C
7	H128F/30521	2W25-28	Washer	22	C
8	T27H/24884	4L3-101	Lubricator	3	C
9	H128F/	2R9-AD4-11	Rivet	6	
10	H128F/61555	2W25-25	Washer - Shim	A.R.	C
11	H128F/15564	2W25-27	Washer - Shim	A.R.	C
12	H128F/30521	2W25-28	Washer - Shim	A.R.	C

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4. Complete modification sets (Items Nos. 1 to 9 inclusive) will be delivered to the Master Modification Section from Commonwealth Aircraft Corporation as arranged by Air Force Head-Quarters. Items Nos. 10 to 12 inclusive will be drawn from the unit store.

Method of Incorporation

5. Remove tail fillets, rudder and trim tab drum access panel from the fin.

6. Disconnect guide bearing, Part No. 17-23014, from the fin rear spar, then unscrew and remove rod assembly, Part No. 17-23036, from the aircraft. Care must be taken that the existing cup, spring and washers remain on the screw assembly, Part. No. 17-23037.

7. Drill out rivets (2 off), attaching fitting, Part No. 17-23059 to the actuating shaft, Part No. 17-23036-2, then remove fitting. Use No. 30 (.128) diameter drill).

8. Install lubricator, Part No. 4L3-101 (Item No. 8) to guide-bearing, Part No. 18-23014 (Item No. 2).

9. Attach guide bearing, Part No. 18-23014 (Item No. 2) to channel, Part No. 17-23036-3 (Item No. 3) using bolt, Part No. 5B22-6A (Item No. 4) 2 required washer, Part No. 2W25-28 (Item No. 7) 2 required and nut, Part No. IN76-1032 (Item No. 6) 2 required.

10. Install channel, Part No. 17-23036-3 (Item No. 3) with guide bearing, Part No. 18-23014 (Item No.2) attached, to the actuating shaft, Part No. 17-23036-2.

11. Re-install fitting, Part No. 17-23059 to the actuating shaft, Part No. 17-23036-2, using rivet, Part No. 2R9-AD4-11 (Item No. 9) 2 required. Ensure that rivets are filed flush on each side.

12. Remove prime and polish cadmium plate for a minimum length of 2½" in the vicinity of the guide bearing, Part No. 18-23014 (Item No.2).

13. Re-install rod assembly, Part No. 17-23036. Care must be taken to pick up the existing cup, spring and washers remaining on screw assembly, Part No. 17-23037.

14. With the control column locked in the neutral position, operate the rod assembly, Part No. 17-23036, until a measurement of 17/32" between the centre line of the fitting, Part No. 17-23059, and the centre line of the rudder-hinges is obtained, then attach guide bearing, Part No. 17-23014, to the fin rear spar using the existing attachment bolts.

15. Locate channel, Part No. 17-23036-3 (Item No. 3) to dimensions as shown on the attached Drawing No. A11424 (Sheet 1) (Figure 1.). Rework stringers, Part No. 17-23001-16 and -25 as required to give clearance to the attachment bolt heads of guide bearing, Part No. 18-23014 (Item No.2).

16. Drill No. 10 (.193) 4 holes, through stringers, Part No. 17-23001-16 and -25 and channel, Part No. 17-23036-3 (Item No. 3), at dimension as shown on the attached Drawing (Figure 1).

17. Install channel, Part No. 17-23036-3 (Item No. 3) using bolt, Part No. 5B22-6A (Item No. 4) 4 required, washer, Part No. 2W25-28 (Item No. 7) 12 required, and nut, Part No. IN76-1032 (Item No. 6) 4 required.

Notes (1) Washers, Part No. 2W25-28 (Item No. 7) to be located as shown on the attached Drawing (Figure 1).

(2) Alignment of the guide bearing, Part No. 18-23014 (Item No. 2) may be facilitated by the use of shim washers, Part No. 2W25-25 (Item No. 10), 2W25-27 (Item No. 11) and 2W25-28 (Item No. 12) as required.

18. Re-install the rudder and connect the trim tab actuating rod assembly, using the existing attachments.

19. Disconnect the top elevator cables from the operating horn assembly, Part Nos. 17-20019 and 17-20020 of the elevator trim tab system left-hand.

