





US Department of Transportation  
Federal Aviation Administration

**MAJOR REPAIR AND ALTERATION**  
**(Airframe, Powerplant, Propeller, or Appliance)**

Form Approved  
OMB No. 2120-0020  
11/30/2007

Electronic Tracking Number

For FAA Use Only

INSTRUCTIONS: Print or type all entries. See Title 14 CFR §43.9, Part 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. §44701). Failure to report can result in a civil penalty for each such violation. (49 U.S.C. §46301(a))

1. Aircraft	Nationality and Registration Mark N2169H	Serial No. 2792
	Make Ercoupe	Model 415-C
2. Owner	Name (As shown on registration certificate) Lynol Amero	Address (As shown on registration certificate) Address 1007 199th Ave E City Lake Tapps State WA Zip 98391 Country USA

**3. For FAA Use Only**

The technical data identified herein has been found to comply with applicable airworthiness requirements and is hereby approved for use only on the above described aircraft subject to conformity inspection by a person in FAR 43.7

6-5-2008 DATE  
John M Gilbert  
FAA Inspector NM01

4. Type		5. Unit Identification			
Repair	Alteration	Unit	Make	Model	Serial No.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	AIRFRAME	_____	(As described in Item 1 above)	_____
<input type="checkbox"/>	<input type="checkbox"/>	POWERPLANT			
<input type="checkbox"/>	<input type="checkbox"/>	PROPELLER			
<input type="checkbox"/>	<input type="checkbox"/>	APPLIANCE	Type		
			Manufacturer		

**6. Conformity Statement**

A. Agency's Name and Address		B. Kind of Agency	
Name Robert Falla	Address 4824 151st Street SW	<input checked="" type="checkbox"/> U. S. Certificated Mechanic	Manufacturer
City Edmonds State WA	Zip 98026 Country USA	<input type="checkbox"/> Foreign Certificated Mechanic	C. Certificate No.
		<input type="checkbox"/> Certificated Repair Station	AP542845423
		<input type="checkbox"/> Certificated Maintenance Organization	

D. I certify that the repair and/or alteration made to the unit(s) identified in item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

Extended range fuel per 14 CFR Part 43 App. B <input type="checkbox"/>	Signature/Date of Authorized Individual <i>Robert Falla</i> AP542845423
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**7. Approval for Return to Service**

Pursuant to the authority given persons specified below, the unit identified in item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is  Approved  Rejected

BY	FAA Fit. Standards Inspector	Manufacturer	Maintenance Organization	Persons Approved by Canadian Department of Transport
	FAA Designee	Repair Station	X Inspection Authorization	Other (Specify)

Certificate or Designation No. AP2741409IA	Signature/Date of Authorized Individual <i>Wingfield</i> 6-5-08
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INSTRUCTIONS FOR CONTINUED AIRWORTHINESS (ICA)  
Shoulder Belt Installation

A/C Make: Ercoupe  
Rev: 0

Model: 415-C  
Date: 5/23/2008

S/N: 2792      Reg. # N2169H

System: Airframe

Item	Subject																																	
1.	<p><b>Introduction:</b> The original Erco model 415 design did not provide for occupant shoulder harnesses. This installation alteration enhances safety aspect for pilot and passenger by providing a shoulder restraint system when used in conjunction with the existing seat belts.</p> <p>Parts for installation include the following: Amsafe lap/shoulder belts, part number 4013-1-01A-8088, rev A, Lot No. A1107</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Aircraft Spruce P/N</th> <th style="text-align: left;">Qty</th> <th style="text-align: left;">Description</th> </tr> </thead> <tbody> <tr> <td>03-16700-1</td> <td>1 ft</td> <td>1015/1020 Bush 3/8 x.065 1ft</td> </tr> <tr> <td>03-20300-</td> <td>3ft</td> <td>4130 Round Steel Bar 1/4</td> </tr> <tr> <td>03-28360</td> <td>2'x2'</td> <td>2024T3 Alum sheet .063 x</td> </tr> <tr> <td>03-46900-2</td> <td>2ft</td> <td>2024T3 Angle 5/8x5/8x1/16</td> </tr> <tr> <td>AN315-4R</td> <td>4</td> <td>Nut, Full Hex</td> </tr> <tr> <td>AN365-428A</td> <td>4</td> <td>Nut, Elastic Stop</td> </tr> <tr> <td>AN4-7A</td> <td>2</td> <td>Bolt Undrilled</td> </tr> <tr> <td>AN665-34R</td> <td>2</td> <td>Clevis Tie Rod Term</td> </tr> <tr> <td>AN935C516</td> <td>6</td> <td>SS Lock Washer</td> </tr> <tr> <td>AN970-4</td> <td>8</td> <td>Washer, Flat</td> </tr> </tbody> </table>	Aircraft Spruce P/N	Qty	Description	03-16700-1	1 ft	1015/1020 Bush 3/8 x.065 1ft	03-20300-	3ft	4130 Round Steel Bar 1/4	03-28360	2'x2'	2024T3 Alum sheet .063 x	03-46900-2	2ft	2024T3 Angle 5/8x5/8x1/16	AN315-4R	4	Nut, Full Hex	AN365-428A	4	Nut, Elastic Stop	AN4-7A	2	Bolt Undrilled	AN665-34R	2	Clevis Tie Rod Term	AN935C516	6	SS Lock Washer	AN970-4	8	Washer, Flat
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2.	<p><b>Description:</b> The restraint system is installed IAW the attached drawing "Shoulder Harness Installation in Ercoupe N2169H. This installation does not affect with any component or system in the aircraft.</p> <p>Added two stiffeners on the aft sides of frame F and G at BL 5L and BL 5R. Stiffeners are made from .063 inch thick 2024-T3 Aluminum using 0.90 inch bend radii. Installed two additional AN470-3-4A rivets common to the skin and frames F and G at the stiffener locations (total five AN470-3-4A common to skin and frames at stiffener locations). Installed 0.25 inch diameter threaded steel rod through frames F and G centered on the stiffeners, left and right sides. Attach steel rod to frames F and G using AN hardware. Installed clevis tie rod fitting on forward side of frame F. Attach Amsafe seatbelt/shoulder harness assembly to clevis tie rod fitting and existing lap belt attach fittings. All work performed per AC 43.13-1B and AC 43.13-2A.</p>																																	
3.	<p><b>Control, Operation Information:</b> None, this modification does not modify the flight characteristics of the airplane.</p>																																	
4.	<p><b>Servicing Information:</b> None</p>																																	
5.	<p><b>Maintenance instructions:</b> Inspection intervals are concurrent with the aircraft inspection procedures.</p>																																	

6.	<b>Troubleshooting Information:</b> None required
7.	<b>Removal and replacement Information:</b> Standard maintenance practices apply
8.	<b>Diagrams:</b> See attachments
9.	<b>Special Inspection Requirements:</b> None
10.	<b>Application of Protective Treatments:</b> None
11.	<b>Data:</b> Standard aircraft hardware and general torque specifications apply
12.	<b>List of Special Tools:</b> None
13.	<b>For Commuter Category Aircraft:</b> No applicable instructions for this area
14.	<b>Recommended Overhaul Periods:</b> None
15.	<b>Airworthiness Limitation Section:</b> "No additional airworthiness limitations"
16.	<b>Revisions:</b> A letter will be submitted to the local FAA Office with a copy of the revised FAA Form 337 and revised ICA. "The attached revised/new Instructions for Continued Airworthiness (dated____) for the above aircraft or component major alteration have been accepted by the FAA, superseding the Instructions for Continued Airworthiness (dated ____)". After the revision has been accepted, a maintenance record entry will be made, identifying the revision, its location, and date on the 337.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

FAA airframe / powerplant certificate number: \_\_\_\_\_

# Alon/Ercoupe Shoulder Harness

11/23/2000

## Documentation Package

### Contents:

- Cover Letter
- Harness Installation Description
- Structural/Stress Analysis
- Drawing – Stiffener Brackets
- Drawing – Rod
- (7) Photographs

## Alon/Ercoupe Shoulder Harness Bill of Materials

The following is required for each installed harness (multiply quantity by 2 if both pilot and passenger harnesses are being installed). Aircraft Spruce part numbers are given:

### Purchased hardware:

- (1) AN665-34R Threaded Clevis Tie Rod Terminal
- (3) MS35333-40 Type A Lock Washers
- (2) AN315-4R Nuts
- (2) AN365-428A Elastic Stop Nut
- (4) AN970-4 Flat Washer
- (8) AN470-3-4 A Solid Rivets (Stiffener to Frame)
- (A/R) AN470-3-3 A Solid Rivets (Frame to Skin – see text)
- (1) AN4-7A Bolt

### Miscellaneous:

- Alodine
- Zinc Chromate
- Grommet (to dress clevis terminal at hat shelf bulkhead)

### Fabricated parts:

- Rod – fabricate from ¼" diameter, 4130 steel rod #03-20300
- Stiffener Bracket "A" – fabricate from .063, 2024T3 aluminum sheet
- Stiffener Bracket "B" approximately 1' x 1' #03-28350
- Bushing (if needed) – fabricate from ¼" ID 3/8" OD, 1015/1020 steel stock #03-16700

# Ercoupe, Forney, Alon, Mooney Shoulder Harness Installation

11/23/2000

## **Disclaimer:**

I am neither a mechanic nor a structural engineer. This document relates the method I used to install a shoulder harness in my Alon in the hope that it helps you to install a harness in your aircraft. The accompanying documents were prepared by a Designated Engineering Representative, Dr. Richard Carlson. Dr. Carlson's analysis was accepted by the FAA FSDO in San Jose, CA as "approved data."

Dr. Carlson examined my aircraft and acted on what he saw. This data officially applies only to my aircraft but I have no reason to believe that my aircraft structure is any different from others in the Ercoupe/Aircoupe series.

My description below of the method of attachment to the airframe is as Dr. Carlson described it to me. The actual installation of the harness must be done under the supervision of a duly rated mechanic and must be approved by the FAA via a Form 337.

## **Why install a shoulder harness? What else is needed?**

If for some reason your aircraft comes to a sudden stop, it is best not to have your face and brains smashed in. According to a lecture I attended at "Airventure '99," during a rapid stop at above 3G deceleration, your limbs and head will flail uncontrollably. If not artificially restrained, you will not be able to prevent them from forcefully striking objects inside the plane. You already have lap belts installed in your aircraft. A shoulder harness will prevent your body from bending at the waist and striking the wheel and instrument panel. The lap belts in your aircraft (and the attachment method to the airframe) were probably designed to withstand a 9G deceleration. The method of attaching the shoulder harnesses to the airframe depicted in the accompanying drawings are also intended to withstand a 9G deceleration with a suitable safety factor, according to Dr. Carlson's analysis.

Dr. Carlson did not believe it is possible to provide for much greater decelerations, given the lack of structure in the Ercoupe to attach the harness to, although the human body can withstand greater deceleration without damage if it is properly restrained. According to the lecture at Airventure, additional protection in an accident could be obtained by preventing whiplash and by providing protection for vertical deceleration. I am working a modification for my Alon seats to provide a head restraint. I am also planning on reupholstering my seats using energy absorbing foam similar to that installed in military aircraft and the Space Shuttle seats to provide better vertical protection.

