55 Stabilizers

CHAPTER 55

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CHAPTER 55 - STABILIZERS

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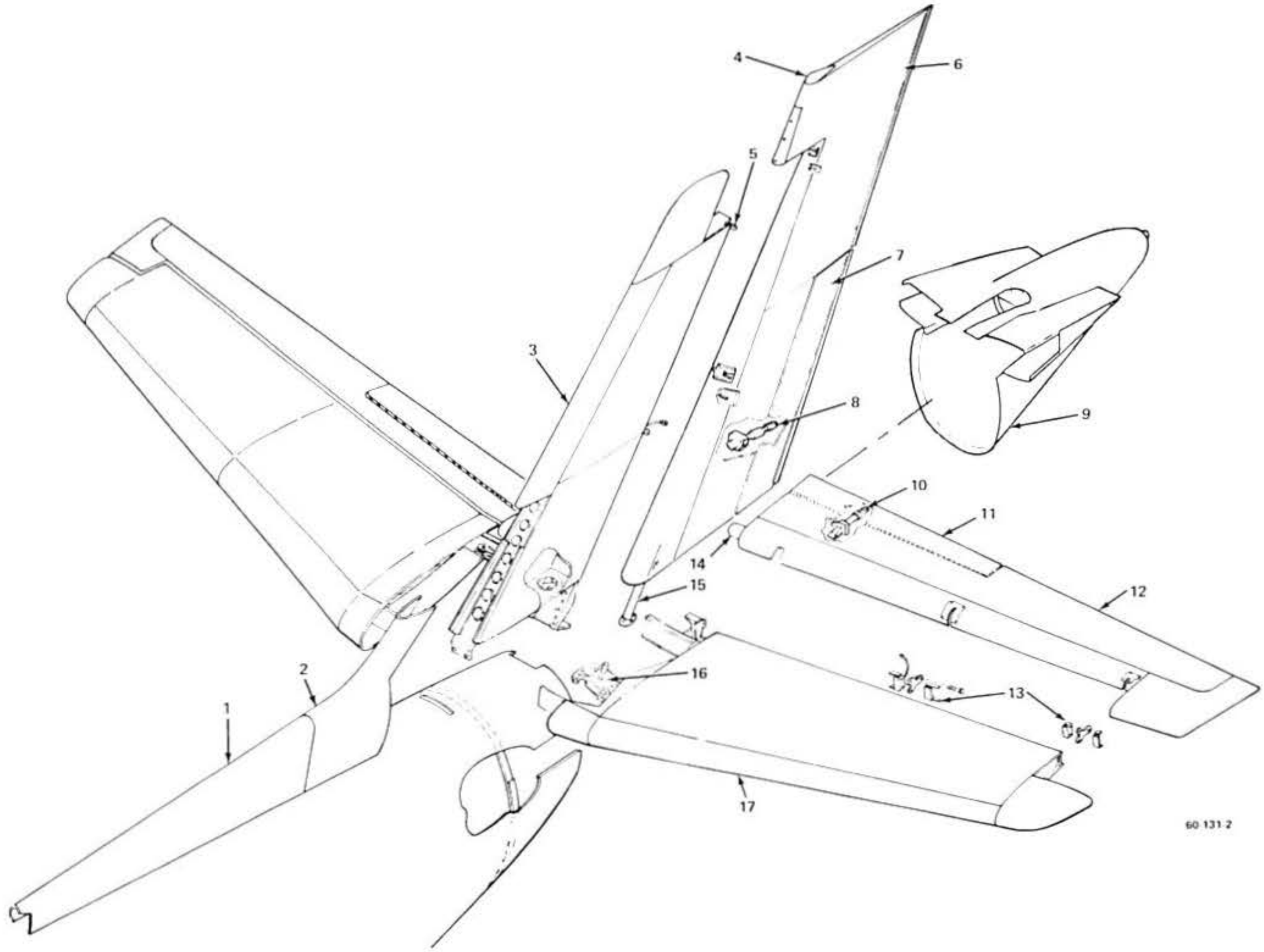