20. Remove the trim tab drum access panel from the upper surface of the tailplane.

21. Disconnect the elevator hinge (2 off) and trim tab actuating rod assembly attachment bolts. Remove actuating rod assembly from aircraft.

22. Disconnect guide bearing, Part No. 17-21019 from the tailplane rear spar, then unscrew and remove rod assembly, Part No. 17-21050, from the aircraft. Care must be taken that the existing cup, spring and washers remain on the screw assembly, Part No. 17-21057.

23. Drill out rivets (2 off) attaching eye-bolt, Part No. 17-21032, to the actuating shaft, Part No. 17-21050-2, then remove eye-bolt. Use No. 30 (.128) diameter drill.

24. Install lubricator, Part No. AL3-101 (Item No. 8) to guide bearing, Part No. 18-21062 (Item No. 1).

25. Install guide bearing, Part No. 18-21062 (Item No. 1) to the actuating shaft, Part No. 17-21050-2.

26. Re-install eye-bolt, Part No. 17-21032 to the actuating shaft, Part No. 17-21050-2, using rivet, Part No. 2R9-AD4-11 (Item No. 9) 2 required. Ensure that rivets are filed flush on each side.

27. Remove prime and polish cadmium plate for a minimum length of 2½" in the vicinity of the guide bearing, Part No. 18-21062 (Item No. 1).

28. Rework the top and bottom surfaces of the elevator skin covering dimensions as shown on the attached Drawing No. A11424 (Sheet 2) (Figure 2) to give clearance to guide bearing, Part No. 18.21062 (Item No. 1) and to also provide access for the grease gun.

29. Re-install rod assembly, Part No. 17-21050. Care must be taken to pick up the existing cup, spring and washers remaining on screw assembly, Part No. 17-21057.

30. Re-install top elevator cables to the operating horn assembly Part Nos. 17-20019 and 17-20020.

31. With the control column locked in the neutral position, operate the rod assembly, Part No. 17-21050, until the centre line of the eye-bolt, Part No. 17-21032, aligns with the centre line of the elevator hinges, then attach guide bearing, Part No. 17-21019, to the tailplane rear spar using the existing attachment bolts.

32. Locate guide bearing, Part No. 18-21062 (Item No. 1) as shown on the attached Drawing (Figure 2). Ensure that the guide bearing, Part No. 18-21062 (Item No. 1) is rotated until maximum edge distance is obtained in tailplane stringers, Part Nos. 17-21001-20 and -21.

33. Drill No. 10 (.193) diameter 2 holes through tailplane stringers, Part Nos. 17-21001-20 and -21 as shown on attached drawing (Figure 2).

34. Install guide bearing, Part No. 18-21062 (Item No. 1) using bolt, Part No. 5B22-6A (Item No. 4) 2 required, washer, Part No. 2W25-28 (Item No. 7) 4 required, and nut, Part No. IN6-1032 (Item No. 5) 2 required.

Note: Alignment of the guide bearing, Part No. 18-21062 may be facilitated by the use of shim washers, Part No. 2W25-25 (Item No. 10), 2W25-27 (Item No. 11) and 2W25-28 (Item No. 12) as required.

