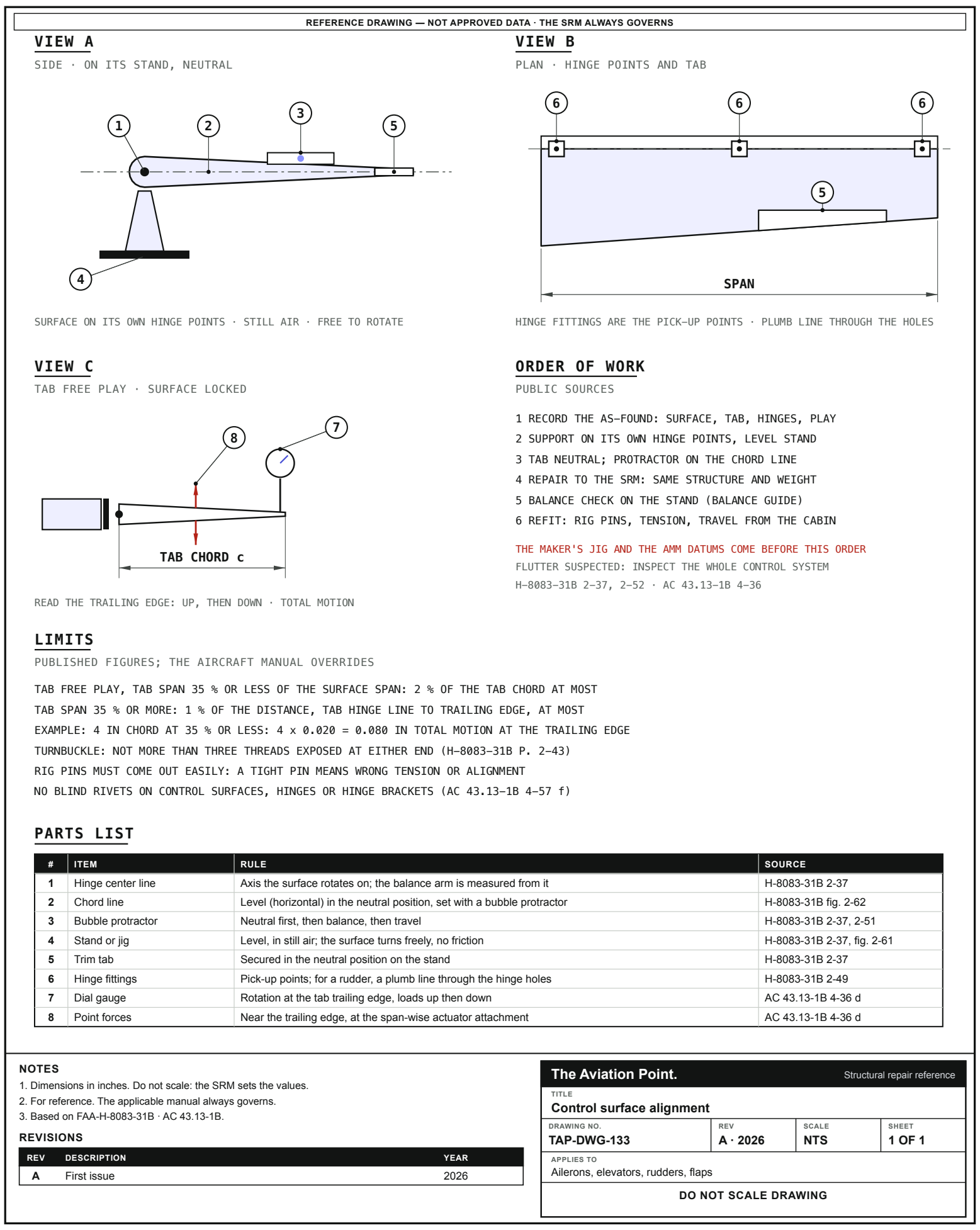
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Control Surface Repair: Fixtures, Alignment and the Checks Before and After

Stand · datums · neutral · free play · rig pins · travel · records

1 Identification



After FAA-H-8083-31B pp. 2-37, 2-43, 2-49, 2-51, 2-52; AC 43.13-1B pars. 1-38, 4-36 d, 4-57 f. Generic, not to scale: the aircraft manual's jig, datums and values govern.