**Description:**

The purpose of the shoulder harness addition is to restrain your upper torso and head against nine times their weight in a forward direction. Because the 'coupe is monocoque construction, there is no structure as described in AC43.13b to which a shoulder harness may be tidily connected. As a result, the only practical method is to tie it to the skin and to distribute the force in such a way that the skin ultimately yields and wrinkles. A large plate riveted to the skin with enough rivets so that the rivets won't tear out can be used, but a means must be found to pass the plate through frame "F" to the passenger compartment. This method requires many rivets through the skin plus either passing the plate between frame "F" and the skin or penetrating frame "F."

The method we chose is similar to the one used for the factory installed lap belts. The rivets that attach frames "F" and "G" are used to transfer the load from the harnesses to the skin. (One of the photos shows an additional small stiffener used in the Alon that is not included in the calculations.) At each frame, a fabricated "U" channel is used to stiffen the frame and distribute the load along several inches of the skin-frame joint. The analysis requires that at least five rivets lie under each of the skin-frame joints to carry the load from the frame to the skin. Because each aircraft is hand assembled, the number of rivets at each joint (and their spacing) may vary. Therefore, it may be necessary to add rivets to that area of the joint if there are not enough (in my aircraft, only frame "G" required extra rivets). A threaded steel rod is used to tie the two frames together along with standard nuts and washers. In the passenger compartment, a threaded clevis tie rod terminal provides the connection to the harness. All hardware is standard and materials are readily available; the only fabrication required is cutting and threading the rod and fabricating the stiffeners from sheet metal.

The choice of a shoulder harness is up to you. Any TSO'd seatbelt/harness assembly may be used. There are many different styles of hardware and lengths available, so choose wisely. I wanted a harness and lap belt that was a single assembly plus an inertia reel, so I ordered a custom belt. My belt comes from AmSafe and is designated with their part number 4013-1-01A-XXXX (where XXXX is the color code). A bolt, nut, and bushing retains the inertia reel in the clevis. I fabricated the bushing from steel bushing stock because there is no ready-made part available.

**Certification suggestion:**

The harness mechanical installation must be approved by the FAA on a Form 337 because this is not a standard repair or an STC'd modification. It is wise to informally submit sample paperwork to the FSDO before doing any work to determine if there is any potential approval problem. The Flight Standards District Office (FSDO) that has jurisdiction over your region must sign/stamp the 337 for your aircraft to be airworthy. The A&P (or IA) who also signs the 337 can do all the FAA legwork for you or you can visit an FAA Inspector yourself – if you do visit the inspector, be prepared to explain which A&P will be supervising or doing the work. In my case, I spoke with the Inspector and explained what I wanted to accomplish, but the Inspector then preferred to deal directly with my A&P. Make sure that an Inspector says to go ahead with the installation before starting on it! It is also likely that the inspector will require a field inspection.



This was true in my case, with the inspector visiting my hangar and looking into the tailcone before I closed it all up, then approving the completed installation after the harnesses were installed.

### **Construction and assembly suggestions:**

There are many routes to follow in fabricating the pieces and installing them in your plane. Depending on your relationship with your FBO or independent A&P plus your own resources and capabilities, you can go any route from doing most of the work yourself to having someone else doing the complete installation and supervising the approval. Ultimately, an A&P must sign and submit the 337 to the FAA, so you should determine the ground-rules before doing any work. One of the most satisfying ways to install the harness is to do all the work yourself, then have the A&P inspect it. All hardware and raw materials can be ordered from a supplier like Aircraft Spruce and Specialty – their receipts can be used as evidence that you have used real aircraft hardware in the event the Inspector asks for proof.

Some hints:

1. The frame “F” attachment point should be located on the centerline of each seat, but no measurements are given in the analysis. The rod should be installed perpendicular to the back of the seat (pointed as straight in the direction the aircraft flies as it can be). One of the photos shows how I used a string from the panel to the tailcone to locate the attachments.
2. Buy and use aircraft hardware only. A shoulder harness is a safety system and you want to be sure it will work. Use only the specified steel rod, the large pattern AN970 washers, and the clevis to ensure strengths shown in the analysis.
3. The skin of your aircraft is not the place to learn riveting. If you haven’t done it before, pay to have two skilled people set and buck the extra rivets. The skin is only .020 thick and can buckle very easily and look bad.
4. You should be able to rivet the stiffeners to the frames yourself with a rivet squeezer. This is not the place for hardware-store pop rivets. Structural rivets are specified.
5. Be sure to use the specified radius when bending the stiffeners. It is required to prevent cracking.
6. No dimension is provided for the tie rods due to differences between aircraft. Determine your rod length by measuring the distance between frames “F” and “G” and adding enough so that the clevis and the rearmost nut can be threaded onto the rod. Length of the threads is determined by the need to maneuver the rod into position with the middle two nuts, lock washers, and flat washers in place. Use the sketch dimension for reference only. The two sides of my aircraft were  $\frac{1}{4}$ ” different– the same length rod could be used for both, but just barely. I had to make the threads approximately  $\frac{1}{4}$ ” longer than the sketch. Thread the steel rod carefully to get clean threads. Remember that the proper outside diameter is less than 0.25”. Run the die no more than 90 degrees at a time and back off to clear chips or they can ruin the thread.
7. To prevent corrosion it is a good idea (but not required) to alodine the aluminum stiffeners and to paint both the stiffeners and rods with zinc chromate before installation.

8. During assembly, be sure to use lock washers in the three positions shown. Also be sure to thread the rod into the clevis at least  $\frac{1}{2}$ ". Try to keep the frames perpendicular to the rod as you tighten the hardware. Remember to use appropriate torque values on the nuts per AC43.13b.  
The larger stiffener goes on frame "F" and the smaller on "G." The stiffeners should be attached to the rear of the frames as close as possible to the skin without bearing against it.
9. My hat shelf rear bulkhead is .020 aluminum. I cut  $\frac{7}{8}$ " holes for grommets where the clevises pass through. This bulkhead is non-structural and is upholstery repair so you are free to do anything that looks good.
10. When making the log entries to go with the 337, don't forget weight and balance. The added mounting components in my aircraft weighed 13.5 ounces per side. I used the mid-point between frames "F" and "G" as the moment arm. Don't forget the added weight of the harness as well. The FAA Inspector required the mention of repetitive inspection on the 337.

#### **The Harness:**

The seat centerline installation is meant for a four-point harness. Any TSO'd harness may be used. I was told that there is no TSO for the shoulder portion, only the lap belts. There are ready-made harnesses available from Wag-AERO that appear to be usable and are relatively inexpensive, but they do not have inertia reels and come in four separate parts that must be joined as you put them on.

This is the most personal part of the installation because you will wear the harness and have to look at it for years. For that reason, I chose a harness made by Amsafe, which is similar to the one they designed for the Cirrus SR-20. The shoulder straps on this harness are permanently attached to the lap belts at the buckle so that putting them on and taking them off is simple. The Amsafe harness is available in many colors. Amsafe designed, TSO'd, and fabricated a harness specifically for this application with a part number of 4013-1-01A-XXXX, where XXXX is the color number.

The inertia reels are attached to the clevises with AN4 bolts and AN 365-424 nuts. The inertia reel bracket has a .375 hole so a bushing is required. Because no standard AN part is available, I fabricated one by cutting to length .25 ID / .375 OD - 4130 steel bushing stock available from Aircraft Spruce.

#### **Suppliers:**

##### AmSafe (harness)

contact Tom Hogdon (and tell him I sent you)  
Amsafe, Inc.  
240 N. 48th Ave.  
Phoenix, AZ 85043  
602-850-2777

*-2702 COST serv Brian Hamell*

Aircraft Spruce and Specialty (hardware and raw material)

Aircraft Spruce & Specialty Co.

225 Airport Circle

Corona, CA 91720

800-824-1930

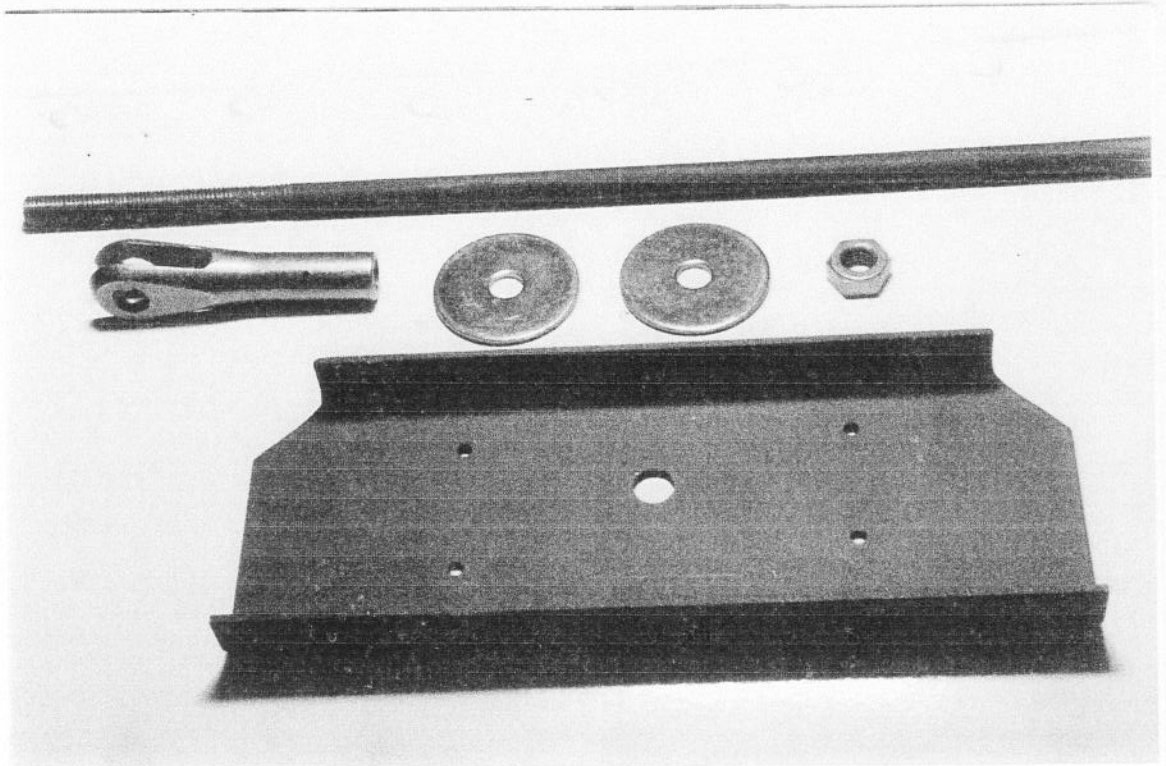
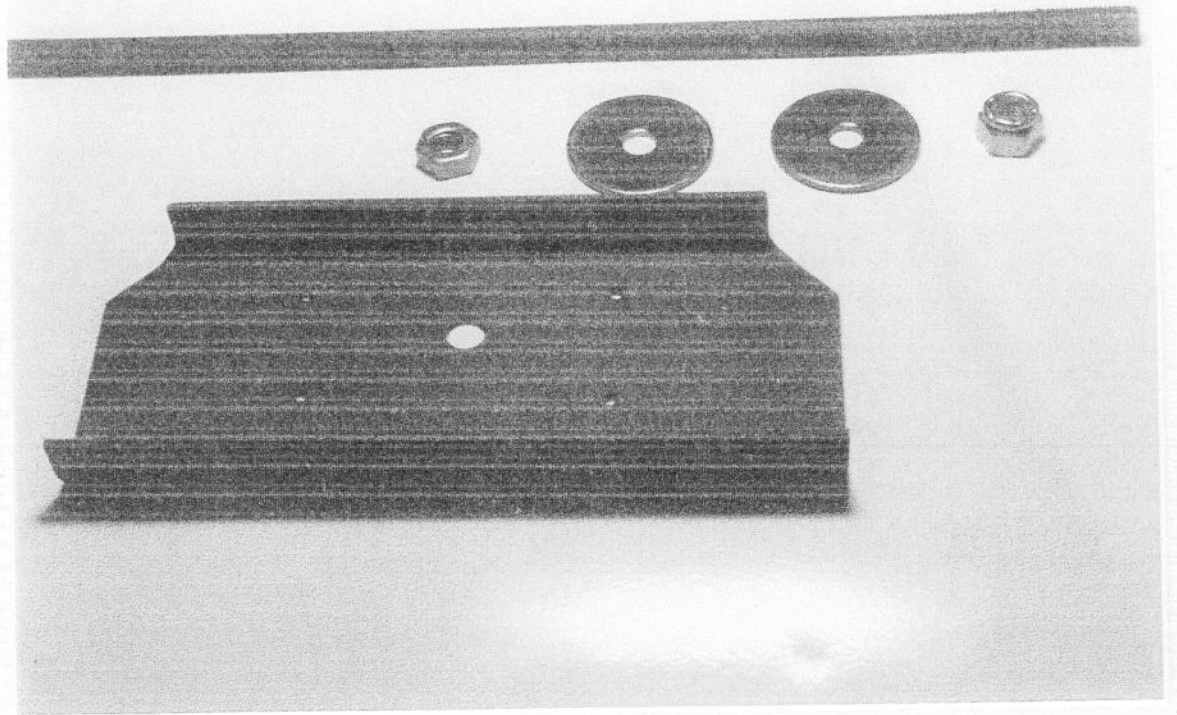
Wag Aero (harness)

