

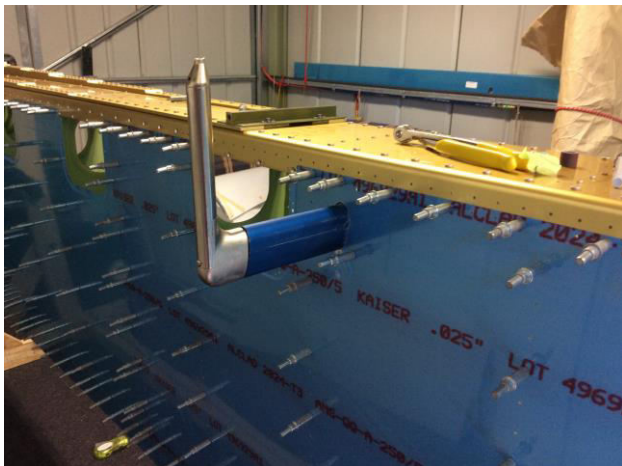
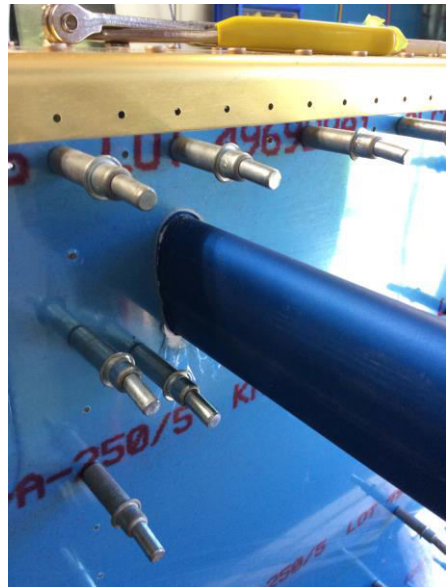
Modification Report

MOD # : **MOD-003**

Taran Laval – SAAA Builder 7417
Van's Aircraft RV7 - 73918

Changed Pitot System

The Standard Vans Pitot system is made up of ¼" aluminium tube, I have elected to swap this out with a Dynon AOA/Pitot probe / Safeair1 Mast, and Safeair1 plastic tubing system to integrate with the Dynon Skyview System



- Part 1 – The Pitot Mast was installed IAW manufacturers (Safeair1) Instructions, see attached *appendix 1*
 - Note – The Clearance between pitot mast and wing rib was not sufficient so a small amount of material was removed from the inboard edge of the pitot mast mounting plate.
- Part 2 – The Pitot/AOA Plumbing installed IAW manufacturers (Safeair1) Instructions – Document 1001, Rev 02, see attached *appendix 2*

Date: **12 NOV 14**

Pitot Mast Installation Guide

Last update: April 04, 2014

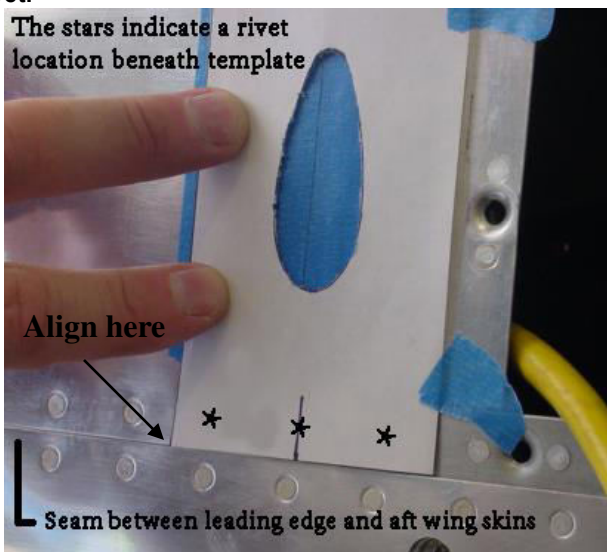
Thank you for purchasing the **SafeAir1** Pitot Mast. This Installation Guide provides a general overview for installation of the Pitot Mast in Van's RV series aircraft. Specific techniques may be varied by the builder. If you have any questions or suggestions for improvement regarding this Guide, please write to us at CustomerCare@SafeAir1.com

Getting Ready: This job takes approximately 90 minutes and requires the general tools available to builders of metal skin aircraft such as Van's RV series.

