



# TASK CARD AMC-Fleet

Task Card: Flight Control Balancing			Date: Feb 2019	Aircraft: C-150
E/C:	P/N:	S/N:	A/C Pos:	NLA Pos:
<p><b>Description:</b> This is a 4-person team task worth a maximum of 100 points. The time period to complete the task is 30 minutes. The team will work together to balance a given flight control surface using the equipment and procedures outlined below.</p>				

Area:	Labor Hours:	W/O Phase:
Skills:		

ITEM:	INSTRUCTIONS	MECH:	QC
	<p><b>OBJECTIVE:</b> Given a Rudder Assembly from a 1962 Cessna 150 aircraft, balancing beam, two balancing mandrels, a 1-pound balancing weight, tape measure, spirit level, extra balance weights, masking tape, and appropriate Cessna Service Manual, perform the following with zero assistance from non-team members:</p> <ol style="list-style-type: none"> <li>(1) Determine if the given control surface is within OEM balance limits, and</li> <li>(2) Determine amount of weight to add or remove as needed to bring the given control surface within OEM balance limits.</li> </ol> <p><b>EVALUATION CRITERIA:</b> Each team will be evaluated on the following skills, abilities, and outcomes:</p> <ol style="list-style-type: none"> <li>(1) Correctly inspect and configure the control surface for balancing</li> <li>(2) Correctly adjust and balance the balancing beam as required</li> <li>(3) Correctly configure the control surface on the balancing mandrels</li> <li>(4) Correctly measure the height of the control surface hinge centerline</li> <li>(5) Correctly configure the balancing beam on the control surface</li> <li>(6) Correctly adjust the balance weight on the balancing beam</li> <li>(7) Correctly determine if the static balance condition of the control surface meets OEM balance limits</li> <li>(8) Correctly determine weight to add or remove as required to bring control surface within OEM balance limits</li> <li>(9) Demonstrate effective communication and teamwork</li> <li>(10) Demonstrate proper use of tools and safety procedures</li> </ol> <p><b>PROCEDURES:</b> Rudder control surfaces require static balancing to ensure stability and that it remains in a streamlined position. When a rudder control surface is supported horizontally along its hinge centerline, it must balance (trailing edge level with hinge centerline). For the 1962 Cessna 150, a tolerance of 0.00 to +41.47 in-lbs is permitted. This means that the trailing edge may not swing upward, but may swing downward, but only far enough that a one-pound weight placed within 41.47 inches from the hinge centerline will cause the trailing edge to return to level.</p>		



ITEM:	INSTRUCTIONS	MECH:	QC
	<p>NOTE: The following checklist is derived from the Cessna Service Newsletter SNL86-44 dated September 12, 1986. Refer to page B-1, General Notes for the exact procedures.</p> <ol style="list-style-type: none"> <li>1. Balance control surface in draft free area</li> <li>2. Place hinge bolts through control surface hinges and position on knife edge balancing mandrels. Be sure hinge bolt shank rests on knife edge.</li> <li>3. Make sure all control surfaces are in their approved flight configurations: painted (if applicable), trim tabs installed, all foreign matter removed from inside of control surface, elevator trim tab push-pull rod installed and all tips installed.</li> <li>4. Place balancing mandrels on a table or other suitable flat surface.</li> <li>5. Adjust trailing edge support to fit control surface being balanced while center of balancing beam is directly over hinge line. Remove balancing beam and balance the beam itself by moving the adjustable weight (fastened by bolt and washer.) Fine balance may be accomplished by use of washer at long screw on end of beam.</li> <li>6. When positioning balancing beam on control surface. Avoid rivets to provide a smooth surface for the beam and keep the beam 90° to the hinge line of the control surface.</li> <li>7. Paint is a considerable weight factor. In order to keep balance weight to a minimum. It is recommended that existing paint be removed before adding paint to a control surface. Increase in balance weight will also be limited by the amount of space available and clearance with adjacent parts. Good workmanship and standard repair practices should not result in unreasonable balance weight.</li> <li>8. The approximate amount of weight need may be determined by taping loose weight at the balance weight area.</li> <li>9. Lighten balance weight by drilling off part of weight.</li> <li>10. Make balance weight heavier by fusing bar stock solder to weight after removal from control surface. The ailerons should have balance weight increased by ordering additional weight and gang channel, listed in applicable Parts Catalog and installing next to existing inboard weight the minimum length necessary for correct balance, except that a length which contains at least two attaching screws must be used. If necessary, lighten new weight or existing weights for correct balance.</li> </ol> <p style="text-align: center;">----- END -----</p>		

## CONTROL SURFACE BALANCING SCORE SHEET

School/Team Name: \_\_\_\_\_

Judge Name: \_\_\_\_\_

Each item below is scored on a scale of 0 to 10, with 10 being the maximum value. Score each item using the following guide:

10 = Perfect: desired result achieved with no room for improvement

5 = Average: achieved desired result but with moderate difficulty or needed improvement

0 = Unacceptable: desired result not achieved or step not performed

The total team score is the sum total of the individual items.

ITEM	EVALUATION CRITERIA	SCORE
1	Inspect and configure control surface for balancing (hinge bolts and cap installed, FOD removed)	
2	Adjust and balance the balancing beam (beam parallel/level with control centerline, beam static balanced)	
3	Configure control surface on balancing mandrels (hinge bolts on knife edge, control surface pivots freely, no rubbing)	
4	Measure height of control surface hinge centerline (hinge centerline height used to determine trailing edge height)	
5	Configure balancing beam on control surface (beam centered on control surface length and hinge centerline)	
6	Adjust balance weight on balancing beam (position weight to get trailing edge height = hinge centerline height)	
7	Determine if static balance condition is within limits (weight within 0.00 and +41.47 in lbs on hinge centerline)	
8	Add or remove weight as needed to bring static balance within limits (proper weight added to balance control surface)	
9	Effective communication and teamwork (all team members participated and communicated effectively)	
10	Proper tool use and safety procedures (demonstrated proper tool use with no safety issues)	

**TOTAL TEAM SCORE:**

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## Service Newsletter

September 12, 1986

SNL86-44

### TITLE

FLIGHT CONTROL SURFACE BALANCING INFORMATION

### TO

CESSNA DISTRIBUTORS, CATEGORY I THRU CATEGORY IV DEALERS, AG DEALERS, CARAVAN I AND CARAVAN II REPRESENTATIVES/SERVICE STATIONS AND CPC'S

### MODELS AFFECTED

All Cessna piston engine and propjet propeller airplanes manufactured since 1946.

