

CROW HARNESS INSTALLATION FOR ZODIAC 601XL

DESCRIPTION OF MODIFICATION

This modification involves replacing the vendor-provided three point seat belt with a Crow Enterprises 3-point harness. These harnesses are commonly used in cart/car racing and by the ultralight community. Fred Crow of Crow Enterprises will custom make a harness to suit the installation requirements of the Zenith Zodiac design.



This modification is based on information from page 2 of the March/April 1997 Zenair News #99 for an attachment point at the rear of the baggage shelf. Both shoulders are restrained from a point centred directly behind and level with the shoulders which is the optimal position. This arrangement interferes with baggage storage which may be a serious consideration for some. Another disadvantage is additional weight in that each harness weighs 1400gm (49oz) compared to each supplied seat belt which weighs 750gm (26.5oz) The rear attach point adds an additional 1000gm (35.3oz). The total extra weight for this modification is 2300gm (81.1oz), a bit less than the weight of one US gallon of fuel.

DISCLAIMER

As with all amateur built aircraft, the aircraft builder has final responsibility for engineering soundness, installation practices, and compliance with national regulations. Since there can be a huge variation in builder skills and actual practices, no warranty of engineering soundness or applicability is made or implied. This document presents “the way I did it” and is presented for peer review and educational purposes only.

RELEASE OF LIABILITY

IF YOU CANNOT BE RESPONSIBLE FOR YOUR OWN ACTIONS YOU ARE HEREBY DIRECTED NOT TO USE ANY OF THE INFORMATION PRESENTED IN THIS OR RELATED DOCUMENTS.

You, the aircraft builder, understanding that the information contained in this and related documents is of an experimental nature and is not approved by any national authority and is not approved for aircraft use;

Whereas: If you choose to implement any of the ideas presented you hereby agree to be solely responsible for any outcome resulting from your own choices and actions.

Whereas: You agree to hold the author harmless from, and the aircraft builder hereby assumes, the entire liability for any and all damage or injury of any nature whatsoever, including death.

Whereas: You agree to indemnify and hold harmless the author from and against any and all loss, claim, expense, damage or injury that the aircraft builder may sustain.

DETAILS OF THE MODIFICATION

The harness is available from Crow Enterprizes, 418 E. Commonwealth Avenue, Fullerton CA 92832-2074. The model number is 20113. Other colours are available under part numbers 20112/Red, 20114/Black, 20115/Purple, 20117/Gray. When ordering advise Fred that the rear attach point is 43 inches behind the seat back and that it is for an airplane.

Crow Enterprizes can be found on the Internet at <http://www.crowenterprizes.com/> and the harnesses can be found at <http://www.crowenterprizes.com/2x2-dune-buggy.html>

Harness Modifications

The harness requires only slight modification to be used in this application. The hole in the belt attachment plates is slightly under ½ inch and must be drilled to ½ inch to match the external diameter of the flanged bushing (Aircraft Spruce part #FF520-10). Photos 1 and 2 show the belt attachment plate with the flanged bush installed.

The FF520-10 bush needs to be trimmed length-wise to just exceed the thickness of the harness attach plate. The harness attach plate is approximately 0.195 inches thick.

The internal diameter of the FF520-10 brass bush determines the size of the harness attach bolt as 3/8 inch (AN-6 bolt). The length of the AN-6 bolt is determined by the required grip length. See the sections below and the bill of materials. See also photo 3

Hardware for Aft Attachment Point

See diagram P-P1 on page 6 for details of the harness attachment angle bracket. The bolt required is an AN6-10A which has sufficient grip length for the Flanged Bushing, AN960-616 washers, harness attachment, and baggage floor. To reduce the weight of the P-P1-1 Harness Attachment, the vertical flange can be cut to a smaller size or the 6061-T6 angle can be substituted with a piece of 0.125 x 2 inch bar of the same material.



Photo 1 Harness Attach Plate and Flanged Bush (flange hidden)



Photo 2 Harness Attach Plate, Flanged Bush, and AN6 Bolt



Photo 3 Harness Attachment Plate, Flanged Bush, and AN-6 Bolt

Hardware for Outboard Seat Attachment Points

Due to the larger fittings on the Crow Harness, the 6B18-4 Seat Belt Attachment needs to be positioned so that the flange for the harness attachment bolt extends aft and not forward as indicated on diagram 6-B-18.