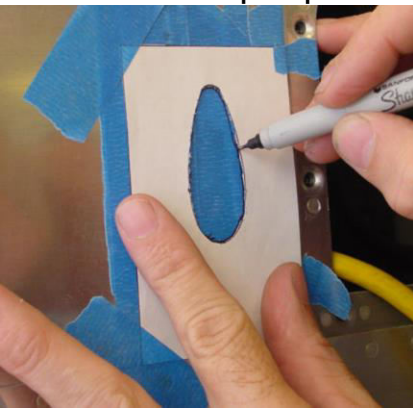
Please read this entire Guide before beginning work.

Techniques may be varied by the builder; this document is only intended to provide a general guide.

Step 2: Remove center area from the template and locate in position on wing skin with forward edge of template along wing skin joint. Also, be sure to locate centerline of template through the center of the middle rivet.

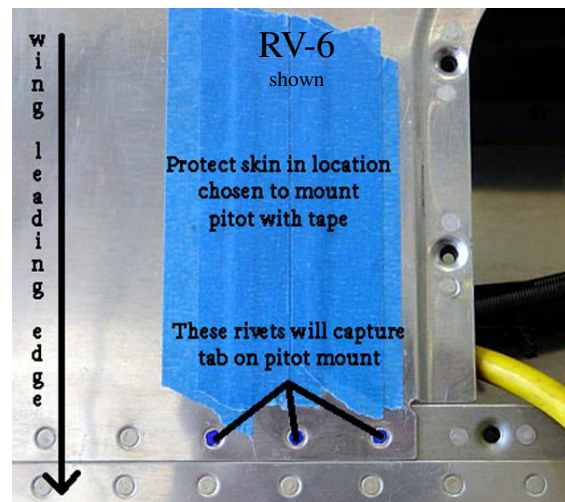
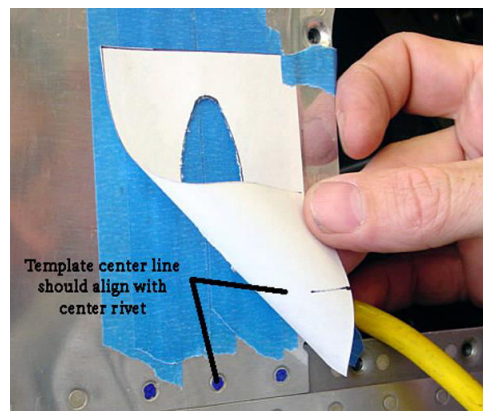
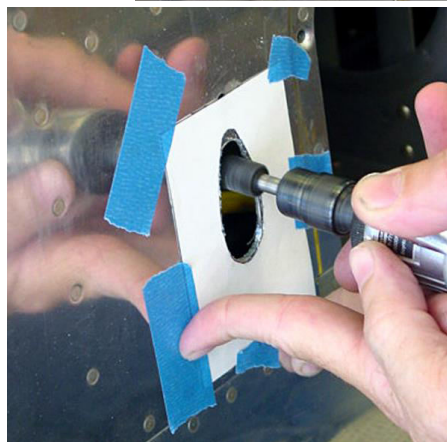


Step 3: Use cutting template to mark area of wing skin to be removed. A drill bit (or Unibit) can be used to open up initial hole.



Step 1: Locate the area just outboard of the aileron bellcrank inspection panel and cover with protective tape. Make note of the three rivets just outboard of the inspection panel in the aft wing skin: These rivets will be drilled out.