### DISCUSSION

This Service Newsletter supersedes Customer Care Newsletter NL83-8 dated March 4, 1983.

Newsletter NL83-8 announced the latest flight control surface balance kit and provided instructions for its use. These instructions have since been incorporated into many of the Service/Maintenance Manuals.

The purpose of this Service Newsletter is to provide Supplemental information for the earlier instructions and Service/Maintenance Manuals and more detailed information for use of the balance fixture on older airplanes and airplanes with piano type aileron hinges.

Page 1 of 2

To obtain satisfactory results, procedures specified in this publication must be accomplished in accordance with accepted methods and prevailing government regulations. The Cessna Aircraft Company cannot be responsible for the quality of work performed in accomplishing the requirements of this publication.

The Cessna Aircraft Company, Customer Services, P.O. Box 1521, Wichita, Kansas 67201 U.S.A. 316-946-6600, Telex: 4319022

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The attached balancing information includes the following:

- A. Pages A-1 thru A-6 - The original flight control surface balancing fixture instructions which provided general procedures for its use.
- B. Pages B-1 thru B-6 - Supplemental instructions to those listed in A. above, includes information for balancing ailerons with piano type hinges on model 150, 152, 172, 180, 182 and 185 airplanes and information on balancing control surfaces on 120, 140, 170, 190 and 195 airplanes.
- C. Page C1 - A table of limits and specifications for control surface balancing on models 120, 140, 170, 190 and 195.

MATERIAL

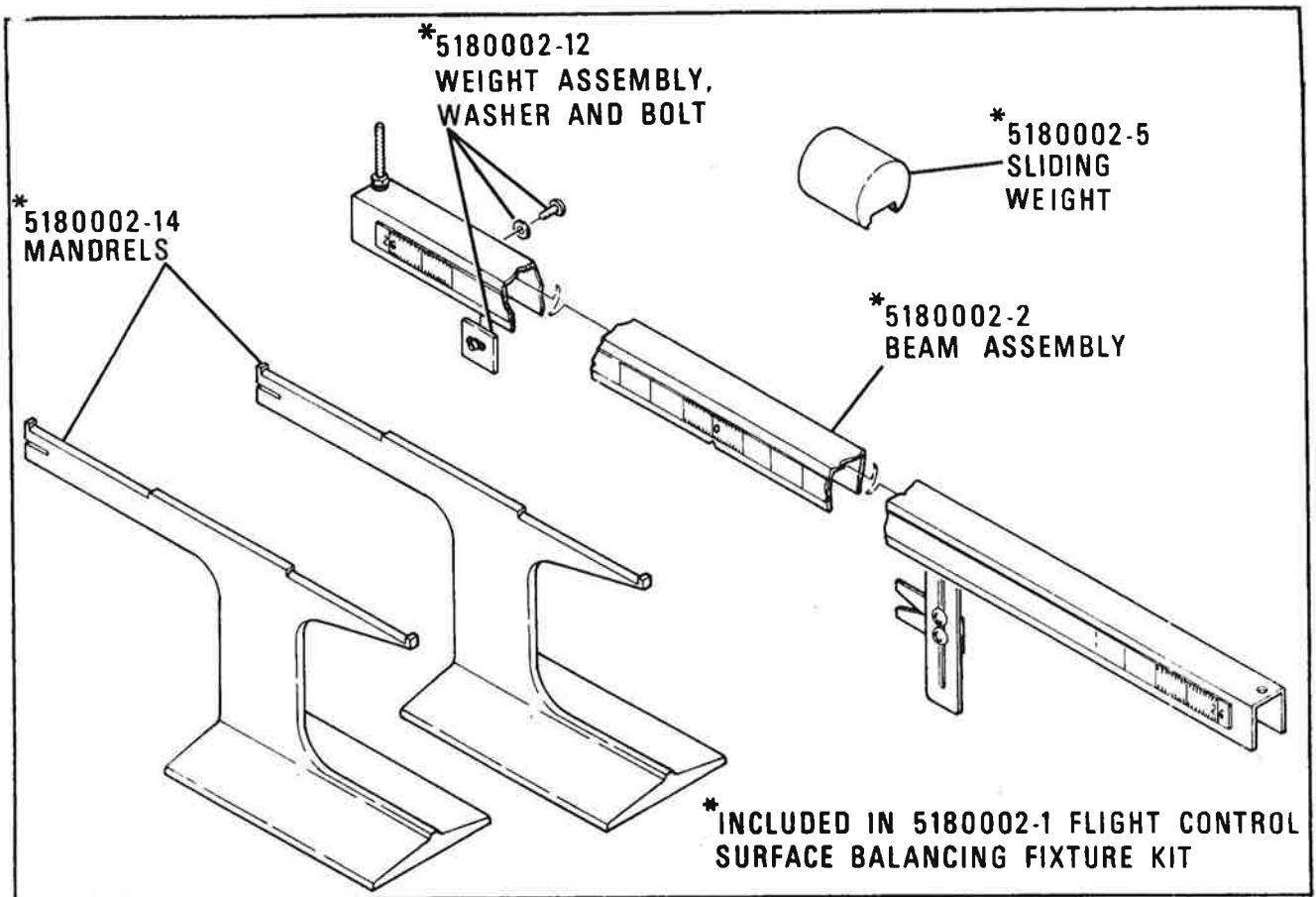
The flight control surface balancing fixture kit is available from the Cessna Supply Division for the suggested list price shown.

<u>Part Number</u>	<u>Description</u>	<u>Price</u>
5180002-1	Flight Control Balance Fixture Kit	\$ 1,654.00 (T) ea.

ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE

\* \* \* \* \*

# FLIGHT CONTROL SURFACE BALANCING FIXTURE KIT (PART NUMBER 5180002-1)



USED FOR BALANCING AILERONS, ELEVATORS AND RUDDERS  
ON ALL CESSNA SINGLE AND MULTIENGINE AIRPLANES

## FEATURES OF THIS BALANCING FIXTURE ARE:

\* UNIVERSAL CESSNA  
APPLICATION

\* QUICK AND EASY TO USE

\* DURABLE ALL METAL  
CONSTRUCTION

\* AN ACCURATE METHOD OF  
BALANCING CONTROL SURFACES

## FLIGHT CONTROL SURFACE BALANCING

### STATIC BALANCING OF FLIGHT CONTROL SURFACES (WITH THE 5180002-1 CONTROL SURFACE BALANCING FIXTURE)

#### 1. General Information

- A. Refer to the applicable Service/Maintenance Manual for specific information concerning the conditions for balancing control surfaces and the adjustment of the balance weights.

#### 2. Control Surface Balancing

- A. (See Figure 1.) Adjust beam to fit onto control surface as follows:

- (1) Beam can be located anywhere on control surface as practical. On control surfaces with hinge bolts, the best location is directly over a hinge bolt to allow easier beam alignment.

#### NOTE

Do not allow the beam or hanger assembly to rest on any rivet heads.

- (2) Align the beam so that it is positioned 90 degrees to the hinge line and the centerline mark on beam (0 position) is directly over the hinge line.
- (3) Adjust the hanger assembly to fit against the trailing edge of the control surface so that the beam is parallel to the chord of the control surface. Check position of the beam centerline mark to ensure that it is still directly over the hinge line.
- (4) Mark the location of the beam on the control surface and remove the beam assembly from the control surface.

FLIGHT CONTROL SURFACE BALANCING

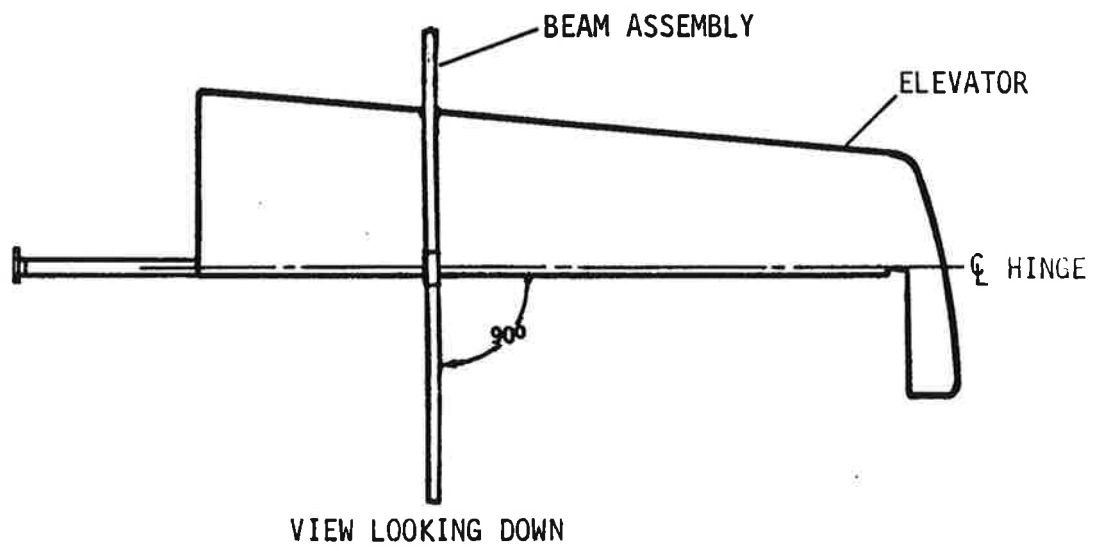
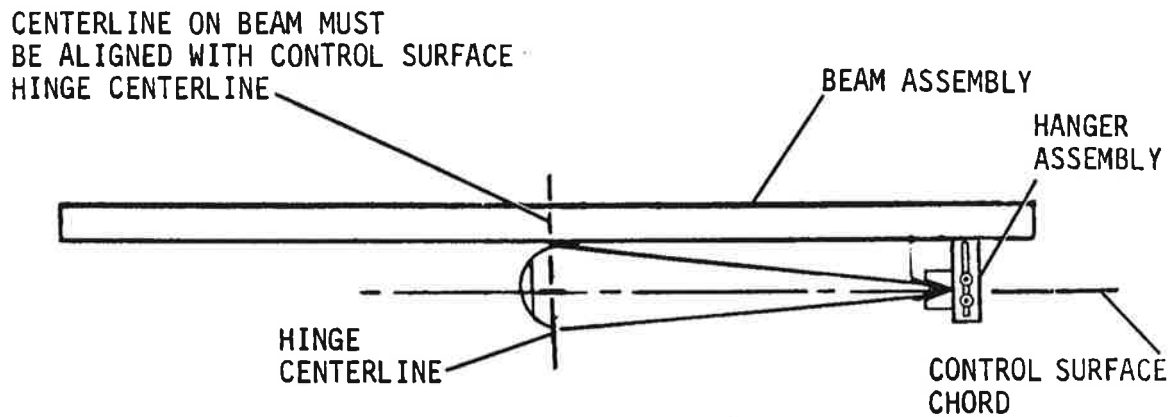


Figure 1. Adjustment of Beam to Fit Control Surface



## FLIGHT CONTROL SURFACE BALANCING

B. (See Figure 2.) Balance the beam assembly as follows:

### NOTE

The beam must be rebalanced for each individual control surface that is to be balanced.

- (1) Place the beam assembly on the knife edge of one mandrel at the centerline of the beam assembly (in notch).
- (2) Position the weight (fastened by a washer and bolt) along the beam assembly as required to allow the beam assembly to be balanced. Secure the weight in position by tightening the bolt. Washers may be added to the long screw (at the other end of the beam) to provide for fine balancing of the beam assembly.

