

**REPORT NAME:**  
INSTALLATION INSTRUCTIONS



**REPORT NUMBER:** PFS-0046-00

1585 Aviation Center Parkway  
Hangar 804  
Daytona Beach, FL 32114

**KIT NUMBER:** PFS-13801, PFS-13803

**REVISION:** F  
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**PREPARED BY:** Tom Strohmayer

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REVISION CONTROL

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## 1.0 INTRODUCTION

### **NOTE:**

**If your cowling has been modified at all to be different than when it was originally built, please ensure our modification will be compatible before installation or flying.**

**Description:** The PFS exhaust consists of an exhaust pipe from each cylinder to the collector assembly located beneath the engine. The collector assembly is enclosed in a shroud, which captures ram air to be heated by exhaust gases passing through the tubes of the collector assembly. This heated air is used to heat the aircraft cabin. A separate compartment of the collector assembly furnishes heated air for carburetor heat. A detachable tailpipe from the collector assembly routes exhaust gases to a muffler through an opening in the lower cowling. A support rod attached to the lower right engine mount supports the muffler.

**Carbon Monoxide testing was performed with the muffler positioned as described in these instructions. Repositioning the muffler and/or support rod may cause carbon monoxide to enter the aircraft cabin.**

**Note:** PFS is the abbreviation for Power Flow Systems.

**Please Note:** The Power Flow Systems Exhaust has been designed and FAA certified to be installed in accordance with these instructions. Any modification to the exhaust system or its components, or any deviation from these instructions without express written permission from Power Flow Systems, Inc. invalidates the design and the FAA approval. Any such modifications or deviations will also void the exhaust system warranty.

***Please read these directions completely before starting installation.***  
**Please call us at 386-253-8833 during normal business hours if you have any questions regarding the installation of this kit.**



## 2.0 KIT CONTENTS

<b>Quantity</b>	<b>Part Description</b>	<b>AA5 Part Number</b>	<b>AA5B, AG5B Part Number</b>
1	#1 Header	11800	Same
1	#2 Header	12800	12800-O360
1	#3 Header	13800	Same
1	#4 Header	14800	14800-O360
1	Shrouded Collector Assembly	41860	Same
1	Carburetor Spacer	6700	Not Used
2	Baffle Stand-Off Clamps	Not Used	6020
1	Muffler Clamp (3 1/2" without pin)	8030	Same
1	Wide Exhaust Clamp (2" with pin)	7022	Same
2	Bolt	Not Used	AN3C4A
4	Flat Washer	Not Used	AN960C10
2	Lock Nut	Not Used	MS21045C3
4	No-blow Header Gasket	77611	Same
8	Exhaust Nut	SL-STD-1410	Same
8	Lock Washer	MS35333-41	Same
8	Plain Washer	AN960-516	Same
4	Studs	MS51864-202-12	Not Used
4	Light Washers	AN960-416L	Not Used
4	Lock Washers	MS35333-40	Not Used
4	Plain Nut	AN315-4R	Not Used
3'	Scat Tube	SCAT-8	Not Used
2	Air Box Gaskets	649974	Not Used

### Classic Tailpipes

1	Intermediate Tube	78100	Same
1	Exhaust Clamp (2" with pin)	7020	Same
1	Tailpipe	80080	Same
1	Support Rod	90860	Same
3	Drilled Bolt	AN4C5	Same
3	Castle Nut	AN310C4	Same
3	Cotter Pin	MS24665-153	Same
6	Flat Washer	AN960C416	Same

### Short Stack Tailpipes

1	Intermediate Tube	78104	Same
1	Tailpipe	80061	Same
1	Support Rod	90861	Same
1	Balljoint Flange	510	Same
2	Drilled Bolt	AN4C5	Same
2	Castle Nut	AN310C4	Same
5	Cotter Pin	MS24665-153	Same
4	Flat Washer	AN960C416	Same
1	#12 Adel Clamp	MS21919WH-12	Same
1	#6 Adel Clamp	MS21919WH-6	Same
2	Stainless Screw	MS51958-63	Same
5	Stainless Washers	AN960C10	Same
2	Locknut	MS21044C3	Same
3	Drilled Bolt	AN3C12	Same
3	Castle Nut	AN310C3	Same
3	Balljoint Springs	33703	Same
1	Aluminum Strap	201	Same

Equivalent hardware may be used throughout.