P.O. Box 181

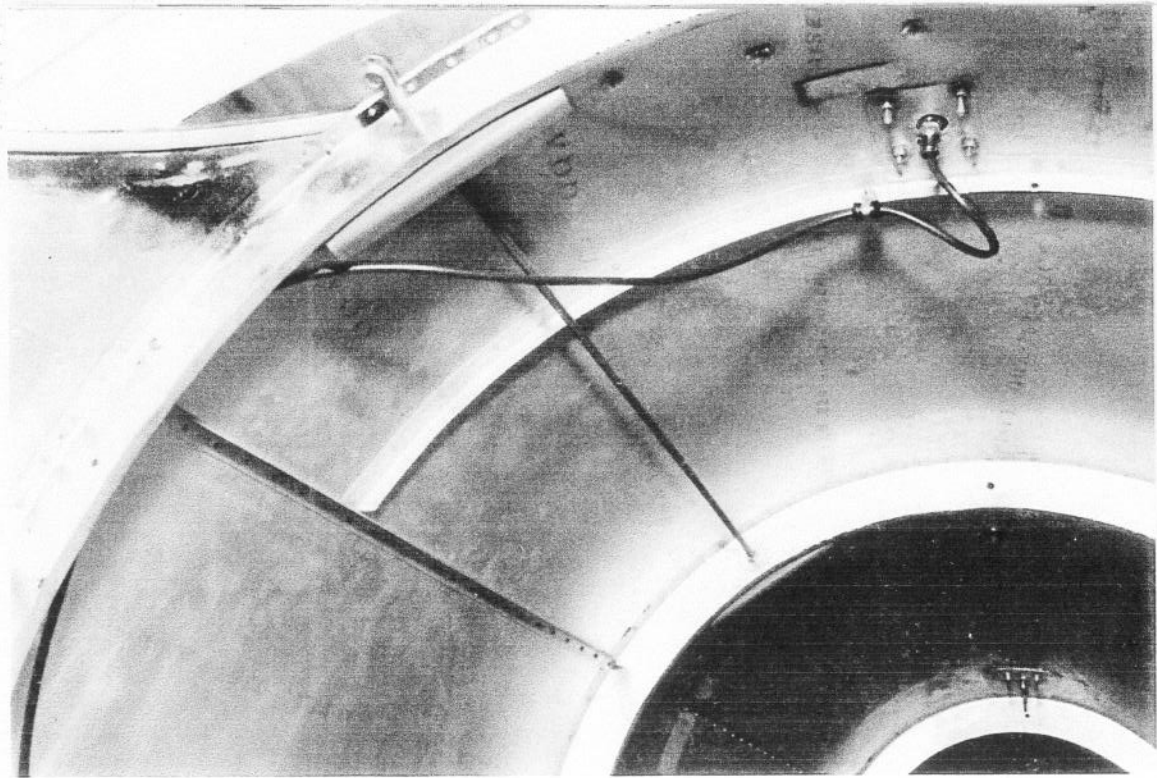
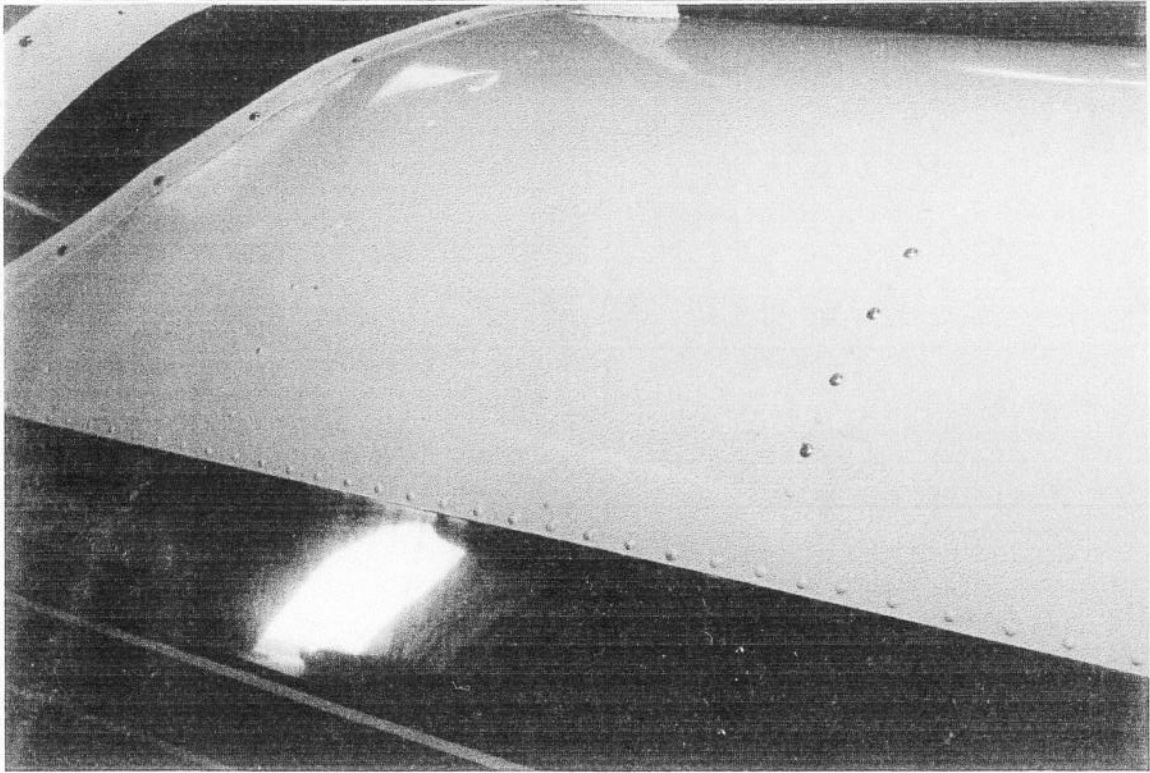
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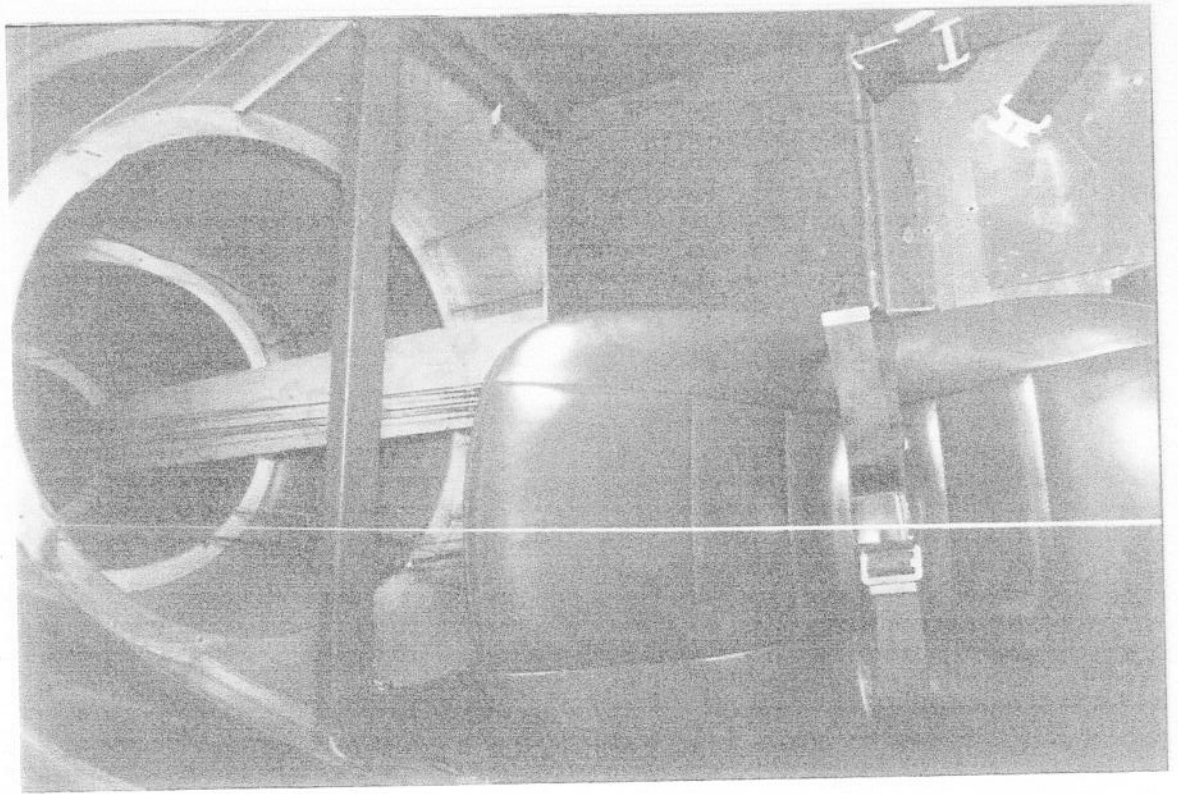
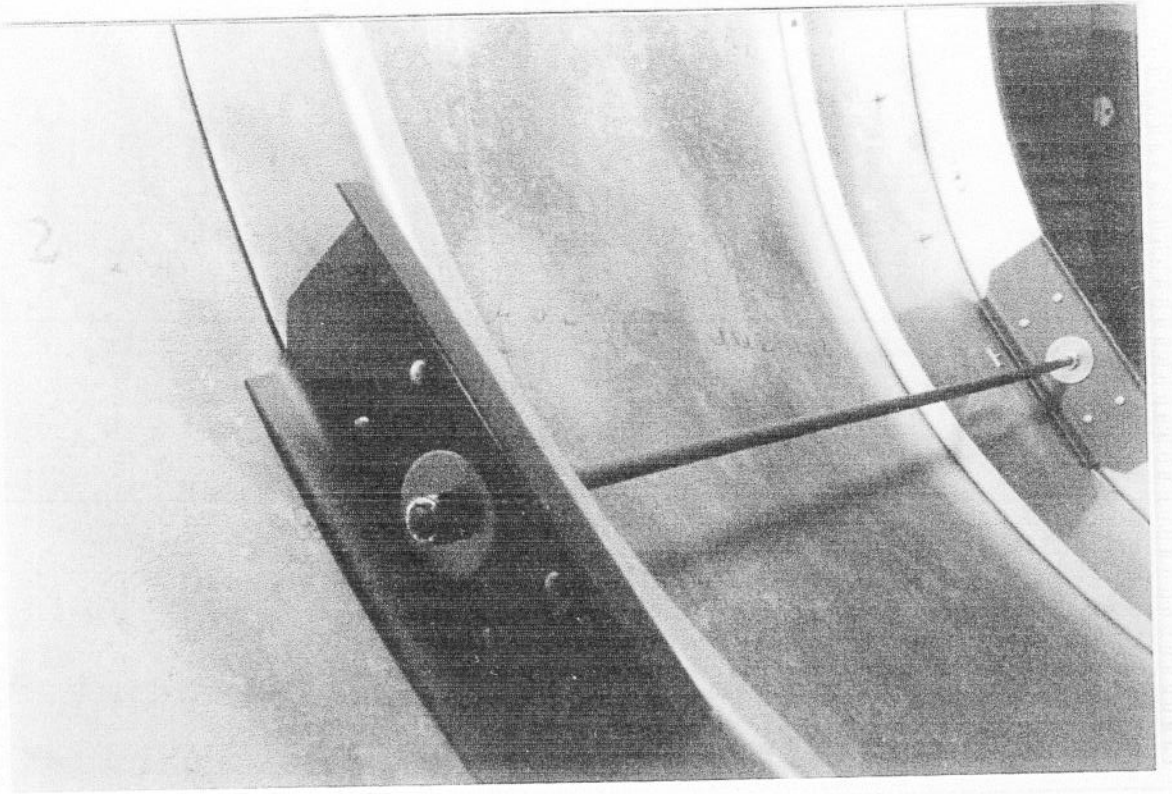
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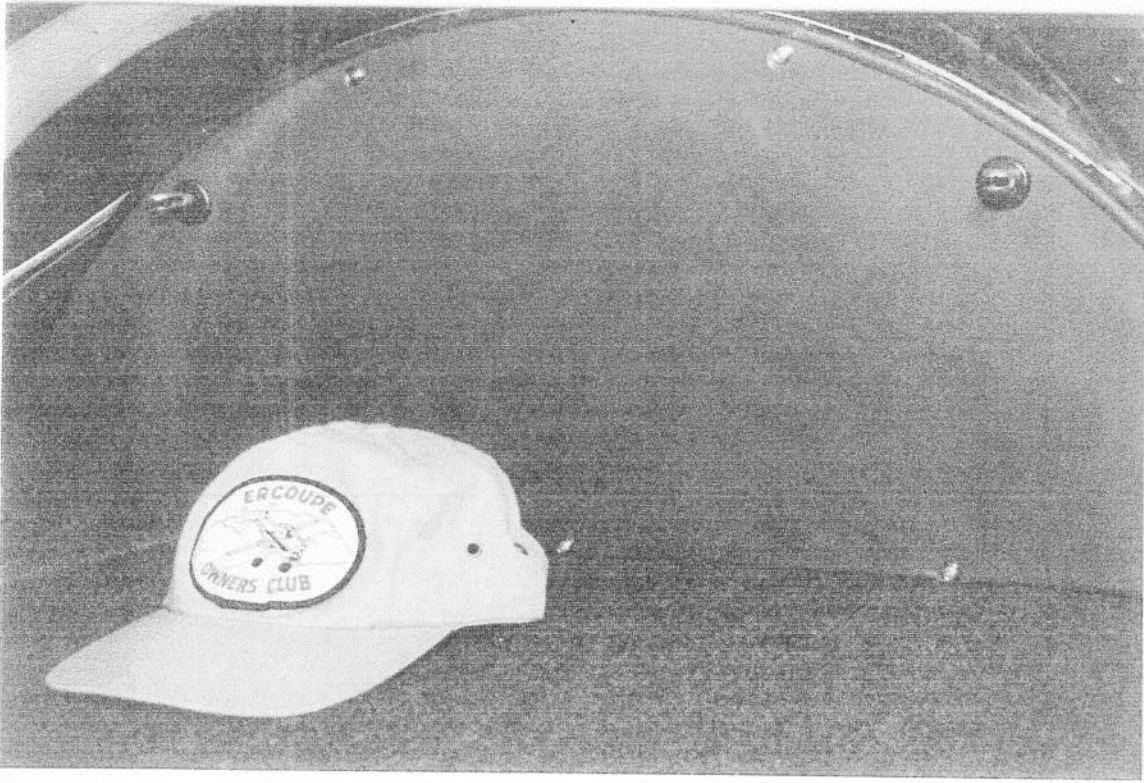
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RECEIVED

