

**BEECHCRAFT  
BONANZA SERIES  
MAINTENANCE MANUAL**

**BALANCING CONTROL SURFACES -  
MAINTENANCE PRACTICES**

**BALANCING THE AILERON**  
(Figure 1)

When the aileron control surface is being repainted, suspend it by the trailing edge so that excess paint will drain toward the leading edge. After any repainting or repair, the finished surface must be check balanced to ensure that its static moment about the hinge line is within the prescribed limits. The painted and primed aileron assembly must be nose-heavy by 0.2 to 1.5 inch-pounds. The static moment of the aileron is determined by multiplying the unbalanced weight of the aileron 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 control surface is 0.0 inch-pounds. A tail-heavy surface exhibits static underbalance. A nose-heavy surface exhibits static overbalance.

**CHECKING BALANCE**

The aileron balance must be checked in a draft free area with the aileron completely assembled in flying condition. All painting, including stripes and touch-up, must be completed. The tab, 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, they can be categorized under the following two headings:

- a. Counterbalancing - The application of a known force or weight at a measured distance from the hinge line to counter the unbalance moment of the aileron assembly.
- b. Actual Force Measurement - Measurement of the force applied by the aileron surface on a single support at a known distance from the center line of the hinge.

**EQUIPMENT REQUIRED TO PERFORM CHECK  
BALANCING**

- a. A stand with knife edge supports as illustrated in Figure 1. The knife edges must be in the same horizontal plane.
- b. A paper cup or similar light weight container.
- c. Approximately 1 pound 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 inboard end of the aileron assembly so that one end is on the trailing edge and the other end is centered on the leading edge. Mark the chord line with a suitable marker, such as a grease pencil, then remove the straight edge.
- b. Fit the correct size bolts in the hinge brackets and mount the aileron on the knife edge supports. Ascertain that the aileron is free to rotate about the hinge line.
- c. To determine if weight should be added or removed, suspend a paper cup from a point near the center of the aileron trailing edge. Use a short length of small diameter string secured to the surface with a small piece of masking tape as illustrated in Figure 1. The cup must be free to hang vertically.
- d. Add small quantities of lead shot to the cup until the aileron balances with the chord line level. Check this by holding the spirit level aligned with the marked chord line.
- e. The distance "D" must be perpendicular to the hinge line. Measure "D" from the hinge line to the suspension point of the cup.
- f. Remove the cup, contents, and string, then weigh them.