### **3.0 PREPARATION**

Verify that all contents listed on page 4 of this instruction set are included in your kit. Read all instructions before attempting installation, to become familiar with the procedure. If you have any questions regarding the installation, please call (386) 253-8833 *before* attempting installation.

- 3.1 - Remove stock exhaust system in accordance with the latest approved revision of the aircraft service manual.
- 3.2 - For AA5 (S/N 640 & Earlier) installations, remove the airbox from the carburetor in accordance with the latest approved revision of the Aircraft Service Manual.
- 3.3 - Cover the carburetor inlet to prevent debris from entering the carburetor.
- 3.3 - The carburetor heat outlet on the Power Flow Systems Exhaust is designed to accept 2 common sizes of SCAT hose. If your hose is SCAT-10 (2.5" diameter), cut off and de-burr the reducer portion of the carburetor heat outlet on the exhaust system heat shroud.
- 3.4 - If the oil drain is on the pilot side of the engine sump (O-360 Only), relocate it to the passenger side IAW the latest revision of the Engine Service Manual.
- 3.5 - Apply high-temp anti-seize to the header slip joints.

### **4.0 INSTALLATION OF PFS EXHAUST SYSTEM**

#### **4.1 - Installing Collector Box Assembly and Exhaust Pipes**

- 4.1.1 - Insert the exhaust header pipes into the collector assembly as per the numbering on the collector and headers. Be sure to use the alignment marks. A minimum of 1 1/2" penetration is required for proper operation. See Passenger and Pilot Side Views.
- 4.1.2 - Put new gaskets into position on each cylinder. It is suggested that you keep them in place temporarily with either a loop of safety wire or a large cotter pin. Lift and hold the assembly into position. Start a nut on each header to hold the entire assembly in place. See Detail "A", Passenger and Pilot Side.
- 4.1.3 - Install a washer, a lock washer and a nut on each stud (there are 8 sets of these). If utilized, remove the loops of safety wire or cotter pins.
- 4.1.4 - Be sure the collector assembly is not in contact with the engine sump. If necessary, pull down on the 4-1 collector to rotate the assembly away from the sump. Torque I.A.W. the latest revision of the aircraft or engine service manual. See Detail "A" and Pilot Side View.
- 4.1.5 - If the air inlet tube is too close to the alternator on AA5 aircraft, it may be trimmed provided there is sufficient length to clamp the SCAT tube.
- 4.1.6 - Attach the front baffling to the #1 and #2 headers using clamps PN 6020 (AA5B and AG5B Only). See Detail "F".
- 4.1.7 - If installing EGT probes, install them in accordance with their manufacturer's recommendations. (Typically 2 – 4 inches from the exhaust port). All four probes should be equidistant from their respective ports.

## **4.2 - Installing Carburetor Spacer (Grumman AA5 S/N 640 & Earlier Only):**

- 4.2.1 - Install the supplied studs using care not to set the studs too deep, as this may crack the carburetor housing.
- 4.2.2 - Install one of the new gaskets (supplied) over the studs. Set the throttle/mixture cable bracket over the two passenger side studs.  
Place spacer (P/N 6700) under the bracket, making sure the recessed portion of the spacer is on top and lines up with the throttle/mixture cable bracket. Make sure that the bracket seats into the recessed portion of the spacer and that the top surfaces of both are flush with each other to ensure a good airtight seal.
- 4.2.3 - Place the second gasket (supplied) on the studs under the spacer. Install the airbox over the studs and install washers, lock washers, and nuts.
- 4.2.4 - Torque all four nuts in accordance with service manual recommendations. Be sure the airbox doesn't contact the exhaust collector assembly. The collector assembly can be rotated up or down slightly by moving the 4-1 collector.
- 4.2.5 - Reconnect control cables and carb heat scat tubing (use supplied Scat tube).