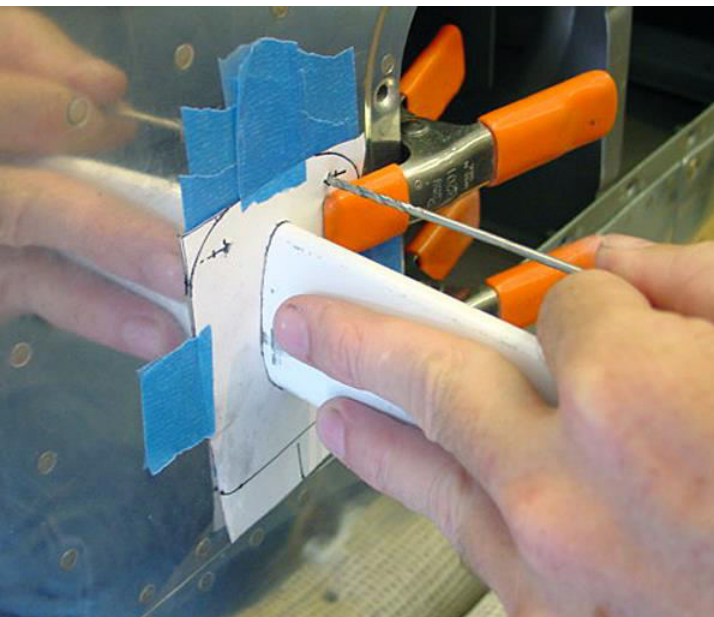
NOTE: RV7,8,9 builders will be working past a wing rib just outboard of the inspection panel.



Step 4: From there a rotary cutting or grinding tool can be used to remove the wing skin material. 3/8 to 1/2 inch diameter rotary tools will work well with the radii to be cut in this application. Be careful and remove material slowly. Check the fit of the Pitot Mast often to obtain the best fit.

(Continue on reverse side)

Step 5: After carefully cutting out the wing skin, remove the three rivets in the spar flange and insert the pitot mast to insure a good fit. Drill (#40) the aft corners of the template through the wing skin just enough to lightly mark the steel mount plate. Remove mast and finish drill on bench. Reinstall mast with cleco's and repeat this process for the three rivets in the spar flange. Use the rivet holes in the spar flange to mark the base plate with a drill bit.



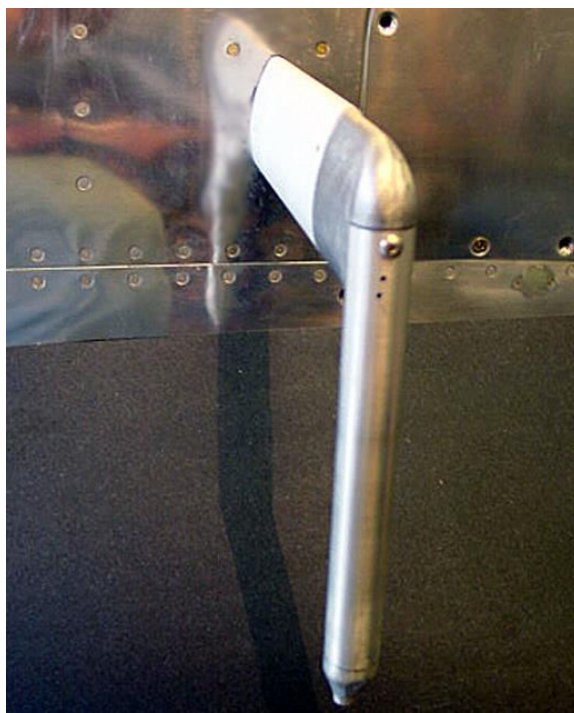
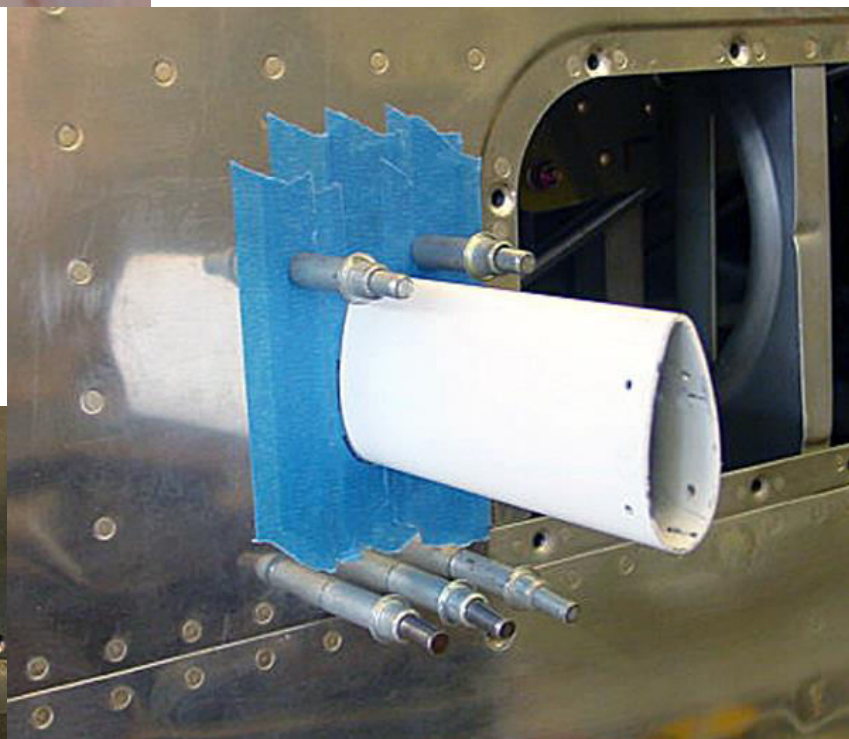
Step 6: After marking the pitot base plate with the drill bit, remove the mast from the wing and finish drilling the mounting holes (#40) on the bench.