 US Department of Transportation Federal Aviation Administration	<b>MAJOR REPAIR AND ALTERATION</b> <b>(Airframe, Powerplant, Propeller, or Appliance)</b>	Form Approved OMB No. 2120-0020
	<b>WP-FSDO (SJC)</b>	<b>For FAA Use Only</b>
	Office Identification	

INSTRUCTIONS: Print or type all entries. See FAR 43.9, FAR 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. 1421). Failure to report can result in a civil penalty not to exceed \$1,000 for each such violation (Section 901 Federal Aviation Act of 1958).

1. Aircraft	Make <b>ALON</b>	Model <b>A-2</b>
	Serial No. <b>A35</b>	Nationality and Registration Mark <b>NG359V</b>
2. Owner	Name (As shown on registration certificate) <b>DAVID E. SMOLER</b>	Address (As shown on registration certificate) <b>19982 CHARTERS CT SARATOGA, CA 95070</b>

**3. For FAA Use Only**

The data identified herein complies with the applicable Airworthiness Requirements and is approved only for the above described aircraft subject to conformity inspection by a person authorized in FAR 43.7.

**02/15/00**  
Date

**REIGH R. GRANLUND**  
Signature of FAA Inspector

**REIGH R. GRANLUND**  
SJC ESDO WP 15

**4. Unit Identification**

Unit	Make	Model	Serial No.	5. Type	
				Repair	Alteratio
AIRFRAME	~~~~~(As described in Item 1 above)~~~~~				X
POWERPLANT					
PROPELLER					
APPLIANCE	Type				
	Manufacturer				

**6. Conformity Statement**

A. Agency's Name and Address <b>VERMILLION AVIATION 200 FORD RD. SP. #253 NEW BRUNSWICK NJ 08816</b>	B. Kind of Agency <input checked="" type="checkbox"/> U.S. Certificated Mechanic <input type="checkbox"/> Foreign Certificated Mechanic <input type="checkbox"/> Certificated Repair Station <input type="checkbox"/> Manufacturer	C. Certificate No. <b>A+P 1938774</b>
<b>408-729-4330</b>		

D. I certify that the repair and/or alteration made to the unit(s) identified in item 4 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

Date <b>2-9-00</b>	Signature of Authorized Individual <b>Vern R Miller</b>
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**7. Approval for Return To Service**

Pursuant to the authority given persons specified below, the unit identified in item 4 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is  APPROVED  REJECTED

BY	FAA Fit. Standards Inspector	Manufacturer	<input checked="" type="checkbox"/> Inspection Authorization	Other (Specify)
	FAA Designee	Repair Station	Person Approved by Transport Canada Airworthiness Group	

Date of Approval or Rejection <b>2-21-00</b>	Certificate or Designation No. <b>1938774</b>	Signature of Authorized Individual <b>Vern R Miller</b>
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### NOTICE


Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements.

#### B. Description of Work Accomplished

(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

INSTALLED PILOT AND PASSENGER SHOULDER  
HARNES ATTACHMENTS PER ATTACHED  
FORM 8110-3 ANALYSIS REPORT DATED 7-29-99.  
INSTALLATION WAS PERFORMED IN ACCORDANCE  
WITH THE FOLLOWING PARAGRAPHS OF AC43.13-1B/2A:  
4-1, 2, 4, 50, 51, 52, 53, 56, 57, 58 USING  
CHAPTER 7 TABLE 7-1 TORQUE VALUES,  
WEIGHT, BALANCE AND EQUIPMENT LIST REVISED.  
CONTINUED AIRWORTHINESS REQUIRES A VISUAL  
INSPECTION AND OPERATIONAL CHECK  
ANNUALLY IN ACCORDANCE WITH  
FAR 43 APPENDIX D.