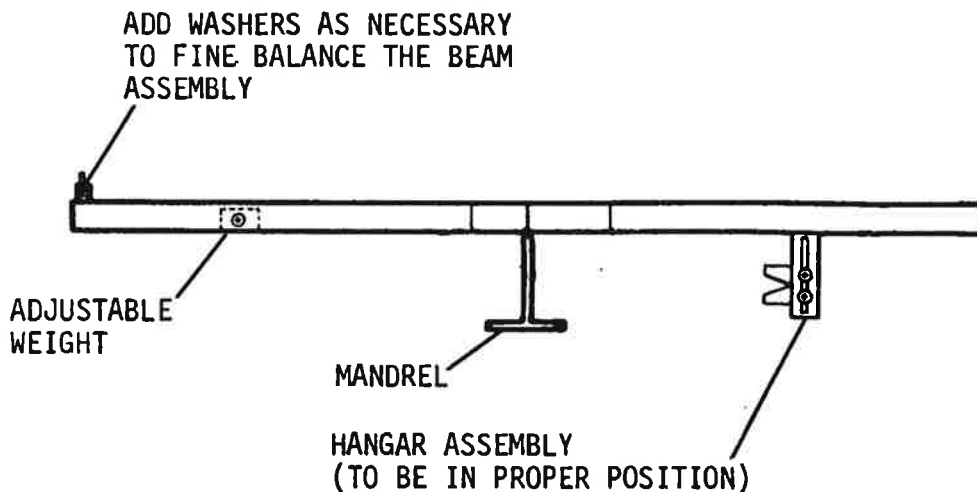


Figure 2. Balancing of Beam Assembly

C. (See Figure 3.) Place the mandrels on a horizontal, flat surface in position to accept the control surface to be balanced and place the control surface on the mandrels as follows:

- (1) Control surfaces with hinge bolts are to be placed on the mandrels such that the hinge bolt shank rests on the knife edge portion of the mandrel. Use either end of the mandrel as required.

## FLIGHT CONTROL SURFACE BALANCING

- (2) Control surfaces with a hinge pin are to be placed on mandrels to utilize the slot in the long end of the mandrels.

### NOTE

The control surface is to be positioned on the mandrels such that no portion of the control surface contacts the mandrels except the hinge bolt or hinge pin.

- D. (See Figure 3.) Balance the control surface as follows:

- (1) Place the beam assembly on the control surface (as previously marked) and place the sliding weight on the beam assembly.

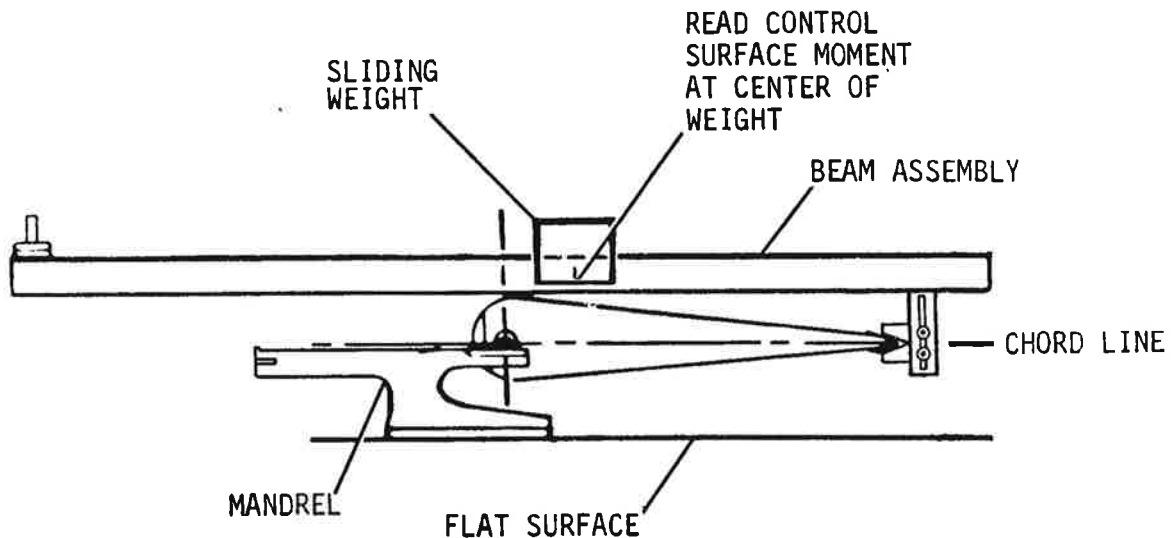
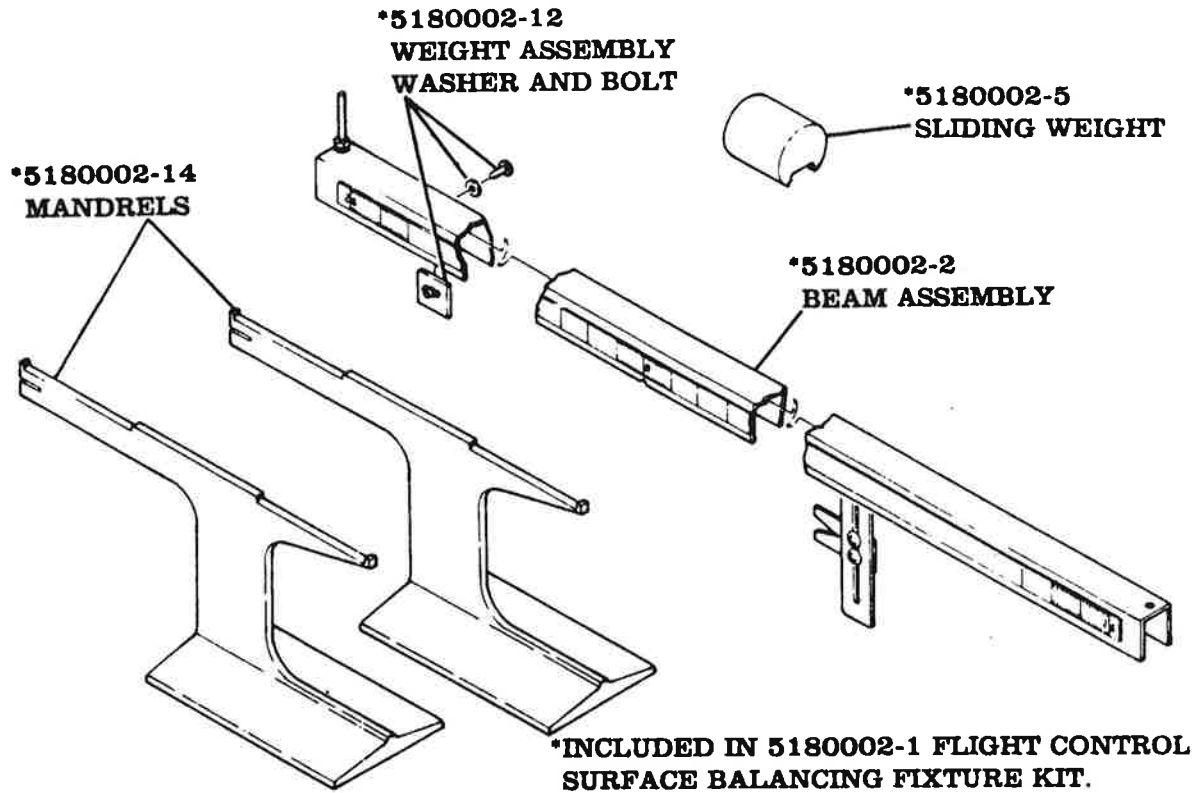