Depending on your choice of fasteners (flush or universal head) deburr or countersink the plate as necessary.

Step 7: If using a flush rivet, dimple the aft holes in the wing skin and cleco pitot mast in place.

Step 8: No need to rivet mast in place at this time unless you are sure you won't need to remove it for any reason.

If you are ready to permanently install the mast you may want to consider a primer coat or sealant (ProSeal) application between plate and wing skin.



Congratulations !!
You're now ready to mount and
plumb your pitot tube.

**Complete Pitot, Static, and Angle-of-Attack
Plumbing Kits are Available from *SafeAir1*.**

www.SafeAir1.com



Pitot, Static and Angle of Attack Air Kit Installation Guide

*This product is not approved for installation in type certificated aircraft – For
EXPERIMENTAL AIRCRAFT ONLY*

Thank you for purchasing a **SafeAir1** product. Pitot-Static systems are not optional; however, plumbing them can sometimes make you wish they were. **SafeAir1** has a history of providing quality Pitot-Static Kits that make this time consuming and frustrating exercise a snap. When using a **SafeAir1** Kit, the amount of time saved on the installation, compared to conventional systems, is significant. And you'll end up with a plumbing system that is more **reliable, durable, and maintenance friendly**. **SafeAir1 Air Kits** offer a great value, saving builders 35%, or more, over individual part pricing.

Unlike many available products, **SafeAir1 Air Kits** has an operating temperature range of -40 degrees F to +200 degrees F. Durability is extreme and the ease of working with this product is second to none.

This Installation Guide provides a general overview for installation of **SafeAir1 Air Kits** in metal experimental aircraft. Applicability and suitability of this kit to experimental aircraft is the responsibility of the builder. If you have any questions or suggestions for improvement regarding this Guide, please write to us at CustomerCare@SafeAir1.com. ***We'd love to see images of your air kit installation, if you are willing to share please email them to the address above.***

Document 1001, Revision 02

August, 2011

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1 Introduction

Please read this entire Guide before beginning work. Builders should make modifications and adjustments as necessary for their installation.

Fittings in **SafeAir1 Air Kits** are of the Quick-Disconnect variety. The fittings capture the tubing with stainless retainers, similar to “Chinese finger cuffs”. If you remember playing with those as a kid, you know the tubing is not coming out! However, by suppressing the release ring (around the tubing entry port), the tubing is easily removed. Within just a few minutes, you’ll be able to disconnect and reconnect tubing, in the blind, with just one hand! O-ring seals, and maintaining precise tubing diameter during the manufacturing process, ensures a reliable seal. This is a “game changer” when it comes to building, instrument installation/removal, and maintenance.

