Elevator Trim Tab Allowable Free Play
August 2005 Cessna 120/140/140A

One of the members asked what the maximum trim tab free play was. He had measured 3/4ths of an inch. Having never considered such a thing because Cessna does not state it in any of the usual 120/140 documents, I went looking. I found the limit reference after a long search:

The conclusion after reading the faa stuff about flutter is that the 3/4 inches of play in the plane was likely caused by flutter. Glad it was caught.

The two "wow!" entries are mine because the amount of tolerance in movement is so small.

And, don't forget to reset the up/down limits of the tab when you have made the repairs. If you need a sketch as to the pieces of the trim system, get back to me because a not-completed article with figures would help in understanding.

Neal

AC 43.13-1B 9/8/98

SECTION 3 Precautionary Measures

4-36. FLUTTER AND VIBRATION PRECAUTIONS.

To prevent the occurrence of severe vibration or flutter of flight control surfaces during flight, precautions must be taken to stay within the design balance limitations when performing maintenance or repair. drainage provisions must be checked and retained when maintenance is being done.

These sections are in the AC-43 report, too, but I did not copy them here.
a. Balance Changes.
b. Painting and Refinishing.
c. Trapped Water or Ice.

d. Trim Tab Maintenance. Loose or vibrating trim tabs will increase wear of actuating mechanisms and hinge points which may develop into serious flutter conditions. When this happens, primary control surfaces are highly susceptible to wear, deformation, and fatigue failures because of the buffeting nature of the airflow over the tab mechanism. Trailing-edge play of the tab may increase, creating an unsafe flutter condition. Careful inspection of the tab and its mechanism should be conducted during overhaul and annual inspection periods. Compared to other flight control systems on the aircraft, only a minor amount of tab-mechanism wear can be tolerated.

(1) Free play and stiffness may best be measured by a simple static test where “upward” and “downward” (or “leftward” and “rightward”) point forces are applied near the trailing edge of the tab at the span-wise attachment of the actuator (so as not to twist the tab). The control surface to which the trim tab is attached should be locked in place. Rotational deflection readings are then taken near the tab trailing edge using an appropriate measuring device, such as a dial gauge. Several deflection readings should be taken using loads first applied in one direction, then in the opposite.

If the tab span does not exceed 35 percent of the span of the supporting control surface, the total free play at the tab trailing edge should not exceed 2 percent of the tab chord.

For example, a tab that has a chord of 4 inches and less than or equal to 35 percent of the control surface span would have a maximum permissible free play of 4 inches x 0.020 or 0.080 inches (total motion up and down) measured at the trailing edge. Correct any free play in excess of this amount. Wow!

If the tab span equals or exceeds 35 percent of the span of the supporting control surface, the total free play at the tab trailing edge should not exceed 1 percent of the distance from the tab hinge line to the trailing edge of the tab perpendicular to the tab hinge line.

So, for a tab of five inches in chord, 5 x 0.01 = 0.050 inches. Wow!

(2) Care must also be exercised during
repair or rework to prevent stress concentration points or areas that could increase the fatigue susceptibility of the trim tab system. Advisory Circular (AC) 23.629-1A, Means of Compliance with Section 23.629, "Flutter," contains additional information on this subject.

NOTE: If the pilot has experienced flutter, or thinks he/she has, then a complete inspection of the aircraft flight control system and all related components including rod ends, bearings, hinges, and bellcranks must be accomplished. Suspected parts should be replaced.

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To go to: AC 23-629-1A

http://www.airweb.faa.gov/Regulatory_and_Guidance_Library\rgAdvisoryCircular.nsf/0/CB7501A9ECED1D89862569B2006DBBD1?OpenDocument

It may be usable to some, but unless you designed the plane, don't bother. 52 pages of how to determine and tests to find it. It is a .PDF file so you can download and study at leisure.

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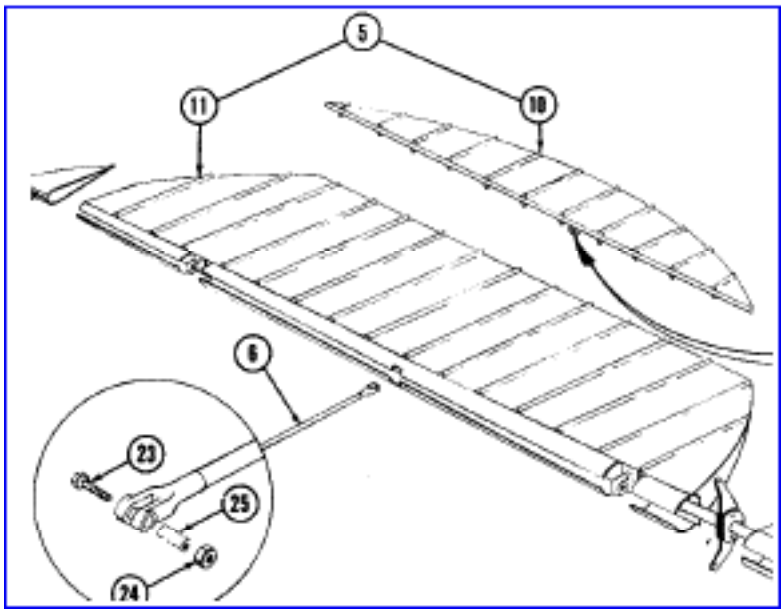
filed as trim tab max limits August 2005



The span of the trim tab on our planes is greater than 35 percent of the span of the elevator.