Photo 4 shows the orientation of the port side Seat Belt Attachment. Shown is a standard 6B18-4 that has been filed down at the top corner to provide clearance to the webbing. This technique can be used but it would be preferable to fabricate a modified attachment to ensure that the attachment will not chaff the harness webbing.



Photo 4 Port Side 6B14-4 Attachment

The material supplied for 6B18-4 can be used for a modified attachment if the attachments have not already been fabricated. The hole for the AN6 bolt needs to be located offset 10mm towards the top from centre of the attachment in order to clear the harness webbing. The centre of the hole is changed from 15mm to 16mm from the edge of the 6B18-4 attachment. Adjust the profile of the attachment to suit the new bolt hole location while respecting the original edge distances.

Hardware for Inboard Seat Attachment Points

There needs to be some clearance between the harness and the centre armrest side (6B18-1). This is achieved by using two AN960-616 flat washers between the flanged bushing and the seat belt attachment doubler plate (6B18-3). The original 5/16 inch hole is drilled to 3/8 inch.



Photo 5 Shim and 6B18-3 Attachment Doubler Plate

To clean up the edges of the attachment doubler plate (6B18-3) and prevent damaging the harness material, the doubler can be installed with a shim underneath (Photo 5 and Photo 6).

Alternatively, install the attachment doubler plate on the inside of the armrest.

There is no need to trim the length of the AN6-10A bolt in this position and an AN365-624 Elastic Stop Nut is used.



Photo 6 Shim for 6B18-3 Attachment Doubler Plate



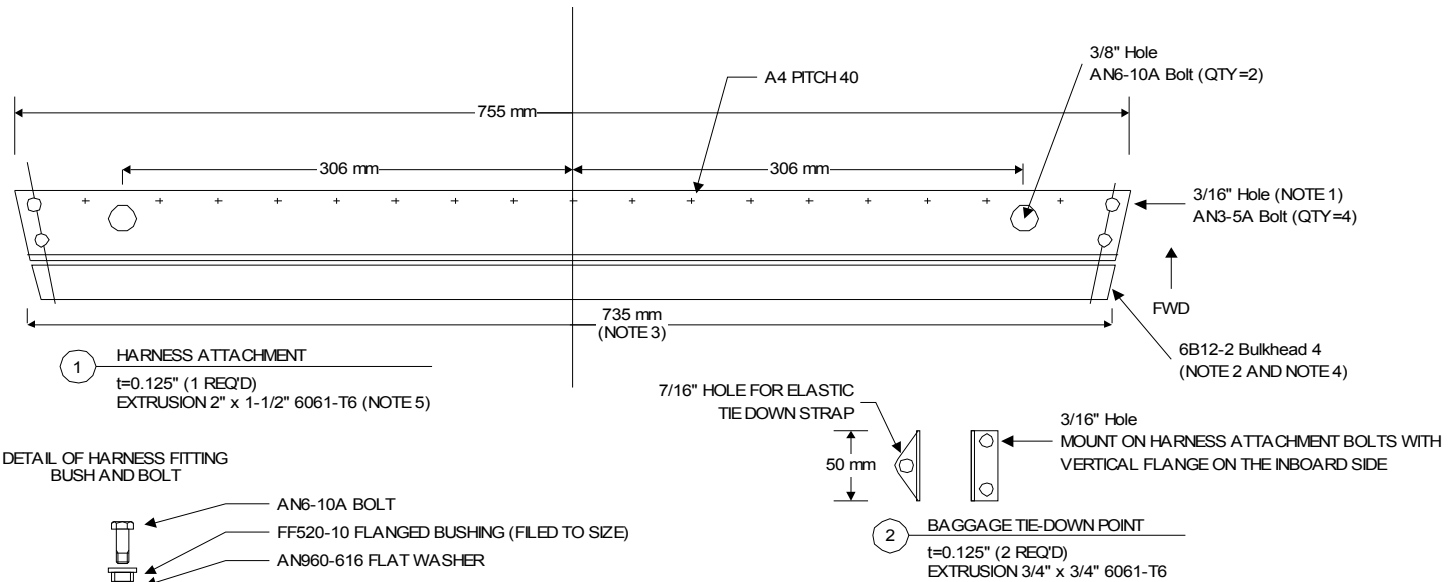
Photo 7 Installed Doubler and Shim for the inboard harness attachment