35. Re-install the elevator hinge bolts (2 off) and the trim tab actuating rod assembly, using the existing attachments.

36. Repeat paragraphs 19 to 35 for elevator trim tab system, right-hand.

37. Re-install tail fillets and trim tab access panels, using existing attachments.

Drawings

38. Drawings Nos. A11424/1-2 are attached hereto.

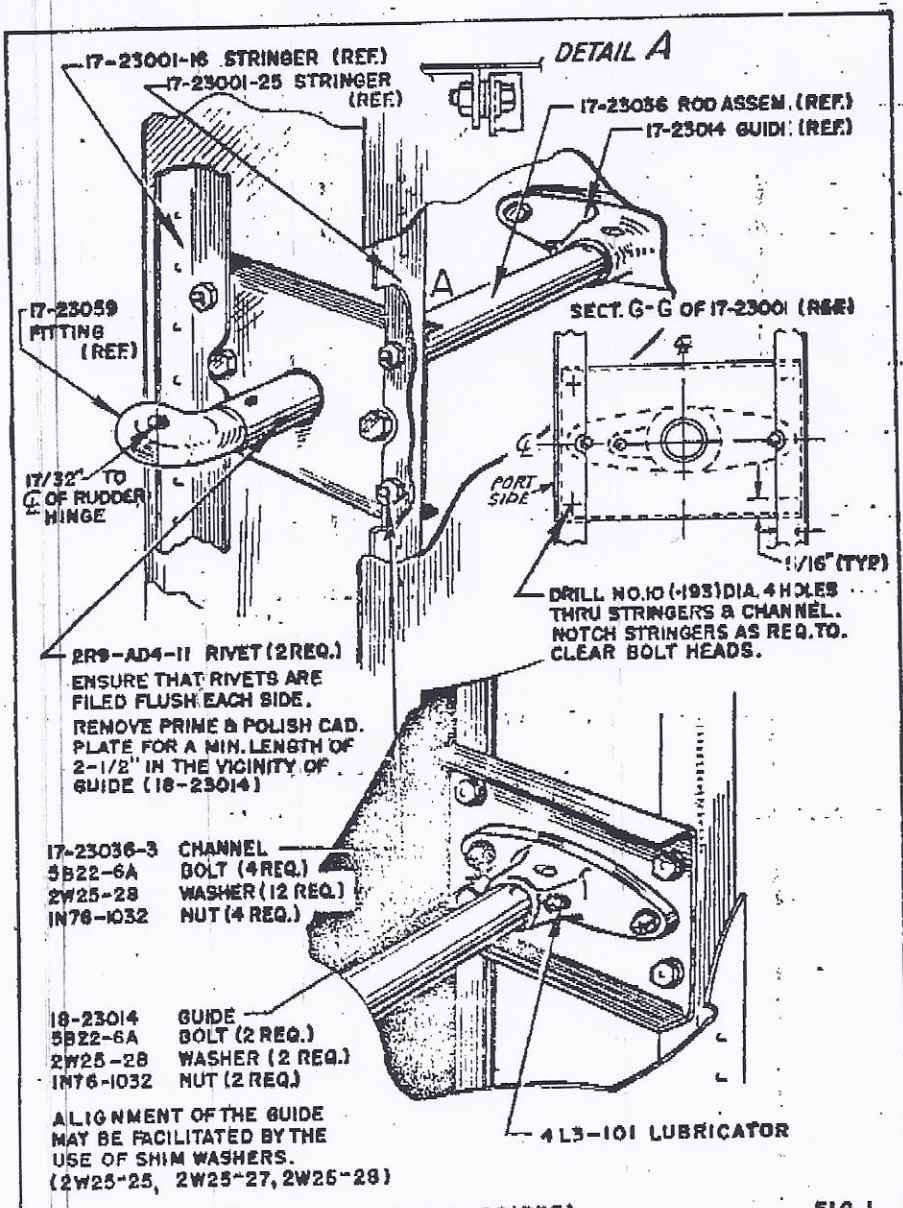
Effect on Weight and Balance

39. The effect of the incorporation of this modification on the weight and balance of the aircraft is negligible.

References : Files R.A.A.F. 3/60/142 and 150/4/8201.
MCR 18-96, R.T.O. Memo. A68/2/7 (30.3.51)

Attachments : Drawing No. A 11424/1-2.

Date of Issue: 16th November, 1951.



C.A.C MOD. 17-M2001 M.C.R 18-96 (REF.) FIG. 1.

ISSUED BY	TITLE	ELEV. & RUDDER TRIM TAB SYSTEM-MOD	DRAWN	
DIRECTORATE OF TECHNICAL SERVICES R.A.A.F	COMPONENT OF		TRACED	
	MACHINE	MUSTANG	CHECKED	
	ENGINE		APPROVED	
	TECH. ORDER	MUSTANG N° 78	DRAWING NO.	A11424
	ISSUE NO.		SHT. 1	
	DATE			