2 Kit Contents

2.1 Parts List

Air Kit Offerings:

A = SkyView System ADAHRS and Optional Back-Ups

B = EFIS System with Optional Back-Ups

C = Standard Instruments (Steam Gauge) and Encoder

Part Number	Description	QTY PER KIT (EA)		
		A	B	C
1	90° Male Elbow	7	7	4
2	Male Run Tee	3	0	0
3	Male Branch Tee	1	4	3
4	Straight Male Connector	0	0	1
5	Union Tee	3	1	1
6	Union 90° Elbow	2	2	1
7	Synthetic Rubber Grommet (ID=1/2", OD=1-1/16", Groove Width=1/16")	2	2	1
	Snap Bushing (Bushings ID=1/4")	30	30	15
8	Female Connector	2	2	1
9	25'- 1/4" Tubing Green (Pitot Air)	1	1	1
10	32'- 1/4" Tubing White (Static Air)	1	1	1
11	23'- 1/4" Tubing Blue (Angle of Attack)	1	1	0
F	Static Air Port	2	2	2
G	AN Hardware Assembly	2	2	1
Misc ¹	Screw (8-32 x 1")	5	3	2
	Nut (832)	5	3	2
	Washer (No.8)	5	3	2

Notes:

1. 18-8 Stainless Steel hardware provided for fittings with mounting lugs.

2.2 Part Number Key



90° Male Elbow¹

1



Male Run Tee¹

2



Male Branch Tee¹

3



Straight Male Connector¹
(Gold Anodized)

4



Union Tee

5



Union 90° Elbow

6



Grommet / Snap Bushing

7



Female Connector²
(Gold Anodized)

8



Static Air Port

F



AN Hardware Assembly
(Blue Anodized)

G

Notes:

1) 1/8"-27 NPT Male

2) 1/8"-27 NPT Female

2.3 Need Other Fittings?

In addition to the fittings above, the following are also available. Visit SafeAir1.com for details.



Plug

F1



Straight Union

F2



Union Y

F3

3 System Planning

Our schematics cover the three basic systems found in experimental aircraft today. Each Kit also includes fittings for some of the more popular options. Compare our schematic to your planned system. In most cases, our kit will contain everything you'll need to complete your Pitot-Static (and Angle of Attack) System. If you have unique requirements, additional fittings and tubing are available.

3.1 SkyView System (Or Similar) ADAHRS and Optional Back-Ups

Proper installation of the ADAHRS module(s) is critical. Primary Flight Display performance is significantly linked to a proper ADAHRS installation. Reference manufacturer's requirements.

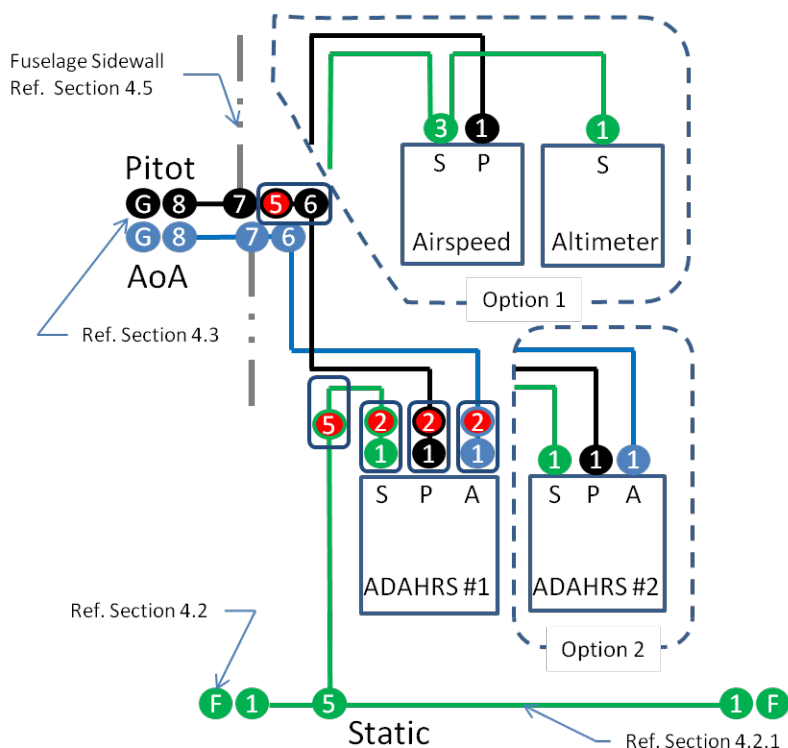


Figure 1–SkyView System ADAHRS and Optional Back-Ups

Notes:

- 1) Standard Fittings. Provided in kit. For use with basic Pitot, Static and AOA Installations.
- 2) Optional Fitting. Provided in Kit. For use if installing back-up instruments.

