

Bearhawk #164 “Three Sigma” Checkout Report

Date: 29 March 2008

Objective: Measure the control deflections and compare them to the plans.

Procedures:

Aileron and elevator deflections were measured with a SmartLevel. Rudder deflections were measured by trigonometry, using the distance of the tip of the balance horn from the hingeline and its distance from the fin at maximum deflection.

Results:

Right Aileron

	Deflection (degrees)	Plans Deflection (degrees)
Up	22.6	20
Down	18.0	20

Left Aileron

	Deflection (degrees)	Plans Deflection (degrees)
Up	21.0	20
Down	19.2	20

The aileron deflection limits are not set by stops at the ailerons but by the geometry of the control stick.

Because of the uncertainties in the measurement technique, the measurements will vary by fractions of a degree over multiple measurements.

The measured deflections of the ailerons, while not exactly matching the plans, are close enough to be considered acceptable.

Rudder

	Deflection (degrees)	Plans Deflection (degrees)
Left	30	30
Right	30	30

The rudder deflection limits are set by hard stops at the rudder horn. The measured deflections match the plans, and are therefore acceptable.

Elevator

	Deflection (degrees)	Plans Deflection (degrees)
Up	26.4	30
Down	26	20

The elevator deflection limits are set by stops at the elevator horn.

The measured deflection in the UP direction is about four degrees short of the deflection specified in the plans. Additionally, the measured deflection in the DOWN direction is in excess of the deflection specified in the plans. After some research, this discrepancy was traced to an error in the setting of the limit stops. Instead of the elevator being set at 30 degrees above the horizontal stabilizer, the elevator was set at 30 degrees above the Fuselage Reference Line. Since the horizontal stabilizer is set at a deflection of 4 degrees trailing edge up from the Fuselage Reference Line, this mistake resulted in the elevator deflection limits being shifted 4 degrees trailing edge down.

This issue was discussed with Bob Barrows, the Bearhawk designer. His recommendation was not to worry about the reduced up elevator deflection. He said that he flies the first prototype with only 22 degrees of trailing edge up deflection. The issue will be a possibly reduced ability to flare with full flaps at far forward c.g. locations. The forward c.g. limit will be investigated during flight test, and may end up being farther aft than specified by the designer.

The most forward c.g. condition will be when flying solo with minimal fuel, since adding any passengers, fuel, or cargo will move the c.g. aft. Additionally, the c.g. can easily be moved aft as required when solo by carrying ballast in the cargo area, such as tools or a survival kit. Thus, the reduced up elevator travel is not expected to be a significant problem.

Conclusions: Control deflections are acceptable.

Recommendations: None.