Datums and pick-up points

Datum	What it is and how it is used	Source
Hinge center line	The axis the surface turns on. The balance arm of a repair is measured from it, to the nearest 0.01 in	FAA-H-8083-31B p. 2-37
Own support points	A surface to be rebalanced is removed and supported from its own points on a stand, jig or fixture; a locally made fixture holds it at the inboard and outboard hinge fittings	FAA-H-8083-31B p. 2-37, fig. 2-61
Chord line, neutral	The neutral position is set with the chord line horizontal, checked with a bubble protractor, before any balancing	FAA-H-8083-31B p. 2-37, fig. 2-62
Trim tab	Secured in the neutral position on the stand. When rigging, the tab is usually set to streamline; some aircraft call for an offset of a degree or two	FAA-H-8083-31B pp. 2-37, 2-52
Rudder hinge holes	With the rudder off, a plumb line passed through the hinge attachment holes should run centrally through all of them. Some fins have the leading edge offset from the longitudinal center line on purpose	FAA-H-8083-31B p. 2-49
Fin lateral datum	Fin verticality: measure from a given point on each side of the fin top to a given point on the left and right stabilizers; the two should agree within the prescribed limits	FAA-H-8083-31B p. 2-49, fig. 2-86
Rig pins	A small pin or clip that sets pulleys, levers and bellcranks in neutral. Without pins, neutral is set by alignment marks, templates or linear measurement	FAA-H-8083-31B p. 2-52
Rigging fixtures and templates	Gauges made by the manufacturer; their markings show the surface travel wanted	FAA-H-8083-31B pp. 2-43, 2-51

Educational reference only, not approved data. Always consult the applicable SRM, AMM, or AC 43.13-1B and your certifying authority.

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2 Allowable damage

Trim tab free play

Tab span against the surface span	Total free play at the tab trailing edge, at most	Source
35 % or less ("does not exceed")	2 % of the tab chord. A 4 in chord: 4 in x 0.020 = 0.080 in, total motion up and down	AC 43.13-1B par. 4-36 d (1)
35 % or more ("equals or exceeds")	1 % of the distance from the tab hinge line to the tab trailing edge, perpendicular to the hinge line. A 4 in distance: 0.040 in (arithmetic on the same rule)	AC 43.13-1B par. 4-36 d (1)
How to measure	Lock the control surface. Apply point forces near the tab trailing edge at the span-wise attachment of the actuator, so the tab is not twisted; read the rotation at the trailing edge with a dial gauge, loading one direction and then the other, several times	AC 43.13-1B par. 4-36 d (1)
If free play is over the limit	Correct it. Only a minor amount of wear in a tab mechanism can be tolerated. If flutter was felt or suspected, inspect the whole control system: rod ends, bearings, hinges and bellcranks; replace suspect parts	AC 43.13-1B par. 4-36 d

3 Repair

After refit: rigging checks

Check	How and what	Source
Neutral	Flight deck control, bellcranks and surface locked in neutral; rig pins in. Pins must come out easily: a tight pin means wrong tension or misalignment	FAA-H-8083-31B pp. 2-43, 2-52
Cable tension	Tensiometer, with the riser for the cable size; the rigging chart gives the tension for the ambient temperature. Tension is set with the surfaces held in neutral	FAA-H-8083-31B pp. 2-43, 2-50
Turnbuckle	Both terminals screwed in the same number of turns; not more than three threads exposed at either end of the barrel; safetied, double-wrap wire preferred	FAA-H-8083-31B p. 2-44
Travel	Measured from neutral in both directions, with the controls moved from the flight deck, not by hand on the surface. Set the stops to the maker's figures	FAA-H-8083-31B p. 2-52
Stops and spring-back	The surface should reach its stop before the flight deck control reaches its own: the small extra push is the spring-back. Chains and cables must not be at the limit of their travel when the controls are on their stops	FAA-H-8083-31B pp. 2-44, 2-52
Dual controls, tabs	Dual controls synchronized and working from both seats; tab position indicator correct; a jackscrew not extended beyond its limit at the tab extremes	FAA-H-8083-31B p. 2-52
Safetying	A second set of eyes on every turnbuckle, rod end and attaching nut or bolt	FAA-H-8083-31B p. 2-52

1. Record the as-found: play, tension.
2. Support on its own hinge points.
3. Neutral with a bubble protractor.
4. Repair to the manual.
5. Check the balance.
6. Refit, rig pins, tension, travel; record.

Key points

- **Authority first:** SRM, manufacturer scheme or approved data.
- **Own hinge points,** level stand, still air, tab neutral.
- **Free play:** 2 % of tab chord (span 35 % or less).
- **Travel** from the flight deck, never by hand on the surface.

MAIN SOURCES · FAA-H-8083-31B, Aviation Maintenance Technician Handbook: Airframe, chapters 2 and 4 · AC 43.13-1B CHG 1, Acceptable Methods, Techniques, and Practices: Aircraft Inspection and Repair · 14 CFR Part 43 · TO 1-1A-1 / NAVAIR 01-1A-1, General Manual for Structural Repair

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