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Figure 1

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HORIZONTAL STABILIZER - MAINTENANCE PRACTICES

HORIZONTAL STABILIZER REMOVAL

a. Remove the tail cone and elevators. (Refer to Chapter 27-30-00.)

b. Remove the dorsal saddle fairing and lower vertical stabilizer fairings.

c. Remove the access cover on the lower aft right side of the fuselage.

d. Disconnect the surface deicer tubes at the horizontal stabilizers.

e. Remove the bolts attaching the horizontal stabilizers to the fuselage bulkheads.

f. Carefully pull the horizontal stabilizers outboard and clear of the fuselage.

HORIZONTAL STABILIZER INSTALLATION

a. Carefully move the horizontal stabilizers inboard into position at the fuselage bulkheads and install the attaching bolts. Torque all 5/16-24 bolts to 100 to 140 inch-pounds and 3/8-24 bolts to 160 to 190 inch-pounds.

NOTE

The attaching bolts shall have no threads bearing against structural members. Proper torque must be maintained without bolt rotation in the bolt holes.

b. Connect the surface deicer tubes at the horizontal stabilizers.

c. Install the access cover on the lower aft right side of the fuselage.

d. Install lower vertical stabilizer fairings and the dorsal fairing.

e. Install the elevators and tail cone. (Refer to Chapter 27-30-00.)

"END"

ELEVATOR - MAINTENANCE PRACTICES

ELEVATOR BALANCING
(Figure 201)

After repainting and/or repair, the finished elevator must be check balanced to ensure that its static moment about the hinge line is within the prescribed limits. The static moment for all completed elevator assemblies must fall within the range of 12.9 to 25.1 inch-pounds underbalance (tail heavy) at the measured moment about the hinge line. The static moment of the elevator is determined by multiplying the unbalanced weight of the elevator assembly times the perpendicular distance from the hinge center line to the center of gravity when the chord line is horizontally level. The weight is measured in pounds and the distance in inches. The static moment of a 100 percent balanced elevator assembly is 0.0 inch-pounds. Tail heaviness indicates static underbalance while nose heaviness indicates static overbalance.

NOTE

Control surfaces ordinarily need not be rebalanced unless they are repainted, repaired or have parts replaced. When repainting, hang the control surfaces by the trailing edge so excess paint will drain toward the leading edge.

The balance weight of the right elevator assembly is manufactured of lead or steel shot and epoxy resin. This weight is constructed in such a manner that adding weight is not recommended, but material may be removed to reduce weight. This weight should be sufficiently heavy to allow repainting and still check balance within the range of 12.9 to 25.1 inch-pounds underbalance (tail heavy). Even though the right elevator balance weight cannot be added to, the elevator MUST have the balance checked any time the elevator is repainted, repaired, or any work is done which might affect the balance.

CHECKING BALANCE

The balance must be checked in a draft free area with the elevator completely assembled in flying condition. All painting, including stripes and touch-up, must be completed. The tab, tab push rod, static wicks, and hinge bolts must be attached. The chord line must be horizontally level and the hinge line must be properly supported when the static moment is measured. Although many different methods of check balancing exist, the simplest is counterbalancing: The application of a known force or weight at a measured distance from the hinge line to counter the unbalance moment of the elevator assembly.

EQUIPMENT REQUIRED TO PERFORM CHECK BALANCING

a. A stand with knife edge supports as illustrated in Figure 201. The knife edges must be in the same horizontal plane.

b. A cup or similar light weight container.

c. Approximately 3 pounds of lead shot.

d. A certified beam balance weighing device calibrated in units of 0.01 pound or less.

e. A straight edge, ruler, and spirit level.