3.2 EFIS System with Optional Back-ups

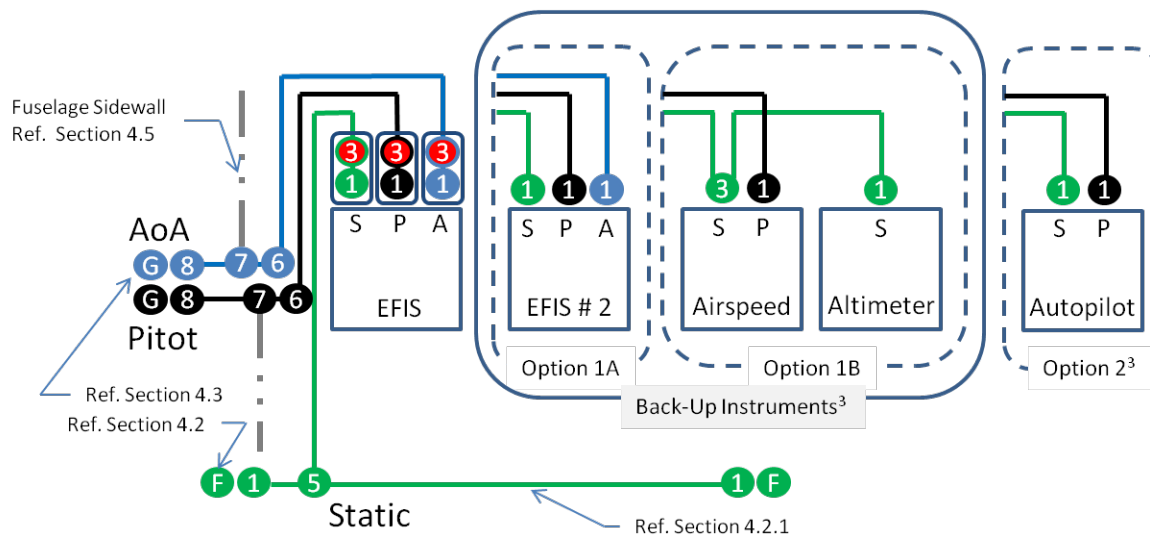


Figure 2—EFIS System with Optional Equipment

Notes:

- 1) X X X Standard Fittings. Provided in kit. For use with basic **Pitot**, **Static** and **AOA** installations.
- 2) X Optional Fitting. Provided in Kit. For use if installing Option 1 or Option 2.
- 3) Kit provides fittings for installation of either Option 1A or Option 1B Back-Up Instruments, and for an Autopilot.

3.3 Standard Instruments (Steam Gauge) and Encoder

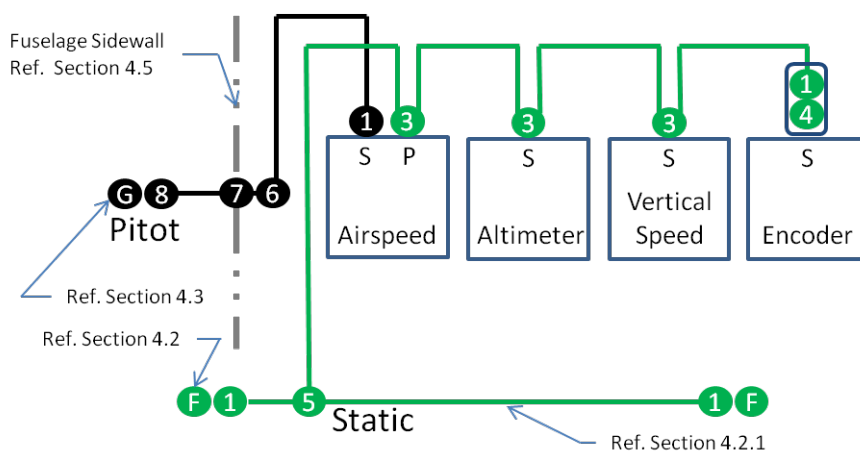


Figure 3 - Standard Instruments (Steam Gauge) and Encoder

Notes:

- 1) X X X Standard Fittings. Provided in kit. For use with basic **Pitot**, **Static** and **AOA** installations.
- 2) X X Optional Fitting. Provided in Kit. Builder's choice.