Figure 3. Balancing of Control Surface

- (2) Position the sliding weight to allow the control surface to be balanced (control surface chord to be parallel to horizontal, flat surface). Read the number on the scale directly below the center mark on the sliding weight. The number read is the moment of the control surface in inch-pounds. The moment must be assigned a + or - as follows:



## FLIGHT CONTROL SURFACE BALANCING



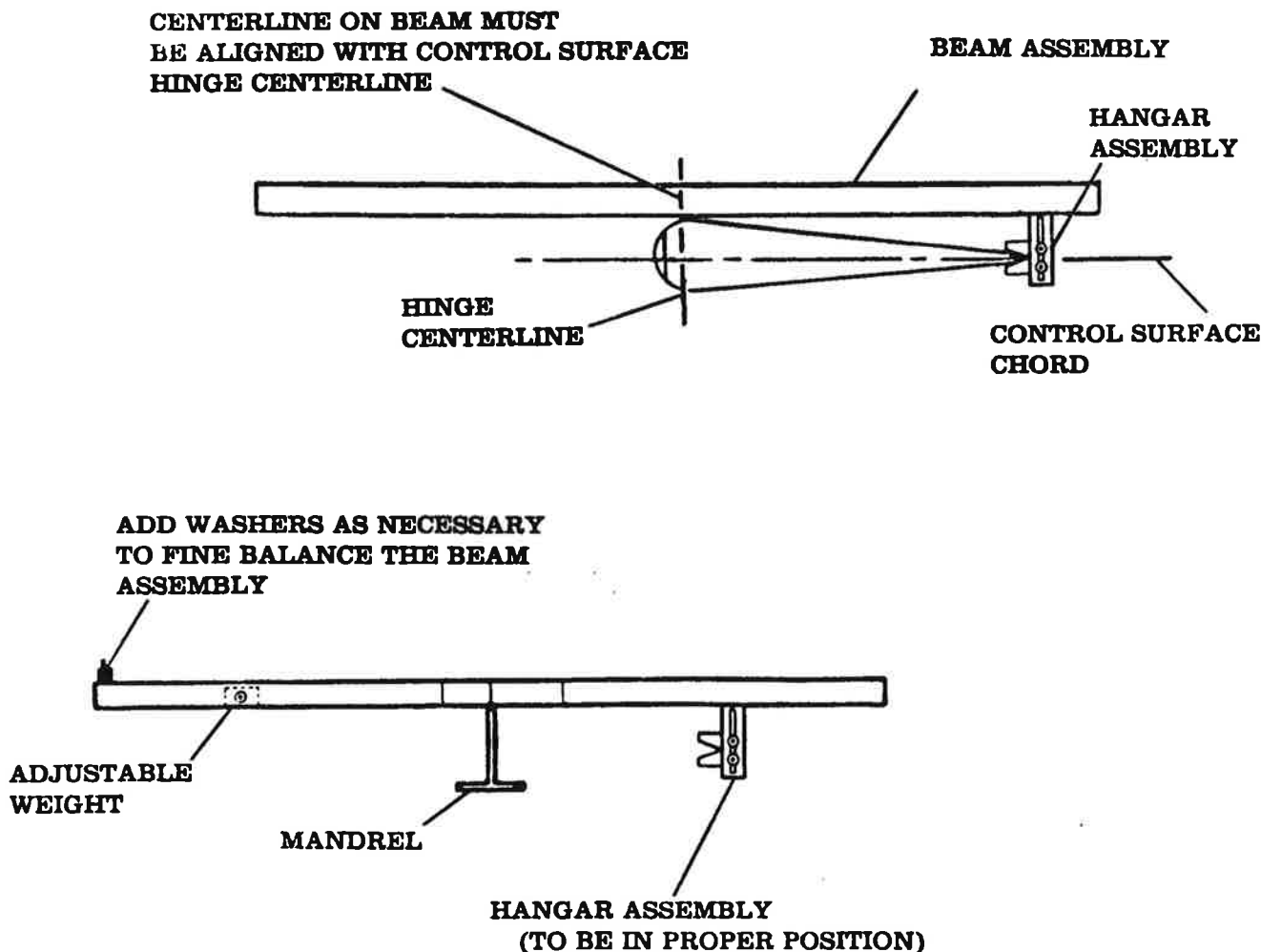
### FLIGHT CONTROL SURFACE BALANCING FIXTURE KIT (PART NUMBER 5180002-1)