BALANCING PROCEDURE

COUNTERBALANCING METHOD

a. Locate the chord line by placing a stright edge at the inboard end of the elevator assembly so that one end is on the hinge center line (at the center of the torque tube) and the other end is centered on the trailing edge. Mark the chord line with a suitable marker, such as a grease pencil, then remove the straight edge.

b. Secure the trim tab in its neutral position with a small piece of masking tape.

c. Fit the correct size bolts in the hinge clevises and mount the elevator on the knife edge supports. Ensure that the elevator is free to rotate about the hinge line.

d. To determine if weight should be added or removed, suspend a cup from a point near the inboard end of the balance weight assembly on the elevator leading edge. Use a short length of small diameter string secured to the surface with a small piece of masking tape as illustrated in Figure 201. The cup must be free to hang vertically.

e. Add small quantities of lead shot to the cup until the elevator balances with the chord line level. Check this by holding the spirit level aligned with the marked chord line.

f. Carefully measure the perpendicular distance "D" within 0.1 inch from the hinge line to the point of suspension of the cup.

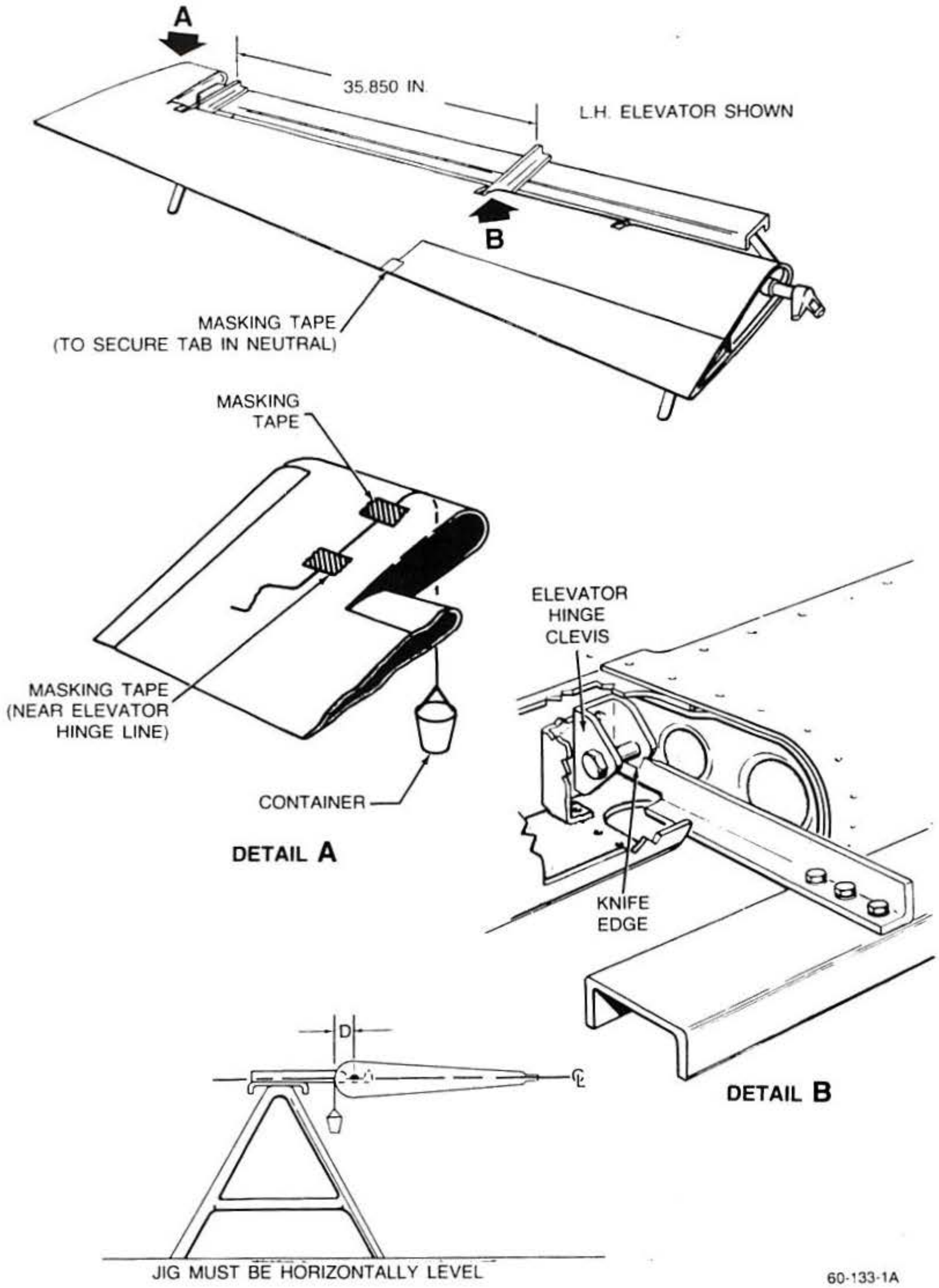
g. Remove the cup, contents, and string, then weight them.