4 Installation

4.1 Recommended Tools

4.1.1 Aviation grade flaring tool (37 degrees)

To flare 3/16ths inch aluminum tubes.

Note: *NEVER* use an automotive style flaring tool for aircraft applications. Aluminum tubing will work harden when flared in excess of 37 degrees and fail.

4.1.2 Plastic Tubing Cutters

Tubing may be cut square with a cutter similar to the one shown below (anvil type action). This tool was purchased from Sears and has a very sharp (razor style) blade.



Plastic Tubing Cutters

Note: “Anvil” Cutters (shown) make square, clean cuts in tubing without crushing or distorting the material. Never use bypass cutters (scissors), dikes, side cutters, or serrated blades for cutting tubing. They deform the tubing and/or leave a jagged burr that will damage the o-ring when secured in the fitting.

4.2 Static Port Installation

The static pressure is obtained through a static air port fitting. The fitting should be located where it can access the air flow in a relatively undisturbed area. This kit contains two fittings; one should be located on each side of the fuselage or in the location recommended by the manufacturer. With this positioning, an average pressure can be taken, which allows for more accurate readings in specific flight situations.



Static Air Port

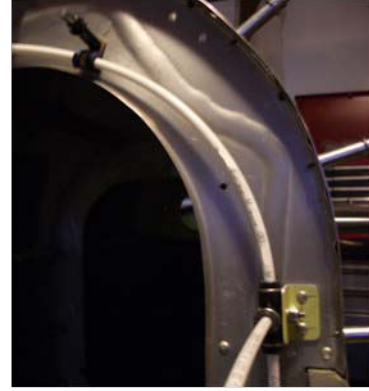
Drill a .250” hole in the appropriate location. (Before drilling, ensure sufficient clearance for the fitting flange) The shallow groove on the backside of the fitting acts as an edge distance guide for the builder choosing to drill 2, 3, or 4 evenly spaced #3 rivets. The number of rivets used to secure the port is left up to the builder. Locate the fitting on the inside of the fuselage skin and back drill to the fuselage. Some builders bond the static ports to the inside of the fuselage skin using Pro-Seal and delete the rivets. This provides for a secure installation, seals out moisture, and prevents the “puckered look” from putting so many rivets in close proximity to one another. **Note:** *Do not grind the protruding air port flush with the exterior of the aircraft skin.*

4.2.1 Static Loop

After installation of the fittings the builder must connect the two fittings to create a static air loop. Reference the appropriate Section 3 Schematic for additional information. The builder shown in the images below chose to route the static line between the two static ports across the top of the bulkhead. Note that the Tee Union is supported with a bracket fabricated from stock angle.



Static Line Loop



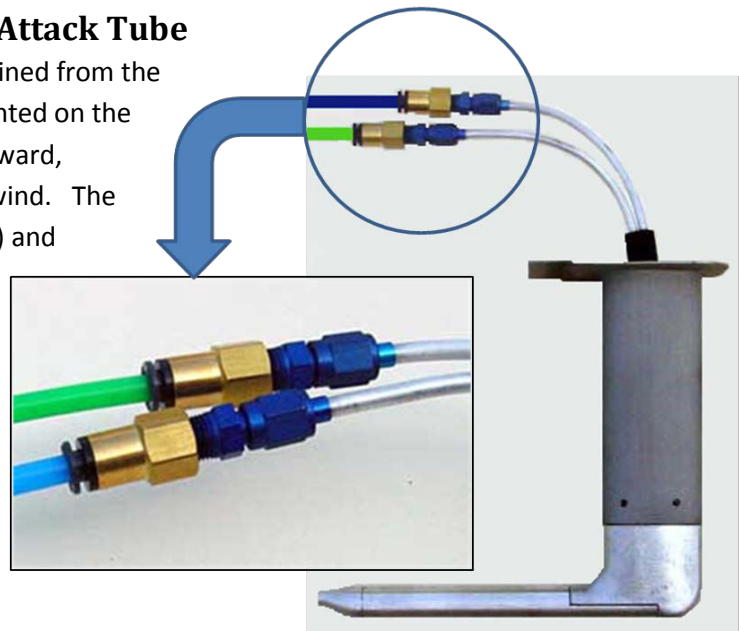
Tee Union Bracket

Static air tubing is then routed forward from the Tee Union to the various flight instruments.