## **4.3 - Classic Tailpipe: Installing Support Rod P/N 90860 (Skip to Section 4.5 for Short Stack Installation)**

- 4.3.1 - Loosen and remove the lower right engine Lord mount bolt. Install the support rod adapter (the teardrop shaped piece of metal welded to the support rod) under the bolt head, on top of the existing large area washer (the washer may be omitted if the bolt is too short). See Detail "D". Ensure that the rod clears all engine compartment parts, and will exit the cowl well forward of the firewall, outboard of the Lord mount. Also make sure that the pointed end of the support rod will clear the bottom of the aircraft cowl.
- 4.3.2 - Slide the intermediate tube PN: 78100 onto the end of the 4-to-1 collector. DO NOT drill for clamp installation, yet.
- 4.3.3 - Slide the muffler assembly PN: 80080 onto the end of the intermediate tube PN: 78100. DO NOT drill for clamp installation, yet.
- 4.3.4 - Temporarily attach the muffler assembly to the support rod with the large diameter clamp, PN 8030.
- 4.3.5 - Be sure that the intermediate tube (PN 78100) does not come in contact with the carb heat outlet on the collector assembly. Move the muffler down until there is sufficient clearance to attach a SCAT tube over the carb heat outlet.
- 4.3.6 - For flat bottom cowls (AA5B and AG5B models), position the included template onto the lower right cowl scoop as per the instructions on the template. This template is to be used as a general guide only, variations in cowlings may result in the provided template being inaccurate. It is strongly recommended that measurements be taken from a fixed point on the firewall to supplement the provided template. We also recommend starting with a 0.75" hole to test fit before creating the final 1.5" hole. Approximate dimensions have been provided for AA5 aircraft with O-320 engines.
- 4.3.7 - Remove the tailpipe from the support rod and intermediate tube and position the lower cowl onto the airplane. Attach the cowl with enough screws to ensure the proper angle of the cowl. The support rod should pass cleanly through the hole drilled through the cowl, and the intermediate tube should pass through the middle of the stock exhaust outlet.

- 4.3.8 - Slide the muffler assembly, P/N 80080, over the intermediate tube outlet. It should be pushed up as far it can go, oriented straight back. The support rod should be contacting the muffler. You may have to make minor adjustments in alignment and rotation of both the muffler assembly and the intermediate tube assembly. Again, be sure that the intermediate tube does not contact the carb heat outlet and provides proper clearance for the SCAT tube installation. If necessary, the support rod can be pulled forward slightly. A slight elongation of the cutout may be necessary, but it will move the muffler down and the extension away from the carb heat outlet.

*Any deviation in muffler and/or support rod alignment may cause carbon monoxide to enter the aircraft cabin. The muffler must be pointed down from the aircraft—not parallel to the fuselage—in order to ensure that no exhaust gases enter the aircraft cabin.*

- 4.3.9 - Position the large support clamp, P/N 8030, around the muffler and temporarily attach the clamp to the support rod.
- 4.3.10 - Turn the nose gear fully to the left and ensure that the muffler assembly does NOT strike the pant. If needed, rotate the muffler outward. The support rod can be carefully bent to assist in assuring that the support rod and muffler clamp stay in alignment. If the end tab does not align flat against the clamp, twist the tab with pliers until it lays flat.

#### **4.4 - Classic Tailpipe: Installing Intermediate Tube and Muffler**

- 4.4.1 - Mark the intermediate tube through the hole in the tailpipe. Mark the 4-to-1 through the hole in the intermediate tube.
- 4.4.2 - Remove the tailpipe.
- 4.4.3 - Remove the lower cowl.
- 4.4.4 - Drill 0.25” holes at the marks made in step 1 above. Be sure to de-burr the holes or later removal of muffler components will be difficult.
- 4.4.5 - Clamp the intermediate tube to the 4-1 outlet with the wide clamp. See Detail “B”. Further reaming may be required if the pin does not insert into the hole with moderate hand pressure.
- 4.4.6 - Re-install the lower cowl. Install the tailpipe and clamp to the intermediate tube with the narrow 2” clamp (the shiny one). See Detail “B”. Further reaming may be required if the pin does not insert into the hole with moderate hand pressure.
- 4.4.7 - Clamp the tailpipe to the support rod with the provided 3.5” clamp. See Detail “C”.
- 4.4.8 - Now that all of the support mechanism for the muffler is correct, tighten the engine mount to manufacturer’s specified torque. *Be sure that the support rod doesn’t rotate when tightening.* To dampen lateral motion and protect the cowling from wear, we recommend creating a grommet out of 3/8” fuel hose or similar material to insert in the hole cut in the cowling. Another option is to attach a length of rubber hose around the support rod itself where it passes through the cowl.