#### GENERAL NOTES

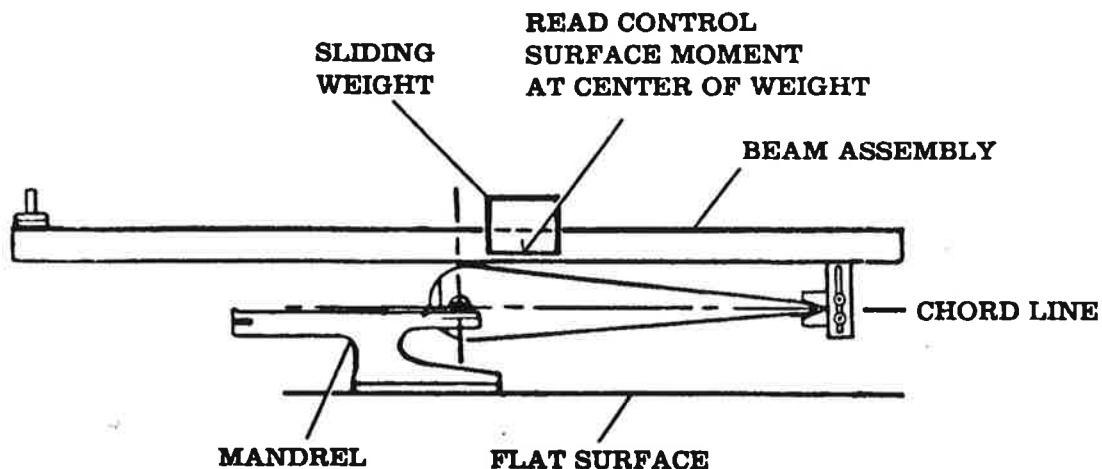
1. Balance control surfaces in a draft-free area.
2. Place hinge bolts through control surface hinges and position on knife edge balancing mandrels. Be sure hinge bolt shank rests on knife edge.
3. Make sure all control surfaces are in their approved flight configurations: painted (if applicable), trim tabs installed, all foreign matter removed from inside of control surface, elevator trim tab push-pull rod installed and all tips installed.
4. Place balancing mandrels on a table or other suitable flat surface.
5. Adjust trailing edge support to fit control surface being balanced while center of balancing beam is directly over hinge line. Remove balancing beam and balance the beam itself by moving the adjustable weight (fastened by bolt and washer). Fine balance may be accomplished by use of washers at long screw on end of beam.
6. When positioning balancing beam on control surface, avoid rivets to provide a smooth surface for the beam and keep the beam 90° to the hinge line of the control surface.

## FLIGHT CONTROL SURFACE BALANCING

7. Paint is a considerable weight factor. In order to keep balance weight to a minimum, it is recommended that existing paint be removed before adding paint to a control surface. Increase in balance weight will also be limited by the amount of space available and clearance with adjacent parts. Good workmanship and standard repair practices should not result in unreasonable balance weight.
8. The approximate amount of weight needed may be determined by taping loose weight at the balance weight area.
9. Lighten balance weight by drilling off part of weight.
10. Make balance weight heavier by fusing bar stock solder to weight after removal from control surface. The ailerons should have balance weight increased by ordering additional weight and gang channel, listed in applicable Parts Catalog and installing next to existing inboard weight the minimum length necessary for correct balance, except that a length which contains at least two attaching screws must be used. If necessary, lighten new weight or existing weights for correct balance.



## FLIGHT CONTROL SURFACE BALANCING



### CONTROL SURFACE BALANCE REQUIREMENTS

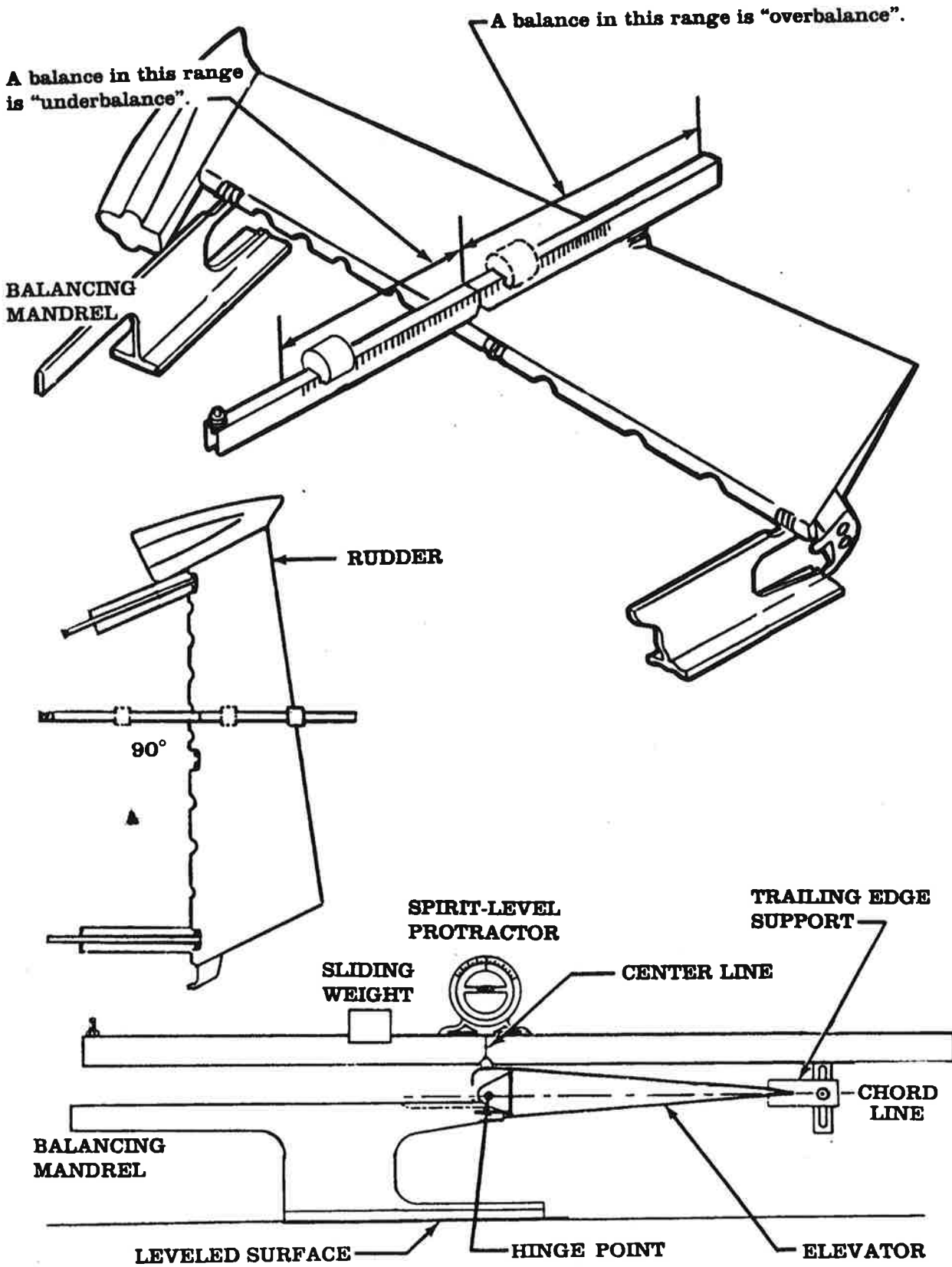
Balance limits for control surfaces are expressed for "Approved Flight" configuration. "Approved Flight" configuration is that condition of the control surface as prepared for flight of the airplane whether it be painted or unpainted.