Additional Sheets Are Attached

DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION <b>STATEMENT OF COMPLIANCE WITH FEDERAL AVIATION REGULATIONS</b>			DATE <b>07-27-1999</b>
<b>AIRCRAFT OR AIRCRAFT COMPONENT</b>			
MAKE <b>ALON</b>	MODEL No. <b>A2</b>	TYPE (Airplane, Radio, Helicopter, etc.) <b>Airplane</b>	NAME OF APPLICANT <b>DAVID SMOLER</b> <b>SARATOGA, CA 95070</b>
<b>LIST OF DATA</b>			
<b>IDENTIFICATION</b>	<b>TITLE</b>		
<b>ANALYSIS REPORT</b>	<b>STRUCTURAL/STRESS ANALYSIS-          SHOULDER HARNESS INSTALLATION(S)          ALON AIRCRAFT MODEL-A2, SN-A35, TN-N635V (C.F.D. 11-10-99) <sup>the</sup></b>  <b>"THIS ANALYSIS APPLIES TO THE STRUCTURAL ASPECTS OF THIS          INSTALLATION ONLY."</b>		
<b>PURPOSE OF DATA</b> <b>STRUCTURAL SUBSTANTIATION</b>			
<b>APPLICABLE REQUIREMENTS (List specific sections)</b> <b>CAR-03: Para 3.38221, 3.3811 dtd. 12-15-46</b> <b>FAR Part 23: Para 23.1413, 23.561(b)</b>			
<b>CERTIFICATION - Under authority vested by direction of the Administrator and in accordance with conditions and limitations of appointment under Part 183 of the Federal Aviation Regulations, data listed above and attached sheets numbered _____ 1-12 _____ have been examined in accordance with established procedures and found to comply with applicable requirements of the Federal Aviation Regulations.</b> I <input checked="" type="checkbox"/> Therefore <input type="checkbox"/> Recommend approval of these data <input checked="" type="checkbox"/> Approve these data			
<b>SIGNATURES(S) OF DESIGNATED ENGINEERING REPRESENTATIVES</b>		<b>DESIGNATION NUMBER(S)</b>	
		<b>DERT-605081-NM</b>	
		<b>A1, A2, A3, A4</b>	

STRUCTURAL / STRESS ANALYSIS

SHOULDER HARNESS INSTALLATION (S)

ALON AIRCRAFT MODEL A2

SN-A35

TN-N6359V

42-381 50 SHEETS 3 SQUARE  
42-380 200 SHEETS 3 SQUARE  
MADE IN U.S.A.



DATE: 11-10-99

PREP: \_\_\_\_\_

RICHARD M. CARLSON  
FAA-DEPT 605081-NM

## I. INTRODUCTION

THIS ANALYSIS REPORT CONTAINS LOADS, STRUCTURAL AND STRESS CALCULATIONS FOR THE SUBJECT SHOULDER HARNESS INSTALLATION WHICH ARE CONSISTENT WITH THE FAA REQUIREMENTS FOR PILOT AND PASSENGER SEAT BELT INSTALLATIONS. (CAR-03, FAR-23). THE CALCULATIONS/ANALYSES SUBSTANTIATE THE STRUCTURAL ASPECTS OF THE INSTALLATION OF THIS SHOULDER HARNESS IN ALON MODEL A2 AIRCRAFT SN-A35, TN-N6359V.

## II. DESCRIPTION\*

THE SHOULDER HARNESS UTILIZED IN THIS INSTALLATION IS AN "AMSAF" INERTIA REEL HARNESS EQUIPPED WITH A SINGLE POINT, MALE, ATTACHMENT LUG (100" L, SAE 4130 STL, .75" DIA. HOLE). THE AIRFRAME ATTACHMENT PROVISIONS INCLUDE AN AN-665 FEMALE SLEEVES TERMINAL AND A THREADED ROD (SAE 4130 STL, .75" DIA). THE THREADED ROD IS SECURED TO THE VERTICAL SHEAR WEBS OF EXISTING FUSELAGE FRAMES "F" & "G" BY MEANS OF .75" DIA. SHEAR/LOCK NUT (S), AN-970 (APPROPRIATE LOCK WASHERS, AND NEW "FRAME ATTACH CHANNELS (163" L, 2024-T3 AL AL). TWO ADDITIONAL AP-3 SKIN-TO-FRAME RIVETS ARE PROVIDED TO BOTH FRAMES "G" & "H" TO IMPROVE THE HARNESS LOAD (642 LBS) INTO THE EXISTING AIRFRAME SKIN.

## III. MATERIAL ALLOWABLES & ENGINEERING DATA

ALL MATERIAL ALLOWABLES AND PANEL BULGING DATA ARE OBTAINED FROM MIL-HDBK 5B-1971 AND "ANALYSIS & DESIGN OF FLIGHT VEHICLE STRUCTURES" - E.F. BRUNN, AND AN HOWEE PARTS CATALOG.

\* SEE ATTACHED (FORM 337) INSTALLATION SKETCH, AND PAGES 4 & 11 OF THIS ANALYSIS



2024-T-3 ALAL SHEET

$F_{tu} = 65,000 \text{ PSL}$ ,  $F_{su} = 40,000 \text{ PSL}$ ,  $F_{br} = 131,000 \text{ PSL}$

AN-3 & 4 STEEL BOLTS, EYE BOLT & CLEVIS

$F_{tu} = 125,000 \text{ PSL}$ ,  $F_{su} = 75,000 \text{ PSL}$

AN-4  $P_{SA} = 4080 \text{ LBS}$ , AN-4  $P_{SSA} = 3682 \text{ LBS}$

AN-3  $P_{SA} = 4080 \text{ LBS}$ , AN-3  $P_{SSA} = 3682 \text{ LBS}$

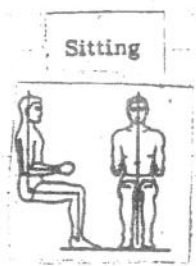
AD RIVETS - E/H = 2.0 ( $P_a$  IN LBS)

RIVET	BASE SHEAR*	CORR SHEAR	BEARING**	CORR. BRG BEARING
AD-4	388	-	-	-
(.020)	-	274	256	382
(.050)	-	388	643	958
AD-3	217	-	-	-
(.020)	-	210	192	286
(.050)	-	217	480	715

\* UNCORRECTED FOR TESTS

\*\* " " ( $F_{br} = 100 \text{ KSL}$ )

OCCUPANT CHARACTERISTICS



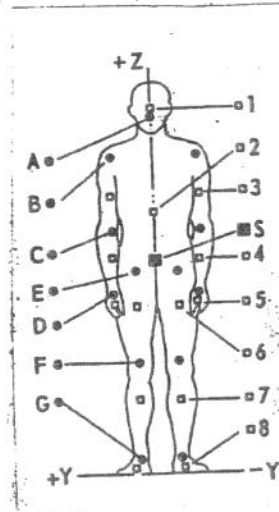
Axis	Center of Gravity (in.)		Moment of Inertia (lb-in.-sec <sup>2</sup> )	
	Mean	S. D.	Mean	S. D.
x	7.9	0.36	61.1	10.3
y	4.8	0.39	66.6	11.6
z	26.5 ✓	1.14	33.5	5.8

Sample size 66. Mean age 33.2 yrs; S. D. age 7.2 yrs. Mean weight 166.4 lbs; S. D. weight 19.8 lbs. Mean stature 69.4 in; S. D. stature 2.9 in.

42 SHEETS 5 SQUARE  
 42 SHEETS 5 SQUARE  
 42 SHEETS 5 SQUARE  
 NATIONAL

43 301 00 SHEETS SQUARE  
 44 302 00 SHEETS SQUARE  
 44 303 00 SHEETS SQUARE  
 44 304 00 SHEETS SQUARE  
 NATIONAL

Symbol		Location on figure		
		Coordinates -- % height		
		X	Y	Z
<u>Hinge Points</u>				
A	Base of skull on spine	0.0	0.0	91.23
B	Shoulder joint	0.0	±10.66	81.16
C	Elbow	0.0	±10.66	62.20
D	Wrist	0.0	±10.66	46.21
E	Hip	0.0	± 5.04	52.13
F	Knee	0.0	± 5.04	28.44
G	Ankle	0.0	± 5.04	3.85
<u>Centers of Gravity</u>				
1	Head	0.0	0.0	93.48
2	Trunk-Neck	0.0	0.0	71.09
3	Upper Arm	0.0	±10.66	71.74
4	Lower Arm	0.0	±10.66	55.33
5	Hand	0.0	±10.66	43.13
6	Upper Leg	0.0	± 5.04	42.48
7	Lower Leg	0.0	± 5.04	18.19
8	Foot	3.85	± 6.16	1.78
S	Total (whole body)			55.27



Source: Adapted from a chart prepared by J. A. Roebuck, courtesy of Douglas Data from Lay and Fisher [27], after Braune and Fischer [3].

### BUCKLING STRENGTH - CURVED SHEET PANELS

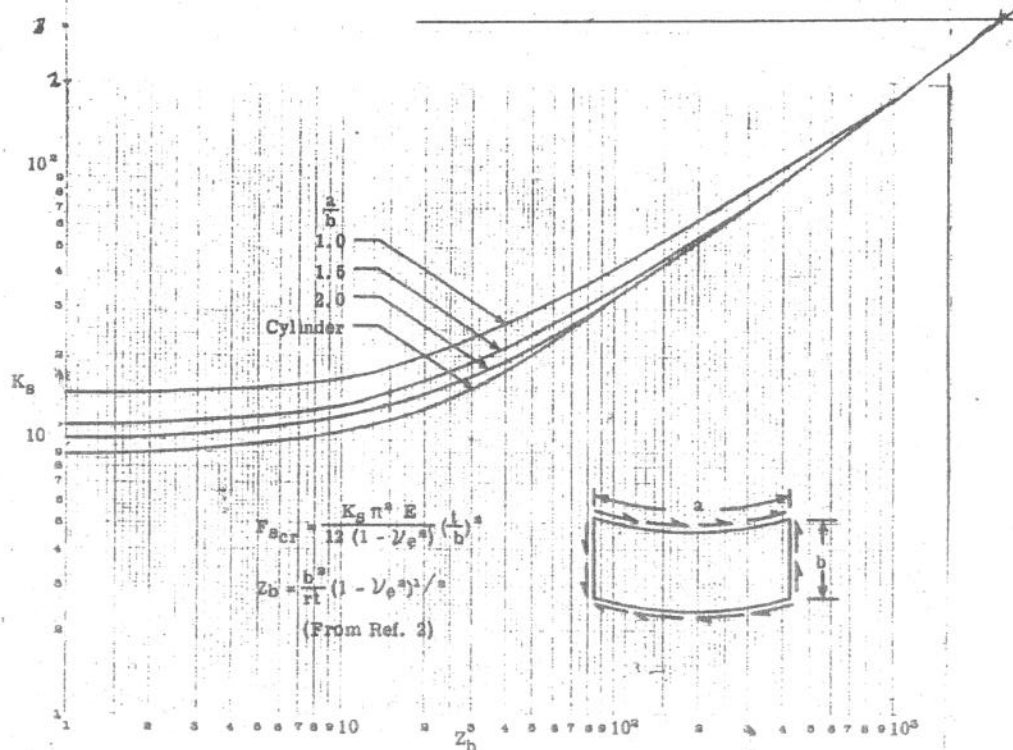


Fig. C9.3 Shear Buckling Coefficients for Wide Clamped Curved Plates.

LOCATION OF SHOULDER HARNESS ATTACHMENT

12-381 50 SHEETS 5 SQUARE  
12-382 100 SHEETS 5 SQUARE  
12-383 200 SHEETS 5 SQUARE  
NATIONAL  
MANUFACTURING CO.  
ANN ARBOR, MICH. U.S.A.