#### **4.5 - Short Stack Tailpipe: Installing Support Rod P/N 90861** **(Skip This Section for Classic Tailpipe Installation)**

- 4.5.1 - Loosen and remove the lower right engine Lord mount bolt. Install the teardrop-shaped end of the support rod under the bolt head, on top of the existing large area washer (omit the washer if the bolt is too short). See Detail "D". Ensure that the rod clears all engine compartment parts. The pointed end of the support rod should point directly at the center of the passenger side cowl scoop.
- 4.5.2 - Slide the intermediate tube P/N 78104 over the 4-1 outlet. DO NOT drill for clamp installation, yet.
- 4.5.3 - Temporarily assemble the balljoint that attaches the tailpipe, P/N 80061 to the intermediate tube. See Detail "G". The tailpipe should be pointed straight back, and pass approximately 4-6 inches forward of the firewall.
- 4.5.4 - Rotate the support rod until the pointed end is centered over the tailpipe. Tighten the lord mount bolt, but do not torque to value yet.
- 4.5.5 - Install the #6 Adel clamp on the support rod, approximately in the middle of the rod.
- 4.5.6 - Install the #12 Adel clamp on the tubular engine mount member that passes outboard of the support rod.
- 4.5.7 - Use the included aluminum strap (P/N 201) to join the two Adel clamps. The strap should be located as to center the support rod end tab over the tailpipe.
- 4.5.8 - Tighten the Adel Clamps and torque the engine mount bolt to the manufacturer's recommended torque, making sure the support rod doesn't rotate while tightening. Make sure that you have at least one to two threads showing through the nut on the engine mount. It may be necessary to install a longer bolt or remove the original large area washer.

#### **4.6 - Short Stack Tailpipe: Installing Intermediate Tube and Tailpipe** **(Skip This Section for Classic Tailpipe Installation)**

- 4.6.1 - Take two or three measurements to reference the tailpipe location with respect to a fixed point on the airframe.
- 4.6.2 - Using the measurements taken in the previous step and the included template as a guide, cut an opening in the passenger side cowl scoop for the tailpipe to exit.
- 4.6.3 - Trim and fit as many times as necessary to obtain ½" to 1" clearance around the perimeter of the tailpipe. When fitting the cowling, be sure to install enough fasteners to ensure the correct cowling position. The cowl may be additionally modified in accordance with Detail "H" to simplify cowling removal and installation.
- 4.6.4 - Once the cutout is finished, make a mark on the 4-1 outlet and intermediate tube joint to indicate alignment. Ensure that the intermediate tube is pushed fully onto the 4-1 outlet.
- 4.6.5 - Remove the cowling and install the pinned clamp P/N 7022 by drilling a ¼" hole the flared end of the intermediate tube (approximately 1 inch from the end of the flare, through the flare and the 4-1 outlet). If the pin requires more than moderate hand pressure to insert, the hole may need further reaming. See Detail "B".
- 4.6.6 - Perform final assembly of the balljoint and clamps. See Details "B", "C", and "G". Do not over-tighten the balljoint, as it may deform the surfaces and cause damage that could result in an exhaust leak.
- 4.6.7 - Patch the hole the original exhaust system used to exit the cowling in accordance with the latest approved revision of AC43.13 or aircraft manufacturer recommendations.