Optional Baggage Tie Down Point

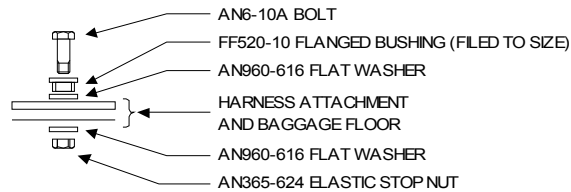
Diagram P-P1-2 depicts an optional baggage tie down point fabricated from 3/4" 0.125 6061-T6 aluminum angle. If this option is installed the AN3-5A bolts must be replaced with AN3-6A bolts which have the correct grip length.

BILL OF MATERIALS

QTY	PART NO.	DESCRIPTION
2	CROW ENTERPRIZES #20113	2x2 RESTRAINT
1	AIRCRAFT SPRUCE 03-48400	2" x 2" x 0.125" 6061-T6 EXTRUDED ANGLE
2	AIRCRAFT SPRUCE 03-47900	3/4" x 3/4" x 0.125" 6061-T6 EXTRUDED ANGLE
4	AN3-5A (or AN3-6A)	BOLT
6	AN6-10A	BOLT
4	AN365-1032A	ELASTIC STOP NUT
4	AN365-624A	ELASTIC STOP NUT
2	AN364-624A	LOW PROFLE ELASTIC STOP NUT
6	AIRCRAFT SPRUCE FF520-10	FLANGED BUSHING - OD=1/2 ID=3/8
14	AN960-616	3/8" FLAT WASHER



DETAIL OF HARNESS FITTING BUSH AND BOLT



- NOTE 1** The two AN3 bolts on upper longeron splice rivet line replace two of the eight A5 rivets. Adjust the rivet pitch accordingly to accommodate the AN3 bolts and the width of the harness attachment. Substitute AN3-6A if installing P-P1-2
- NOTE 2** The harness attachment is installed immediately forward of bulkhead 4 (6B12-2). The slope of the baggage floor (6B16-1) can be adjusted to be slightly higher where the baggage floor meets the front edge of the harness attachment. This will allow a row of A4 rivets to be used along the forward edge of the harness attachment resulting in a pleasant transition.
- NOTE 3** The harness attachment is slightly narrower than Bulkhead 4 (6B12-2) in order to fit inside the upper rear longeron (6B2-1). The ends of the horizontal flange of the harness attachment need to be chamfered to fit the radius of the longeron.
- NOTE 4** The last rivet on each side for the two stiffeners behind Bulkhead 4 (6B12-2) need to be dimpled and flush riveted, or a relief needs to be drilled into the back of the harness attachment vertical flange to ensure that the bulkhead is not distorted by the presence of the harness attachment vertical flange.
- NOTE 5** Weight saving can be realized by trimming the vertical flange of P-P1-1 to 3/4"

ITEM	QTY	PART NO.	DESCRIPTION
P-P1-1	1	AIRCRAFT SPRUCE 03-48300	1.5x2x0.125" 6061-T6 EXTRUSION
P-P1-2	2	AIRCRAFT SPRUCE 03-47900	3/4x3/4x0.125" 6061-T6 EXTRUSION
	4	AN3-5A or AN3-6A (NOTE 1)	BOLT
	4	AN6-10A	BOLT
	4	AN365-1032A	ELASTIC STOP NUT
	2	AN365-624A	ELASTIC STOP NUT
	2	AIRCRAFT SPRUCE FF520-10	FLANGED BUSHING OD=1/2 ID=3/8
	4	AN960-10	3/16" FLAT WASHER
	4	AN960-616	3/8" FLAT WASHER

MATERIAL PRESENTED IN THIS DIAGRAM AND ANY ASSOCIATED INFORMATION IS OF AN EXPERIMENTAL NATURE AND FINAL SUITABILITY FOR ANY PURPOSE IS THE RESPONSIBILITY OF THE INDIVIDUAL AIRCRAFT BUILDER		CROW HARNESS INSTALLATION FOR ZENITH ZODIAC 601XL			
		SCALE	NTS	P-P1	MAY 2004
				SHEET	1 OF 1

Drawing 1 P-P1 Crow Harness Installation for Zenith Zodiac 601XL