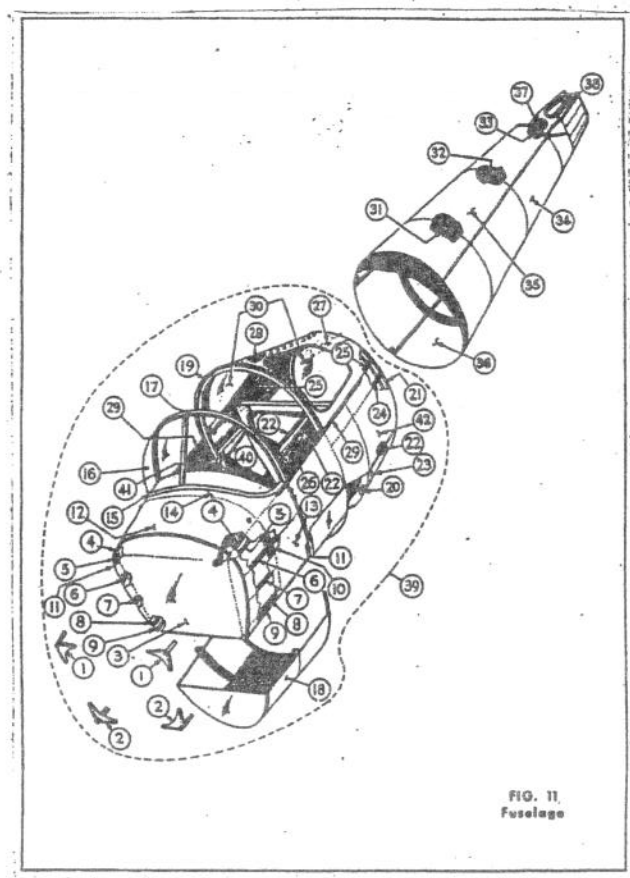


FIG. 11  
Fuselage

HARNESS ATTACHMENT IJIVETED TO FRAMES  
1/2" & 3/4" MARKED (31) & (32) AND CONNECTED BY  
A THREADED STEEL ROD.

#### IV. LOADING ANALYSIS

THE ALON MODEL A-2 RECEIVED TYPE CERTIFICATION IN 1947 UNDER PROVISIONS OF CAR-03. BOTH CAR-03 AND CURRENT FAR-PART 23 REQUIRE THE USE OF SEAT BELTS FOR ALL OCCUPANTS; HOWEVER, SHOULDER HARNESSSES ARE OPTIONAL FOR NORMAL CATEGORY AIRPLANES.

BOTH CAR-03 & FAR-PART 23 SPECIFY THE FOLLOWING OCCUPANT, ULTIMATE, DESIGN, LOAD FACTORS: [ $\S$  3.3811,  $\S$  23.561 (b)(3)]

$$\begin{aligned} n_z &= 3.0 \text{ (UP)} \\ n_x &= 9.0 \text{ (FWD)} \\ n_y &= 1.5 \text{ (SIDE)} \end{aligned}$$

SINCE, THE SHOULDER HARNESS IS INSTALLED TO RESTRAIN UPPER TORSO ROTATION DURING MINOR ACCIDENTS WHICH PRODUCE FWD ACCELERATION ON THE OCCUPANT IT IS ASSUMED THAT:

- a) THE SEAT BELTS REACT VERTICAL LOADS ( $n_z$ )
- b) THE SEAT BELT / SHOULDER HARNESS COMBINATION REACTS FORWARD AND SIDE LOADS ( $n_x, n_y$ ).
- c) THE VERTICAL LOCATIONS OF THE SEAT BELT HORIZONTAL REACTION AND OCCUPANT HIP JOINT ARE COINCIDENT.

SHOULDER HARNESS LOADS ARE CALCULATED BASED ON OCCUPANT WEIGHT OF 170 LBS, A MEAN STATURE OF 69.4" AND A HIP & SHOULDER JOINT LOCATION (MEASURED FROM BOTTOM OF FEET) OF 52% & 81% OF MEAN STATURE RESPECTIVELY. SITTING CG - 26.5" (SEE DATA IN SECTION III).

42.381 50 SHEETS 5 SQUARE  
42.382 100 SHEETS 5 SQUARE  
42.383 200 SHEETS 5 SQUARE  
NATIONAL



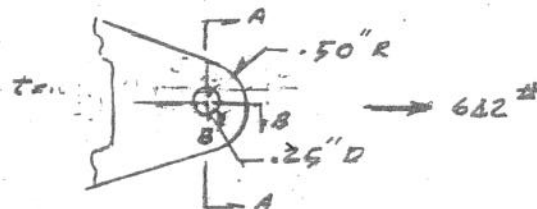


## V. STRESS ANALYSIS

### A. SHOULDER HARNESS ATTACHMENT

COMPARING  $P_{SHX}$  &  $P_{SHY}$  MAGNITUDES FROM PAGE 6, AND THE LUG CLEVIS DIMENSIONS,  $P_{SHX}$  IS THE CRITICAL LOADING CONDITION.

#### 1. SHOULDER HARNESS LUG (4130)



AT SEC A-A:

$$\sigma_{bx} = \frac{642}{(.25)(.188)} = 13,660 \text{ PSI}$$

$$\sigma_c = \frac{642}{(1.00 - .25)(.188)} = 4,553 \text{ PSI}$$

AT SEC. B-B

$$\tau_s = \frac{642}{(2)(.500 - .25)} = 1284 \text{ PSI}$$

$\therefore$  ALL M.S. ARE LARGE (N.F. > 3.00)

#### 2. ATTACH BOLT (AN-4)

APPLIED LOAD = 642# REACTED IN DOUBLE SHEAR;  $P_{SHX} = 3682\#$

$\therefore$  M.S. IS LARGE.

4200#

3. AN-665 CLEVIS TERMINAL

$$\text{ALLOWABLE } P_{T_A} = 4200\#$$

$$\therefore MS = \frac{4200}{642} - 1 = \underline{5.54}$$

B. HARNESSES-TO-AIRFRAME LOAD TRANSFER

1. .25" DIA. THREADED STEEL (A130-125 KSI)  
HAS SAME ALLOWABLE TENSION LOAD  
AS AN-4 BOLT:

$$P_{T_A} = 4080\#$$

$$\therefore MS = \frac{4080}{642} - 1 = \underline{5.36}$$

C. AIRFRAME ATTACHMENT1. STEEL ROD

ROD IS ATTACHED TO FRAMES "F" & "G"  
BY AN 4 NUTS, LOCK WASHERS, AN 90  
WASHERS, AND "FORMED" .063" CHANNELS  
WHICH ARE RIVETED TO THE FRAMES.

ASSUMING A 60-40 DISTRIBUTION  
OF THE 642# HARNESSES LOAD:

$$P_{SH_{X-F}} = (.6)(642) = 385\#$$

$$P_{SH_{X-G}} = (.4)(642) = 257\#$$

SHEAR STRESS AT FRAME "F" WEB-LEG  
INTERSECTION IS:

$$\tau_s = \frac{(385)}{(4.75)(.025)} = 3242 \text{ PSI}$$

STEEL ROD ATTACHMENT(S)  
MS ARE HIGH.

2. FRAME-TO-SKIN ATTACHMENT

WITH TWO (2) ADDITIONAL A03 RIVETS AT FRAMES "F" & "G", A TOTAL OF FIVE (5) RIVETS ARE PRESENT TO TRANSFER LOADS TO FRAMES.

$$\therefore P_s = \frac{385}{5} = 77 \#$$

FROM PAGE 2:  $P_{SA} = 210 \#$ ,  $P_{bA} = 286 \#$

$$\therefore MS = \frac{210}{77} - 1 = \underline{1.73}$$

3. SKIN BUCKLING

FOR BOTH PILOT & PASSENGER HARNESS LOADS APPLIED SIMULTANEOUSLY, AND APPROXIMATING AN "ACTIVE" SHEAR PANEL BETWEEN FRAMES "F" & "G" AND THE FUSELAGE SIDE STRINGERS OF DIMENSIONS 43" (R=13.7") X 23.75" (LONG) X .02", THE APPLIED SHEAR STRESS IS:

$$\tau_s = \frac{2(385)}{2(1.02)(23.75)} = 811 \text{ PSI}$$

FROM PAGE 3:

$$F_{sCR} = \frac{K_s \pi^2 E}{12(1-\mu^2)} \left(\frac{t}{b}\right)^2$$

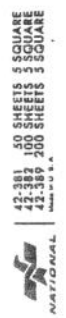
WHERE  $E = 10.5 \times 10^6$ ,  $\mu = .33$ ,  $t = .02$ "  $b = 43$

$$\therefore F_{sCR} = \frac{(3.14)^2 (10.5 \times 10^6)}{12(1-.111)} \left(\frac{.02}{23.75}\right)^2 K_s = 6.8 K_s$$

$$\text{AND } Z_b = \frac{b^3 (1-\mu^2)^{3/2}}{12 E t} = \frac{(23.75)^3 (1-.111)^{3/2}}{(12)(10.5 \times 10^6)(.02)}$$

$$Z_b = 1935 \frac{a}{b} = \frac{43}{23.75} = 1.8$$

$\therefore$  FROM PAGE 3  $K_s \approx 300$



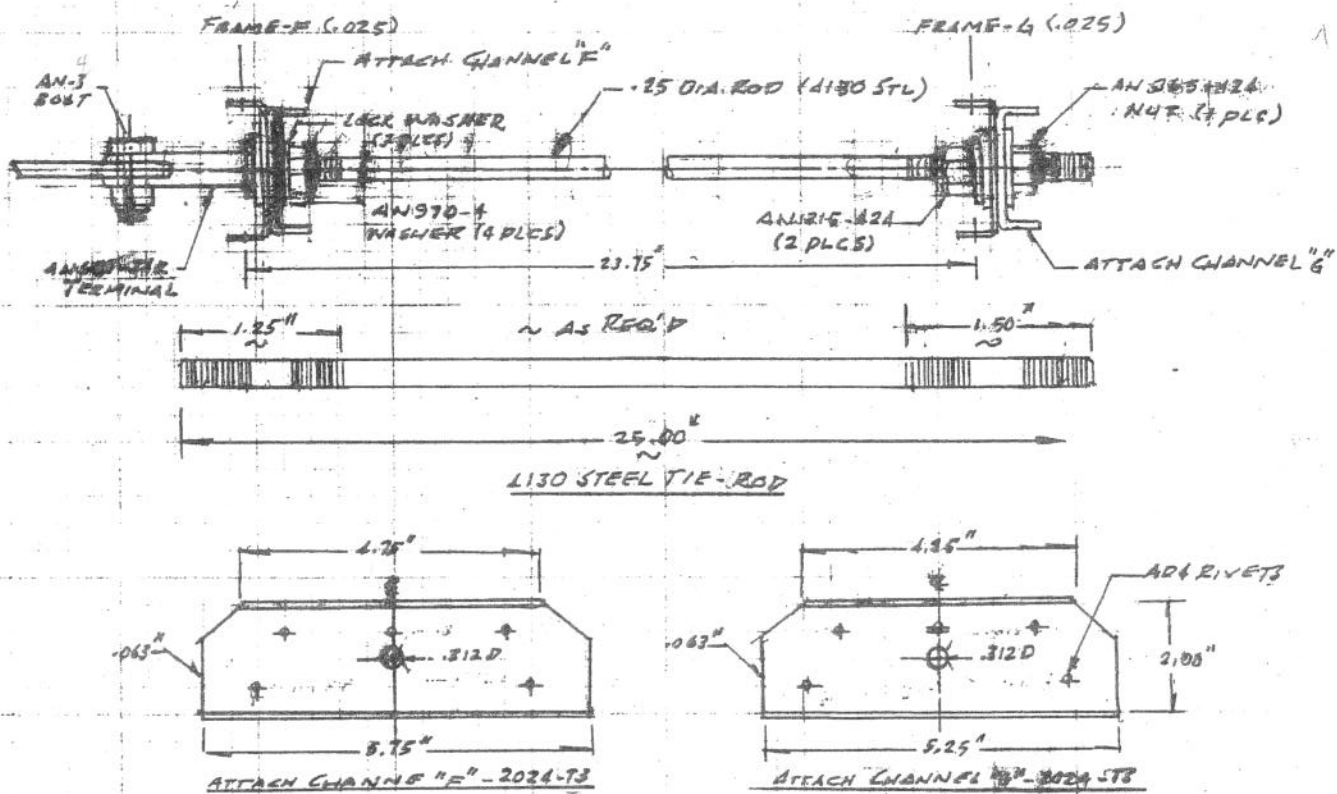
1.  $F_{SCR} \approx (6.8 \times 300) \approx 2040 \text{ PSI}$