"Approved Flight" limits must never be exceeded when the surface is in its final configuration for flight.

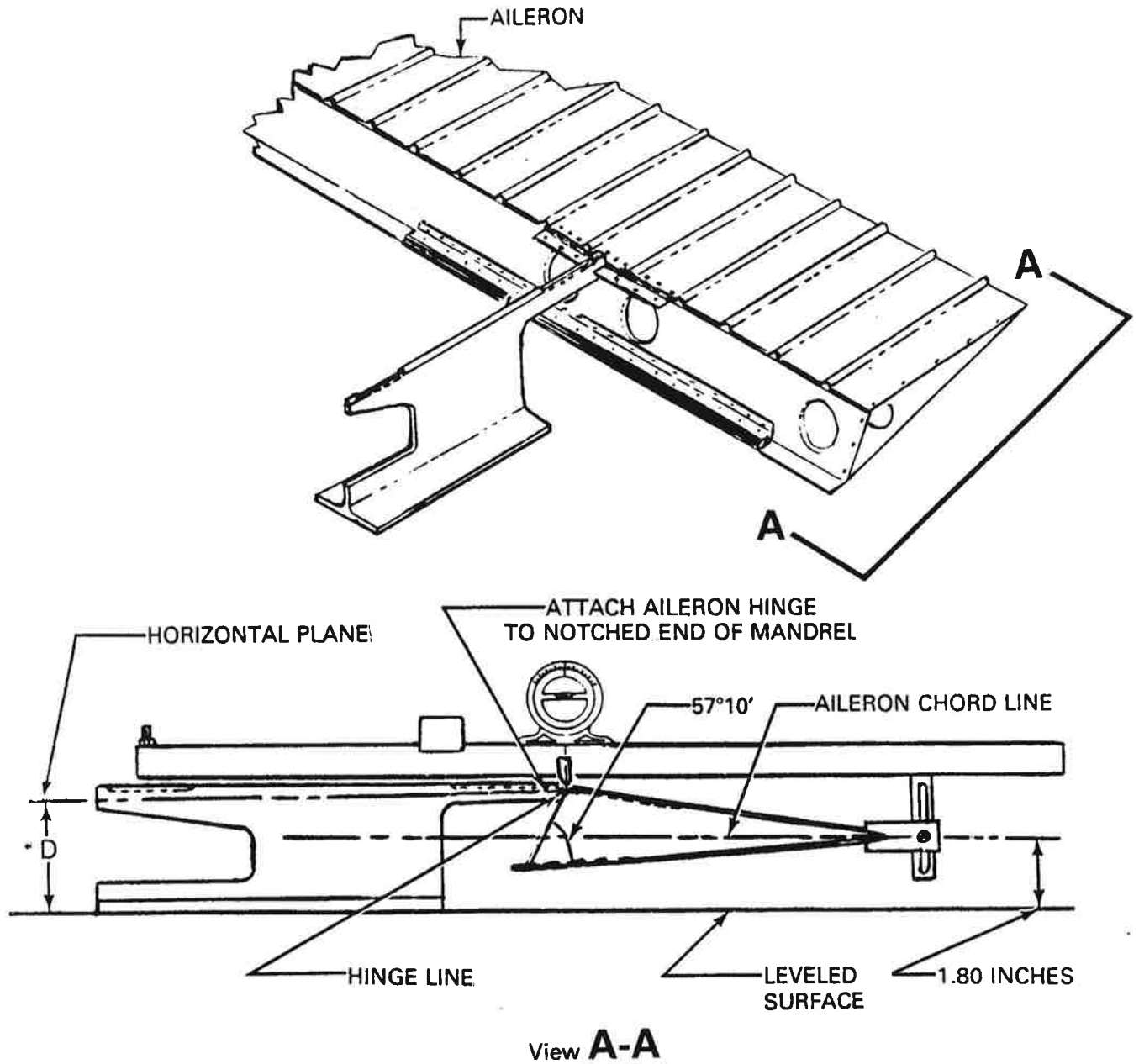
UNDERBALANCE is defined as the condition that exists when the control surface is trailing-edge heavy, and is symbolized by a plus (+).

OVERBALANCE is defined as the condition that exists when the control surface is leading-edge heavy, and is symbolized by a minus (-).