**NOTE**

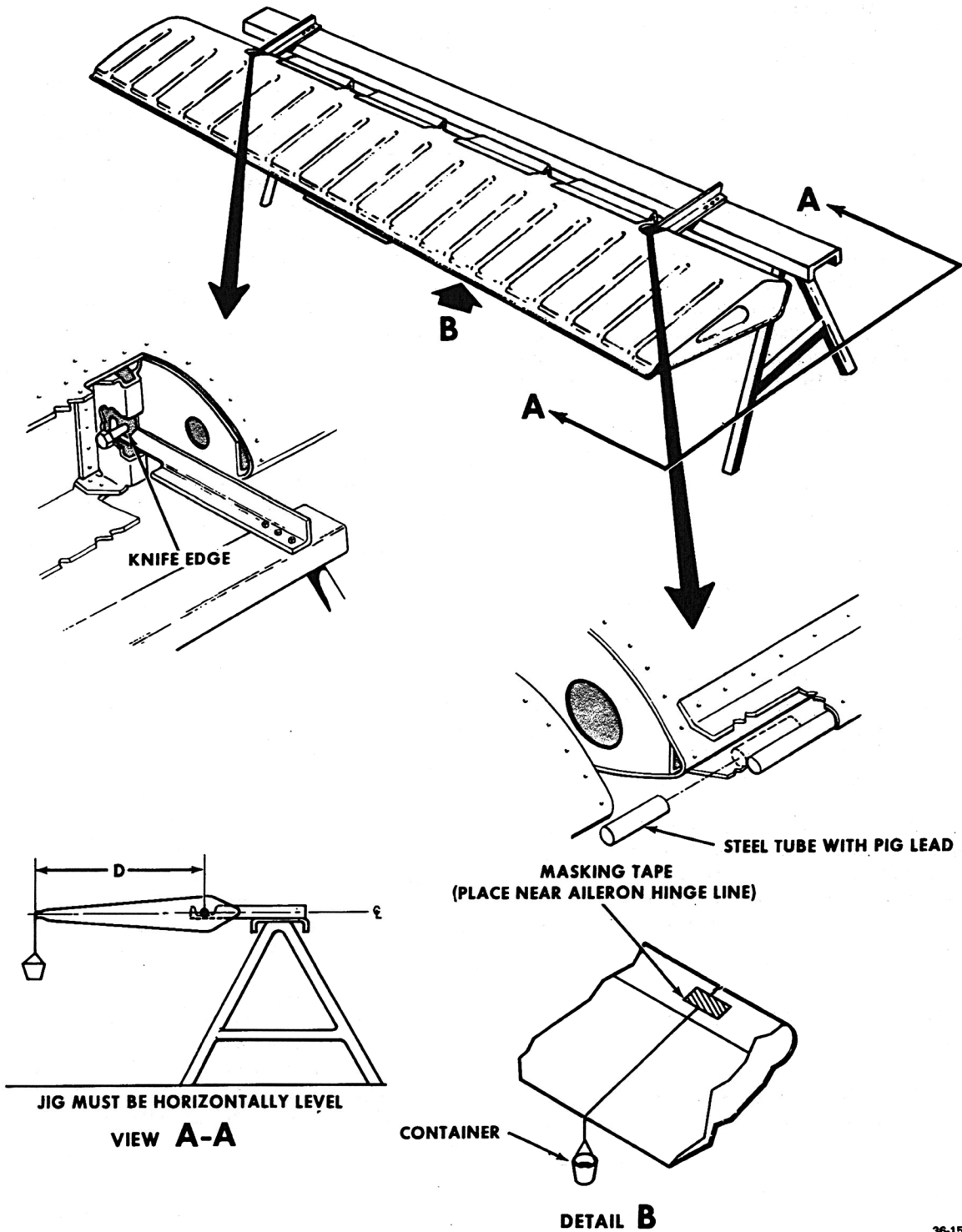
Since any weighing error is magnified by the distance "D", weighing is most important and must be done carefully on scales that are certified for accuracy.

- g. Calculate the static balance as follows:
  1. The weight of the cup and contents is designated by "W".
  2. The over or underbalance moment is designated by "M".
  3.  $M = W \times D$
  4. The following is a typical example of a balancing calculation: Assume the aileron is overbalance (nose-heavy) and the paper cup was suspended from the trailing edge. Assume that the aileron balances with the chord line level at "W = .150 pound" and "D = 10.0 inches", then . . .

$$M = .150 \times 10.0$$

M = 1.50 inch-pounds. The product of "W x D". In this instance, "M" is within the required static balance range and is therefore acceptable.

BEECHCRAFT  
BONANZA SERIES  
MAINTENANCE MANUAL



Balancing the Aileron  
Figure 1

36-151-1A

**BEECHCRAFT  
BONANZA SERIES  
MAINTENANCE MANUAL**

h. The center of gravity of the aileron is forward on the hinge center line causing the surface to be nose-heavy. Proper aileron balance is obtained by adding or removing lead rod at the leading edge of the aileron. The rod is 15/32 inch diameter and is installed in brackets attached to the leading edge of the aileron. When adding additional lead rod the maximum total of the length of the rod to be added is not to exceed 5 inches over the entire length of the aileron and

would be installed at the center brackets.

***CAUTION***

When a lead rod is added to obtain correct balance, it must be installed securely with rivets. A loosely installed rod will vibrate and may cause an undesirable vibration of the surface.

**"END"**