NOTE

Since any weighing error is magnified by the distance "D", weighing is most important and must be done carefully on scales that are certified for accuracy.

h. Calculate the static balance as follows:

1. The weight of the cup and contents is designated by "W".



Balancing the Elevator
Figure 201

2. The underbalance moment is designated by "M".

3. M = W x D

4. The following is a typical example of a balancing calculation: Suspend a cup from the leading edge and add the required amount of lead shot. If the elevator balances with the chord line level at "W = 2.00 pound" and "D = 10.0 inches", then . . .

M = 2.00 x 10.0

M = 20.00 inch-pounds (The product of "W x D" must be accurate to within 0.10 inch-pounds.) In this instance, "M" is within the required static balance range and is therefore acceptable.

i. If the static balance does not fall within the range of 12.9 to 25.1 inch-pounds tail heavy (underbalance), weight must be added or removed (left elevator only) and the balance rechecked.

Remove the balance weight (left elevator only) and add or remove solder to bring the elevator balance within required limits. Coat the weight with a corrosion preventative material such as zinc chromate primer to insulate the dissimilar metals. Replace the balance weight and recheck the balance.

"END"

VERTICAL STABILIZER - MAINTENANCE PRACTICES

VERTICAL STABILIZER REMOVAL

a. Remove the tail cone and rudder. (Refer to Chapter 27-20-00.)

b. Remove the dorsal saddle fairing and the lower vertical stabilizer fairings.

c. Disconnect the antenna coaxial cable.

d. Disconnect the surface deicer tubes at the vertical stabilizer.

e. Remove the bolts attaching the vertical stabilizer to the fuselage bulkheads.

f. Carefully raise the vertical stabilizer clear of the fuselage.

VERTICAL STABILIZER INSTALLATION

a. Carefully lower the vertical stabilizer into position at the fuselage bulkheads and install the attaching bolts. Torque all 5/16-24 bolts to 100 to 140 inch-pounds and 3/8-24 bolts to 160 to 190 inch-pounds.

NOTE

The attaching bolts shall have no threads bearing against structural members. Proper torque must be maintained without bolt rotation in the bolt holes.

b. Connect the surface deicer tubes at the vertical stabilizer.

c. Connect the antenna coaxial cable.

d. Install the lower vertical stabilizer fairings and the dorsal saddle fairing.

e. Install the rudder and tail cone. (Refer to Chapter 27-20-00.)

"END"

RUDDER - MAINTENANCE PRACTICES

RUDDER BALANCING
(Figure 201)

After repainting and/or repair, the finished rudder must be check balanced to ensure that its static moment about the hinge line is within the prescribed limits. The static moment for all completed rudder assemblies must fall within the range of 21.1 to 31.2 inch-pounds underbalance (tail heavy) at the measured moment about the hinge line. The static moment of the rudder is determined by multiplying the unbalanced weight of the rudder assembly times the perpendicular distance from the hinge center line to the center of gravity when the chord line is horizontally level. The weight is measured in pounds and the distance in inches. The static moment of a 100 percent balanced rudder assembly is 0.0 inch-pounds. Tail heaviness indicates static underbalance while nose heaviness indicates static overbalance.