$M.S. \approx \frac{2040}{811} - 1 = \underline{1.52}$

V. SUMMARY - CONCLUSION

THE FOREGOING ANALYSES DEMONSTRATE THE SUBJECT SHOULDER HARNESS INSTALLATION MEETS OR EXCEEDS COMPARABLE DESIGN LOADING REQUIREMENTS (CAR, FAR) FOR SEAT BELTS APPLICABLE TO THE DLON A2 AIRCRAFT TYPE DESI. CERTIFICATE (TC).



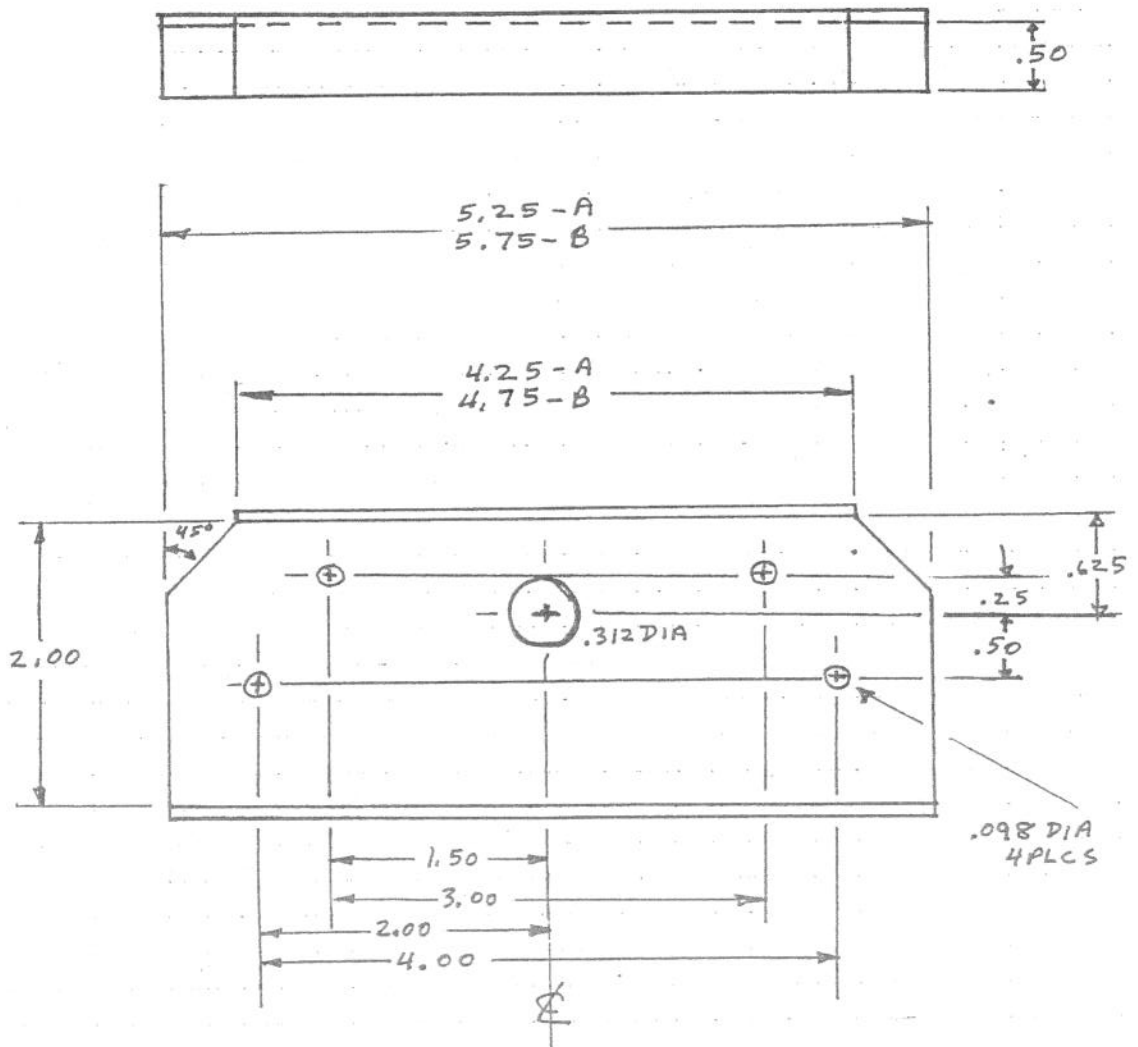




# STIFFENER "A" AND "B"

MATERIAL 2024-T3 .062 THK

NOTE: .090 MIN BEND RADIUS

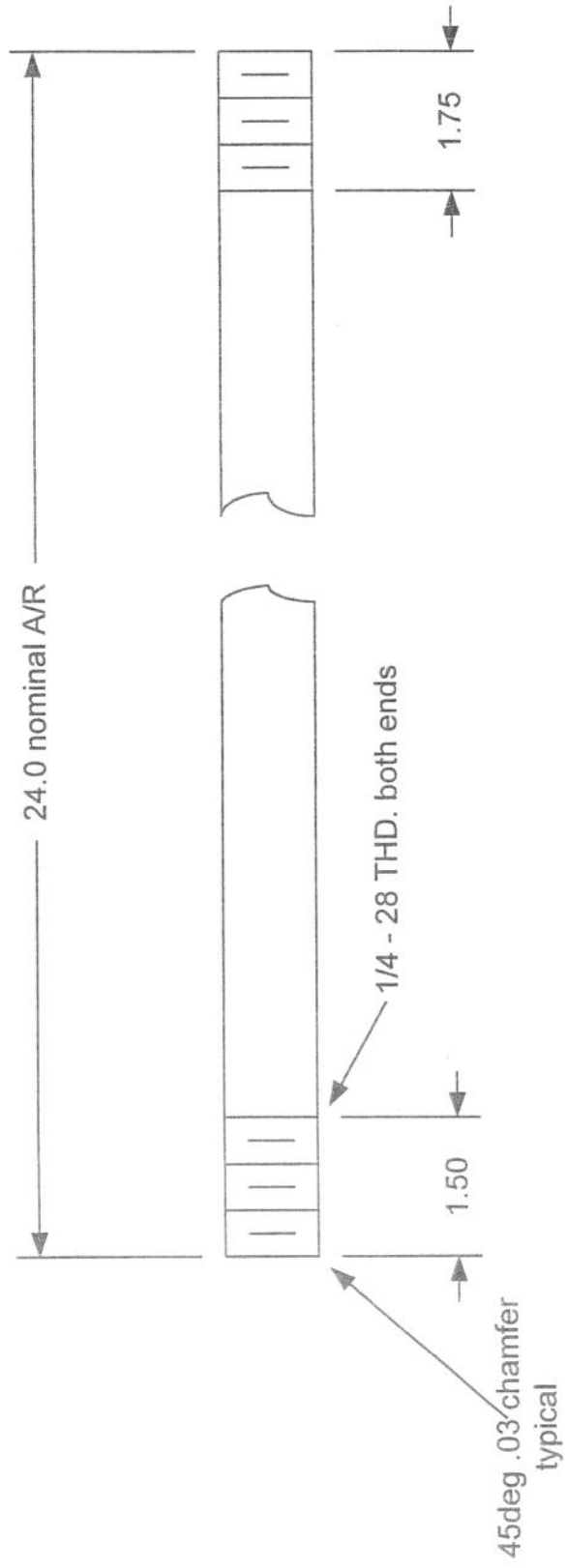


3 x 5.25  
3 x 5.75

# Tie Rod - Harness Attachment

Material: 0.25 dia. #4130 Steel Rod Stock

Finish: none



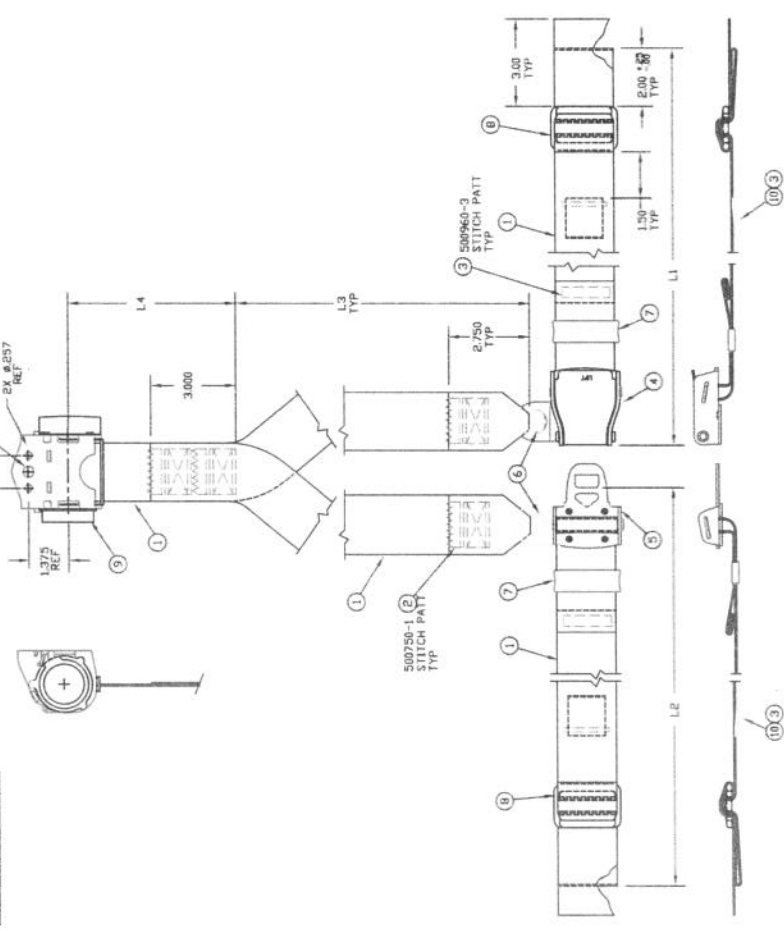
1 2 3 4 5 6 7 8

TRIM & FINISH TABLE	
CODE	FINISH
01	STANDARD FINISH

PLATING CODE TABLE	
CODE	FINISH
A	STANDARD FINISH

LIN	DESCRIPTION	DATE	APPROVED
-	NEW DRAWING RELEASE WFC: 5183	12-84-99	DK, JM
A	ITEM 5 WAS 364499-413-125 CR-1432	11-18-00	DK, JM

THIS DRAWING CONTAINS PROPRIETARY DESIGN, SPECIFICATIONS, DATA, INFORMATION, AND TECHNICAL MATERIAL THAT ARE THE SOLE PROPERTY OF AMSAFE, INC. TO BE HELD AND TREATED AS CONFIDENTIAL INFORMATION OR MANUFACTURED WITHOUT THE WRITTEN PERMISSION OF AMSAFE, INC.