# FLIGHT CONTROL SURFACE BALANCING



# FLIGHT CONTROL SURFACE BALANCING



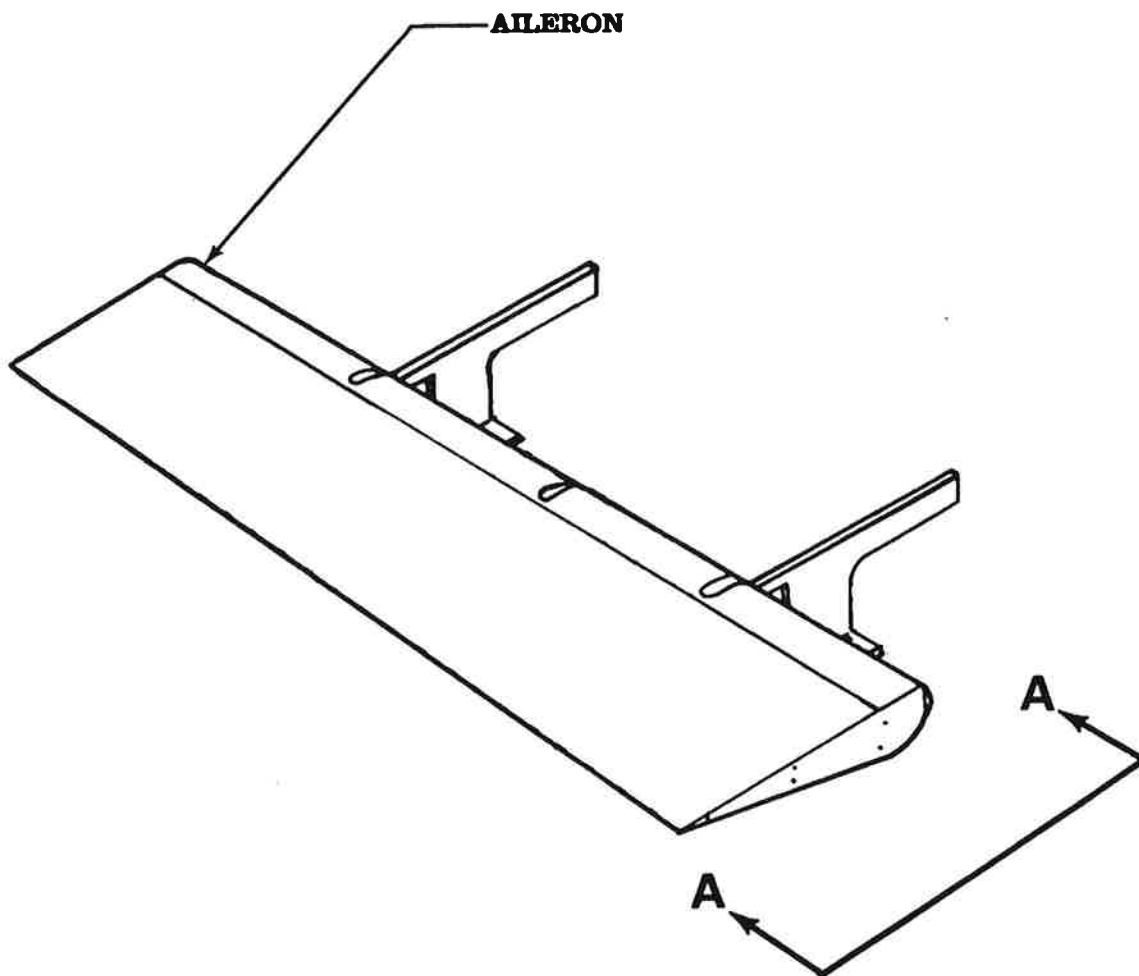
## NOTE

This detail is applicable to ailerons which are attached to the wing with piano-type hinges.

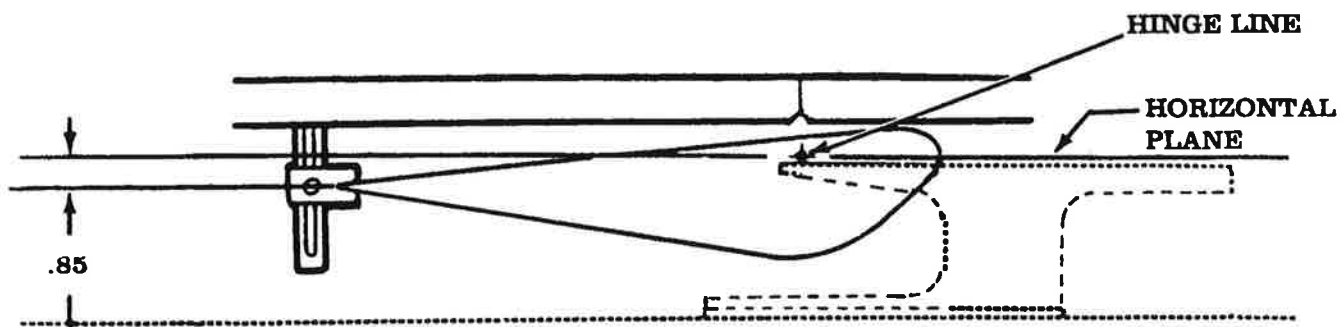
\*D minus 1.80 inches equals chord line of aileron. Make sure trailing edge is straight in area where 1.80-inch measurement is taken.



FLIGHT CONTROL SURFACE BALANCING



View A-A



Balance aileron inverted, with trailing edge at point opposite cut-out for middle hinge .85" below hinge line horizontal plane.

### CONTROL SURFACE BALANCE LIMITS FOR EARLY MODEL AIRPLANES

MODEL	SERIAL	AILERONS		RUDDER		RH ELEVATOR		LH ELEVATOR	
		WEIGHT (POUNDS)	BALANCE (IN. LBS)	WEIGHT (POUNDS)	BALANCE (IN. LBS)	WEIGHT (POUNDS)	BALANCE (IN. LBS)	WEIGHT (POUNDS)	BALANCE (IN. LBS)
120/140	8000	3.50	0.0						
	THRU	+.25	TO	NONE SPECIFIED					
	15075	-.00	×14.3						
140A	15200	1.75	0.0						
	THRU	+.06	TO	NONE SPECIFIED					
	15724	-.00	+11.31						
170	18000	3.50	0.0	4.00	+23.0	NONE	0.0	NONE	0.0
	THRU	+.25	TO	+.12	TO	SPECIFIED	TO	SPECIFIED	TO
	18729	-.00	+14.3	-.00	+27.0		+67.3		+44.0
170A	18730	*2.94	0.0	4.00	+23.0	NONE	0.0	NONE	0.0
	THRU	+.06	TO	+.12	TO	SPECIFIED	TO	SPECIFIED	TO
	20266	-.00	+11.31	-.00	+27.0		+67.3		+44.0
170B	20267	2.94	0.0	4.00	+23.0	.92	+22.0	.75	+19.44
	THRU	+.06	TO	+.12	TO	+.10	TO	+.10	TO
	27169	-.00	+11.31	-.00	+27.0	-.10	+26.0	-.10	+24.0
190/195	7001	RH	-.94	5.70	-.94	11.00	-.94	6.12	-.94
	THRU	7.93	TO	+.13	TO	+.13	TO	+.13	TO
	7999	LH	+.94	-.00	+.94	-.00	+4.69	-.00	+4.69
	&	6.56							
	16000								
190/195	16084	RH	-.94	5.70	-.94	6.71	-.94	6.00	-.94
	THRU	7.93	TO	+.13	TO	+.13	TO	+.13	TO
	16183	LH	+.94	-.00	+.94	-.00	+4.69	-.00	+4.69
		6.56							

\*Some Model 170A airplanes were delivered with 1.75-pound lead balance weight in ailerons.