CHECKING BALANCE

The balance must be checked in a draft free area with the rudder completely assembled in flying condition. All painting, including stripes and touch-up, must be completed. The tab, tab push rod, static wicks, anti-collision light, chain and cable assembly, and hinge bolts must be attached. The chord line must be horizontally level and the hinge line must be properly supported when the static moment is measured. Although many different methods of check balancing exist, the simplest is counterbalancing: The application of a known force of weight at a measured distance from the hinge line to counter the unbalance moment of the rudder assembly.

EQUIPMENT REQUIRED TO PERFORM CHECK BALANCING

a. A stand with knife edge supports as illustrated in Figure 201. The knife edges must be in the same horizontal plane.

b. A can or similar light weight container.

c. Approximately 9 pounds of lead shot.

d. A certified beam balance weighing device calibrated in units of .01 pound or less.

e. A straight edge, ruler, and spirit level.

BALANCING PROCEDURE

COUNTERBALANCING METHOD

a. Locate the chord line by placing a straight edge at the lower closure rib of the rudder so that one end is aligned with the center of the torque tube while the other end is centered on the trailing edge. Mark the chord line with a suitable marker, such as a grease pencil, then remove the straight edge.

b. Secure the trim tab in its neutral position with a small piece of masking tape.

c. Fit the correct size bolts in the hinge brackets and mount the rudder on the knife edge supports. Ensure that the rudder is free to rotate about the hinge line.

d. Suspend a can from a point on the leading edge directly above the lower hinge skin cutout. Use a short length of small diameter string secured to the surface with a small piece of masking tape as illustrated in Figure 201. The can must be free to hang vertically.

e. Add small quantities of lead shot to the can until the rudder balances with the chord line level. Check this by holding a spirit level aligned with the marked chord line.

f. Carefully measure the perpendicular distance "D" within 0.1 inch from the hinge line to the point of suspension of the can.

g. Remove the can, contents, and string, then weigh them.

NOTE

Since any weighing error is magnified by the distance "D", weighing is most important and must be done carefully on scales that are certified for accuracy.

h. Calculate the static balance as follows:

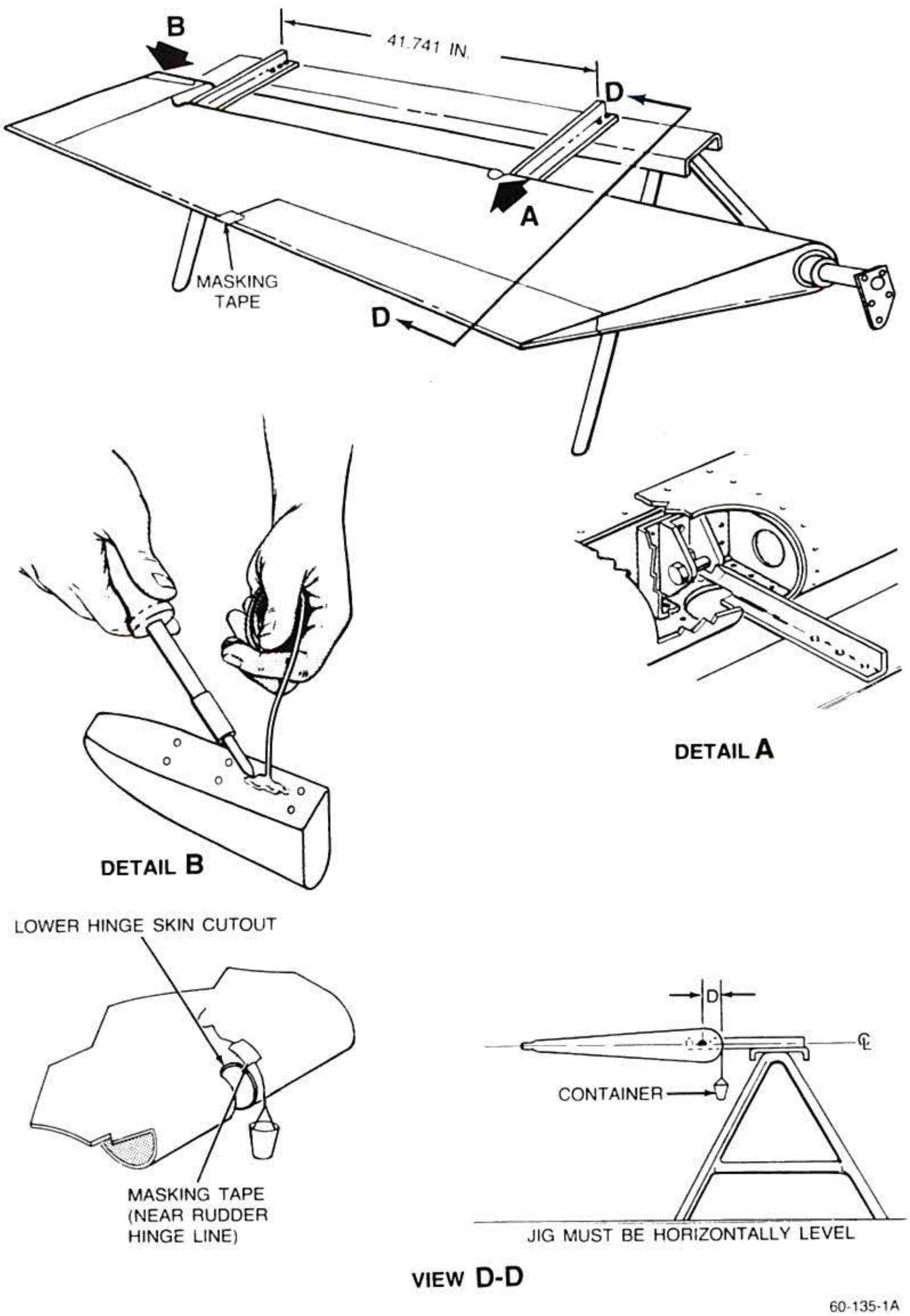
1. The weight of the can and contents is designated by "W".
2. The underbalance moment is designated by "M".
3. M = W x D
4. The following is a typical example of a balancing calculation: If the rudder balances with the chord line level at "W = 8.00 pound" and "D = 3.5 inches", then . . .

M = 8.00 x 3.5

M = 28.00 inch-pounds (The product of "W x D" must be accurate to within 0.10 inch-pounds.) In this instance, "M" is within the required static balance range and is therefore acceptable.

i. If the static balance does not fall within the range of 21.1 to 31.2 inch-pounds underbalance, remove the rudder horn weight and add or remove solder to bring the rudder balance within the required limits.

j. The weight of the solder to be added or removed is calculated as follows:



Balancing the Rudder
Figure 201

1. The weight of solder to be added or removed is designated "W_1".

2. The moment difference between the actual measurement and the required moment is designated "M_1".

3. The perpendicular distance from hinge center line to the point of solder removal or addition is designated "D_1".

4. $W_1 = M_1 \div D_1$

5. The following are typical examples of required solder changes:

a. If the rudder balances at "M_1 = 32.0 inch-pounds" then "M_1 = 32.0 - 31.2 or 0.8 inch-pounds" and "D_1 = 8.5 inches" then W_1 = 0.8 ÷ 8.5 or 0.09 pounds of solder to be added.

b. If the rudder balances at "M_1 = 20.0 inch-pounds", then "M_1 = 20.0 - 21.1 or -1.1 inch-pounds" and "D_1 = 8.5 inches", then W_1 = -1.1 ÷ 8.5 or -0.13 pounds of solder to be removed.

"END"