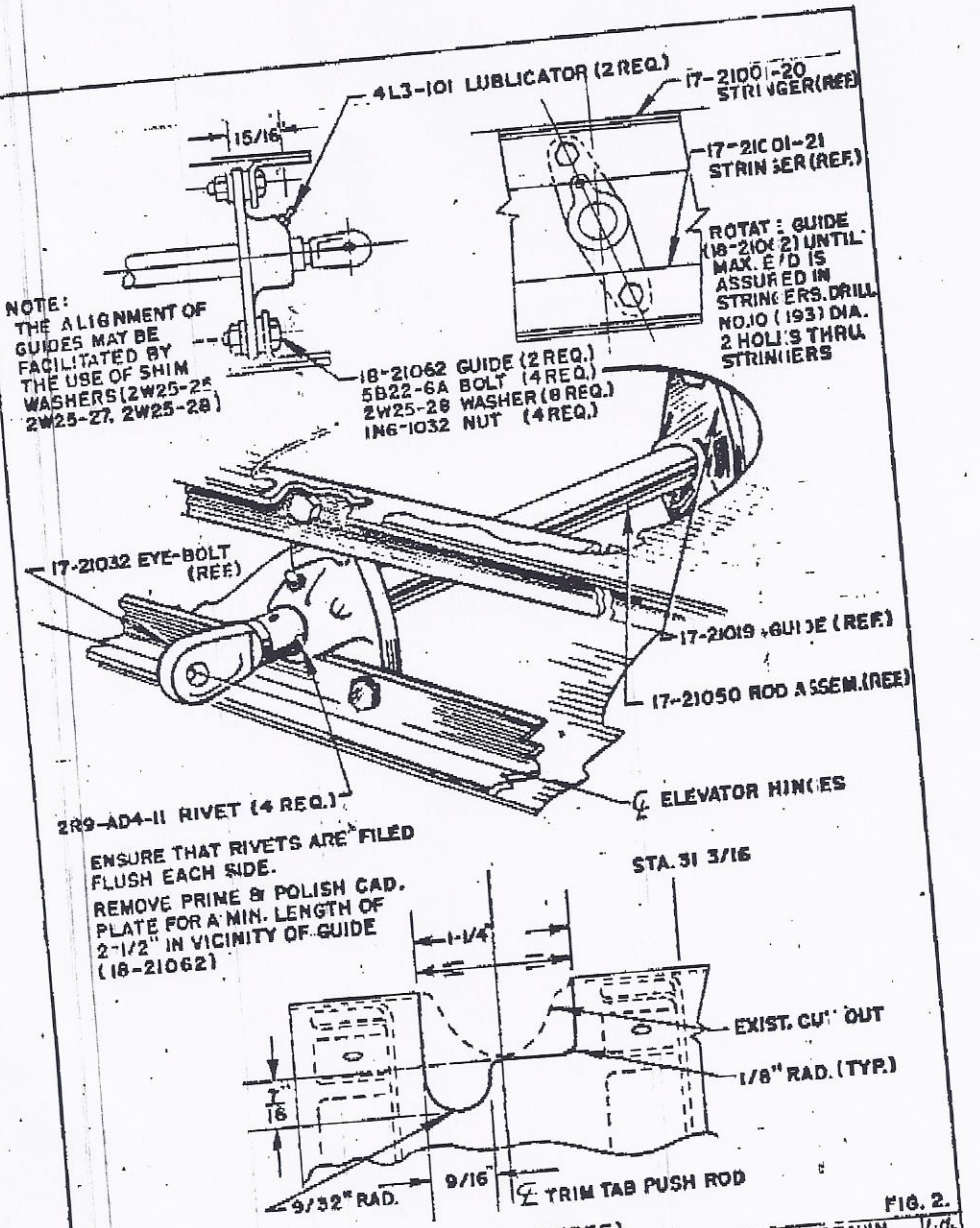


FIG. 2.

M.C.R 18-96 (REF.)

C.A.C 17-M2001

ISSUED BY	TITLE	ELEV. & RUDDER TRIM TAB SYSTEM-MOD.	DRAWN	I.H.
	COMPONENT OF		TRACED	I.H.
DIRECTORATE OF TECHNICAL SERVICES R.A.A.F	MACHINE	MUSTANG	CHECKED	
	ENGINE		APPROVED	
	TECH. ORDER	MUSTANG No 78	DRAWING NO.	A11424 SHT. 2
	ISSUE NO.			
	DATE			