QTY	DESCRIPTION	UNIT
2	500759-1 LABEL	
1	500580-533 INERTIA REEL ASSY	
1	MS22004-1 AD JUSTER	
2	503984-1 WEB SLIDE	
2	JAC 0056893 INERTIA REEL ASSY	
1	500759-137-2 BUCKLE ASSY	
1	500750-501 BUCKLE ASSY	
4	69 THREAD	
3	207 WEBBING	
1	11200-5 CLR/CUST REQ	
1	RESTRAINT SYSTEM ASSY	

LIST OF MATERIAL	
UTAS/ASSEMBLY	RESTRAINT SYSTEM ASSY
UNLESS OTHERWISE SPECIFIED	UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES	DIMENSIONS ARE IN INCHES
UNLESS OTHERWISE SPECIFIED	UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE FULLY EXTENDED (WHERE APPLICABLE)	ALL DIMENSIONS ARE FULLY EXTENDED (WHERE APPLICABLE)
REPAIR OR DISASSEMBLY OF THIS SYSTEM MAY BE CARRIED OUT ONLY	REPAIR OR DISASSEMBLY OF THIS SYSTEM MAY BE CARRIED OUT ONLY
BY A QUALIFIED PERSONNEL AT AN AMSAFE APPROVED	BY A QUALIFIED PERSONNEL AT AN AMSAFE APPROVED
REPAIR STATION. AMSAFE, INC. IS NOT RESPONSIBLE FOR DAMAGE OR	REPAIR STATION. AMSAFE, INC. IS NOT RESPONSIBLE FOR DAMAGE OR
MAJORITY RESULTING FROM ANY UNAUTHORIZED ATTEMPT TO REPAIR OR	MAJORITY RESULTING FROM ANY UNAUTHORIZED ATTEMPT TO REPAIR OR
DISASSEMBLE THE RESTRAINT SYSTEM	DISASSEMBLE THE RESTRAINT SYSTEM
PRODUCTION TEST PER E303502-2	PRODUCTION TEST PER E303502-2
THE CONDITIONS AND TEST REQUIRED FOR TSO APPROVAL OF THIS	THE CONDITIONS AND TEST REQUIRED FOR TSO APPROVAL OF THIS
ARTICLE ARE MINIMUM PERFORMANCE STANDARDS. IT IS THE	ARTICLE ARE MINIMUM PERFORMANCE STANDARDS. IT IS THE
RESPONSIBILITY OF THOSE DESIRING TO INSTALL THE ARTICLE EITHER	RESPONSIBILITY OF THOSE DESIRING TO INSTALL THE ARTICLE EITHER
IN OR WITHIN SPECIFIC OPERATIONAL CONDITIONS AND WITHIN THE TSO	IN OR WITHIN SPECIFIC OPERATIONAL CONDITIONS AND WITHIN THE TSO
STANDARDS. THE ARTICLE MAY BE INSTALLED ONLY IF FURTHER	STANDARDS. THE ARTICLE MAY BE INSTALLED ONLY IF FURTHER
EVALUATION BY THE APPLICANT (USER/INSTALLER) DOCUMENTS AN	EVALUATION BY THE APPLICANT (USER/INSTALLER) DOCUMENTS AN
ACCEPTABLE INSTALLATION AND IS APPROVED BY THE ADMINISTRATOR.	ACCEPTABLE INSTALLATION AND IS APPROVED BY THE ADMINISTRATOR.
REPAIR OR DISASSEMBLY OF THIS SYSTEM MAY BE CARRIED OUT ONLY	REPAIR OR DISASSEMBLY OF THIS SYSTEM MAY BE CARRIED OUT ONLY
BY A QUALIFIED PERSONNEL AT AN AMSAFE APPROVED	BY A QUALIFIED PERSONNEL AT AN AMSAFE APPROVED
REPAIR STATION. AMSAFE, INC. IS NOT RESPONSIBLE FOR DAMAGE OR	REPAIR STATION. AMSAFE, INC. IS NOT RESPONSIBLE FOR DAMAGE OR
MAJORITY RESULTING FROM ANY UNAUTHORIZED ATTEMPT TO REPAIR OR	MAJORITY RESULTING FROM ANY UNAUTHORIZED ATTEMPT TO REPAIR OR
DISASSEMBLE THE RESTRAINT SYSTEM	DISASSEMBLE THE RESTRAINT SYSTEM
ALL DIMENSIONS ARE FULLY EXTENDED (WHERE APPLICABLE)	ALL DIMENSIONS ARE FULLY EXTENDED (WHERE APPLICABLE)
THIS ASSEMBLY CONFORMS TO FAA TSO-C114.	THIS ASSEMBLY CONFORMS TO FAA TSO-C114.

AMSAFE, INC. PHOENIX, ARIZONA  
 RESTRAINT SYSTEM ASSEMBLY  
 SCALE: 1/2  
 CASE CODE: 4013  
 SHEET 1 OF 1

AmSafe Sales - 602-850-2702  
 BRIAN HAMMILL 369 00/ea + 3 weeks

BHAMILL@AMSAFE.COM

I certify that the article(s) listed below:

- \*Conforms to all applicable drawing dimensions and specifications.
- \*(If applicable) Meets the requirements of FAR 25.853 (a) Compartment Interiors.
- \*(If applicable) Conforms to British CAA specifications.
- \*(If applicable) All parts/materials are certified new, conform to the design data, and are in airworthy condition.
- \*Meets all the requirements of TSO-C114.
- \*The parts/materials reflected herein were produced under a FAA approved Manufacturing and Quality Assurance system/methods as set in FAR Part 21 Sub-Part O, Para. 21.601.
- \*The conditions and tests required for TSO approval of this article are minimum performance standards.
- \*It is the responsibility of those installing this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standard.
- \*TSO articles must have separate approval for installation in an aircraft. The article may be installed only if performed under 14 CFR part 43 or applicable airworthiness requirements.
- \*For the latest copy of the CMM/SMM, please log onto [www.amsafeaviation.com](http://www.amsafeaviation.com)

CUSTOMER NAME: LYNOL AMERO SALES ORDER NO. S143170

Line	Purchase Order No.	Am-safe Part No.	Rev.	Lot No.	Customer Part No.	Dated Code	Quantity
1	AMERO	4013-1-01A-8088	A	A1107	None	12-11-07	2

This document is the property of the customer and should remain with the articles listed above.  
**PLEASE DELIVER TO THE QUALITY ASSURANCE DEPARTMENT**

**REMARKS:**

NEW

AMSAFE INC  
1043 NORTH 47th. AVENUE  
PHOENIX, ARIZONA 85043 USA  
PHONE: (602) 850-2850 FAX:(602) 850-2812

*Grace Jenkins* 12-11-07  
QUALITY ASSURANCE REPRESENTATIVE DATE

**CUSTOMER**

# ENGINEERING ORDER

DRAWING NO. 4013		DRAWING TITLE: RESTRAINT SYSTEM ASSEMBLY			ORIGINATED BY: T.E.KOWALSKI			DISTRIBUTION CMM 25-22-30		
					ORIGINATION DATE: 1-17-2000			01-18-00 01-14-00 01-15-00 01-17-00 01-18-00		
NEXT HIGHER ASSEMBLY N/A		DCN X	LTR A	EO AMENDMENT	EFFECTIVITY			01-18-00 01-17-00 01-18-00		
		DOA	LTR	DATE	RELEASE DATE: 1/18/00	LOT NO.		APPROVAL		
AFFECTED DOCUMENTS		CLASS		I	II	TOOLING AFFECTED		YES NO X		
YES NO MFG/TEST/INSP CMM/IPL PMA REGULATORY AFFECTED DOCUMENT NOS. *FAA NOTIFICATION		DWG CHG TYPE NEW REL ADD PARTS X SUB. PARTS X DIM CHG NOTE CHG PICTORIAL OTHER		AFFECTED COMPONENTS			REWORK	USE AS IS	SCRAP	ENGINEERING DATE DESIGN DATE QUALITY DATE MANUFACTURING DATE MARKETING/CUST DATE PLANNING DATE
				RAW MATERIAL						01-18-00
				IN PROCESS			X			1-17-00
				FINISHED			X			1-18-00
				HIGHER ASSY						1-18-00
				1.						
				2.						
REASON(S) FOR CHANGE						CHANGE ORIENTATION:				
TO USE LOWER COST FINISH ON CONNECTOR						CR-1432 CUSTOMER: KITPLANE MARKET REQ BY: D.GOETZ DATE: 1-17-2000				
DESCRIPTION OF CHANGE(S):										
ITEM 5 IS: 504459-413-72 WAS: 504459-413-155										





**AMSAFE AVIATION**  
 1043 NORTH 47th AVENUE  
 PHOENIX, AZ 85043  
 PH (602)850-2850 FAX (602)850-2812

**SHIPPER**  
 000149020  
 12/12/07

CUSTOMER NO.
10005890

SALES ORDER NO.
S143170

BOL NO.
000149020

PAGE NO.
1

LYNOL AMERO  
 (BOEING)  
 1007 199TH AVE E  
 LAKE TAPPS, WA 98391  
 United States of America

LYNOL AMERO  
 (BOEING)  
 1007 199TH AVE E  
 LAKE TAPPS, WA 98391  
 United States of America

Ship to ID: 10005890

CUSTOMER ORDER NO.
AMERO

TERMS
CRCARD

FREIGHT
PP

SHIP VIA
FEDEX GROUND

F.O.B.
ORIGIN

Sales Order Remarks:  
 Remarks:

SHIPMENT REFERENCE 000149020

LINE	ITEM NUMBER / DESCRIPTION	DRAWING AND CERTIFICATIONS	DUE DATE	QTY ORDERED	QTY SHIPPED	QTY BACK ORDERED
1	4013-1-01A-8088 RESTRAINT SYSTEM ASSY.	DRAWING: 4013 CERT: TSO-C114 Lot/Serial Numbers Shipped s143170-1	2007-12-10	2 Expire Ref.	2 2	0

DATE SHIP	NO PCS	DESCRIPTION	WEIGHT	FINAL DESTINATION

**SPECIAL INSTRUCTIONS:**

COUNTRY OF ORIGIN USA