4.3 Connection to Pitot/Angle of Attack Tube

The pitot and angle of attack pressure is obtained from the pitot tube. The pitot tube is most often mounted on the wing or front section of an aircraft, facing forward, where its opening is exposed to the relative wind. The image below shows how the Pitot line (green) and Angle of Attack line (blue) are connected to a Dynon Probe using components supplied in the kit. Pitot and Angle of Attack tubing are then routed to the various flight instruments.

Note: Some builders choose to cover the aluminum tubes with rubber or vinyl hose for added protection against abrasion.



Pitot (green) And Angle Of Attack (blue) Air System
(Shown with **SafeAir1** Pitot Mast And Dynon Pitot)
Attached With AN Fitting Assembly.

4.4 NPT Fitting Installation

Threaded fittings; i.e. Part Numbers #1, #2, and #3, swivel. In other words, after reaching the appropriate torque value, you can rotate the fitting and point the port(s) in the desired direction. You can also use this feature when installing fittings in close quarters. The port can stay stationary as the threaded base is rotated.

When installing fittings with NPT threads into an instrument, **ALWAYS** use a back up wrench to prevent the fitting in the instrument from turning.

CONSULT the manufacturer of the instrument for torque values before installing 1/8" NPT fittings.

4.5 Wall Penetrations and Structural Pass Throughs

It is important to efficiently route the tubing while providing protection against chaffing.

4.5.1 Grommet/Fitting Installation

This installation should be used when a tight turn of the line is desirable after passing the line through the fuselage sidewall (from the wing root). Drill a 13/16" hole and install grommet. Insert a 90° Elbow or Union Tee fitting through I.D. of the grommet to complete the installation. If this turns into a struggle, a little Isopropyl alcohol makes this much easier and it evaporates without leaving a residue. The fit is pretty snug and the grommet alone should secure the fitting. If you prefer, you may fashion a bracket and secure the fitting utilizing the molded lug. We've included stainless hardware should you choose to go this route.



Wall Penetration with
Grommet Installed



Top View of Union 90° Elbow
Installed Through Grommet

4.5.2 Snap Bushing Installation

This installation should be used when a tight turn is not required to route the line through the fuselage sidewall (from the wing root), i.e. the tubing minimum bend radius 1" can be complied with; or when routing tubing through structure. Drill a 3/8" hole and install snap bushing.



Snap Bushing Installed

4.6 Tubing Installation

Reference Section 4.2.1 Plastic Tubing Cutters. Cut tubing to length. Make square, clean cuts in tubing without crushing or distorting the material. Never use bypass cutters (scissors), dikes, side cutters, or serrated blades for cutting tubing. They deform the tubing and/or leave a jagged burr that will damage the o-ring when secured in the fitting.



Tubing Cut - Good



Tubing Cut - Bad

Push the cut tubing into the fitting until you feel it “bottom out”. It’s easy to recognize. To remove the tubing from a fitting: push in (towards the fitting) on the dark colored ring where the tubing enters the fitting while simultaneously pulling the tubing out. Once you get the hang of it, it is easily accomplished with one hand. The fittings included in the kit are made for quick connect/disconnect. If you are frequently disconnecting tubing from the fittings, a light silicon lubricant may be used on the outside of the tubing as a lubricant. This helps preserve the integrity of the O-ring. (Water is also a suitable lubricant.)

Caution: *OBSERVE the minimum bend radius of 1” for ¼” tubing*



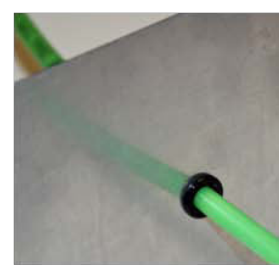
Front Side view of Union Tee Installed in Grommet



Front Side view of Union 90° Elbow Installed in Grommet



Backside View of Fitting installed in Grommet



Snap Bushing and Tube Installed

5 Additional Information

Get the most out of your investment! *SafeAir1* Air Kits have an operating temperature range of -40 degrees F to +200 degrees F. **DO NOT** allow MEK or Acetone to come in contact with any of the Pitot, Static or AoA system components.