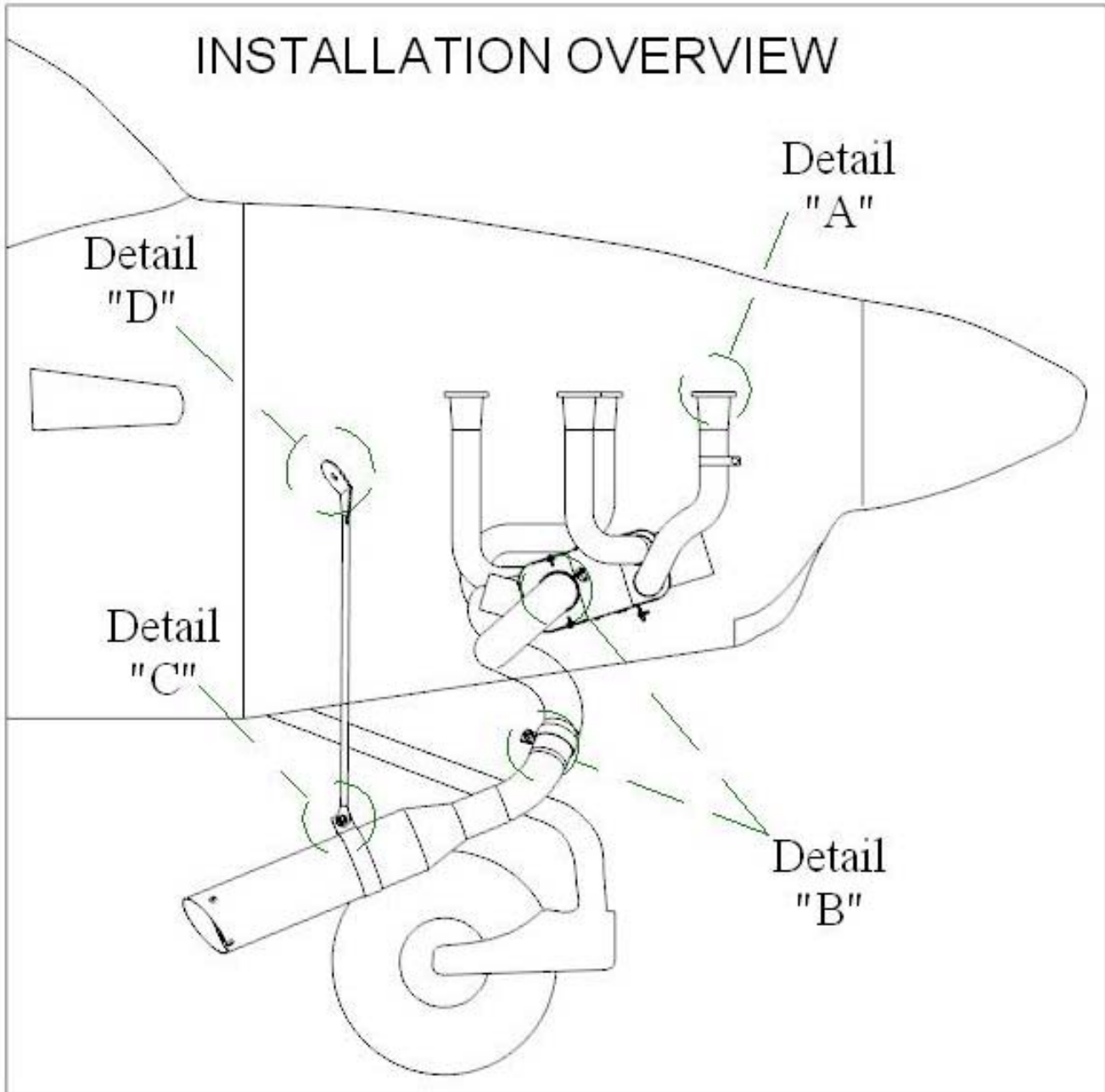




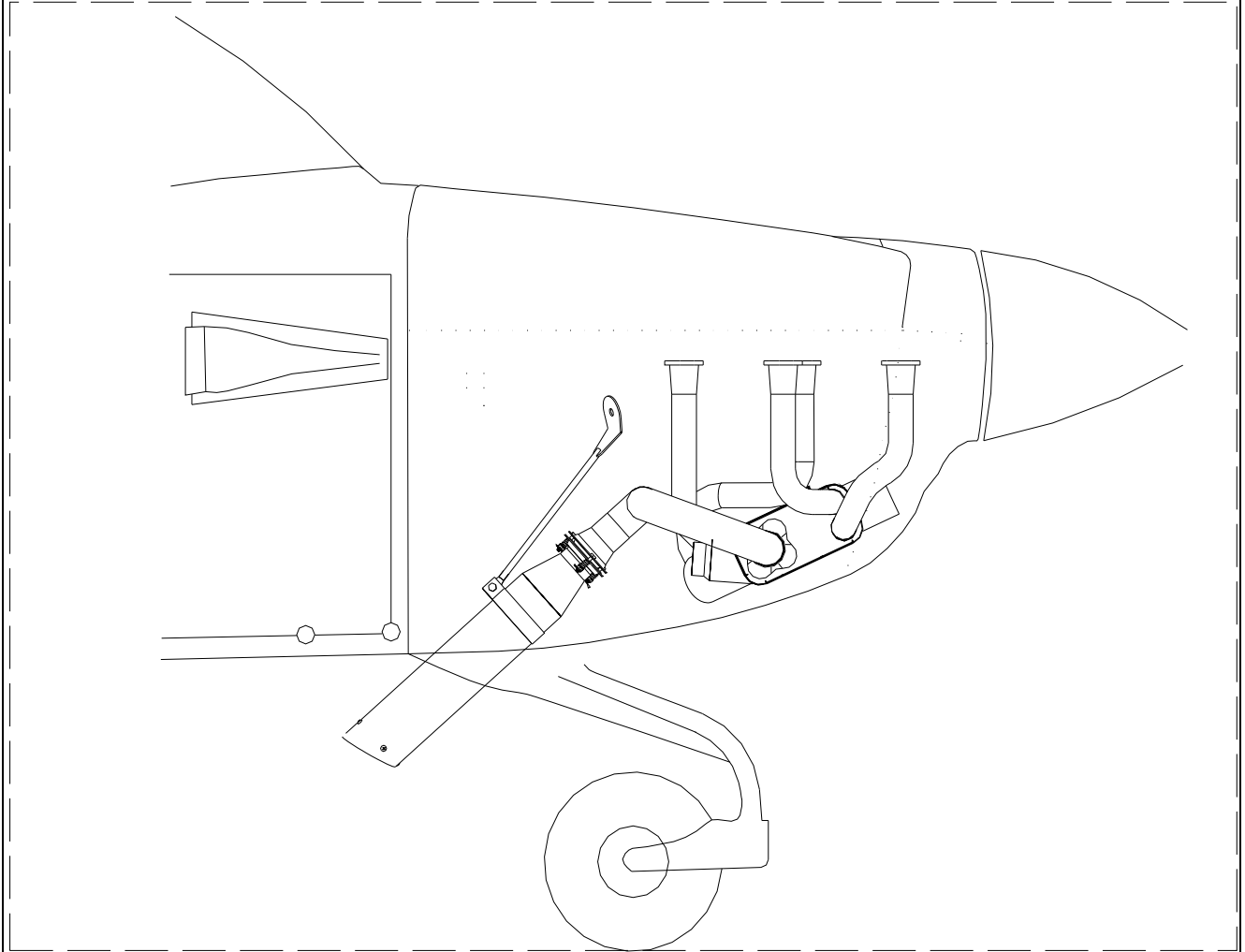
## **5.0 INSPECTION AND PAPERWORK**

- 5.1 - Any deviation in muffler and/or support rod alignment may cause carbon monoxide to enter the aircraft cabin. The muffler must be pointed down and away from the aircraft—not parallel to the fuselage—in order to ensure that no exhaust gases enter the aircraft cabin.
- 5.2 - Be sure that the final installation allows a minimum of 2” clearance between exhaust system components and fuel and oil lines.
- 5.3 - After performing run-up, inspect the tailpipe and cowling for rubbing or chafing. Any holes cut in the cowling may need to be enlarged based on the amount of motion caused by engine start and shutdown. The motion of the tailpipe will be greatest during engine start and shutdown.
- 5.4 - Create a placard (supplied with new systems) and install in clear view of the pilot that reads: “The Power Flow Systems, Inc. tuned exhaust system may cause the aircraft to burn more fuel at high power settings when running a rich mixture. It is the Pilot’s responsibility to determine what, if any, change in fuel flow exists and to plan accordingly.”
- 5.5 - Make appropriate entries in the logbook and on FAA Form 337. The STC is located at the back of this instruction set for easy removal.
- 5.6 - Typical Weight and Balance Information: 21.25 lbs at station 25.5 -- It is recommended that the installer weigh both the stock and Power Flow systems for an exact differential.
- 5.7 - Please see accompanying report, PFS-0049-00, for Instructions for Continued Airworthiness.

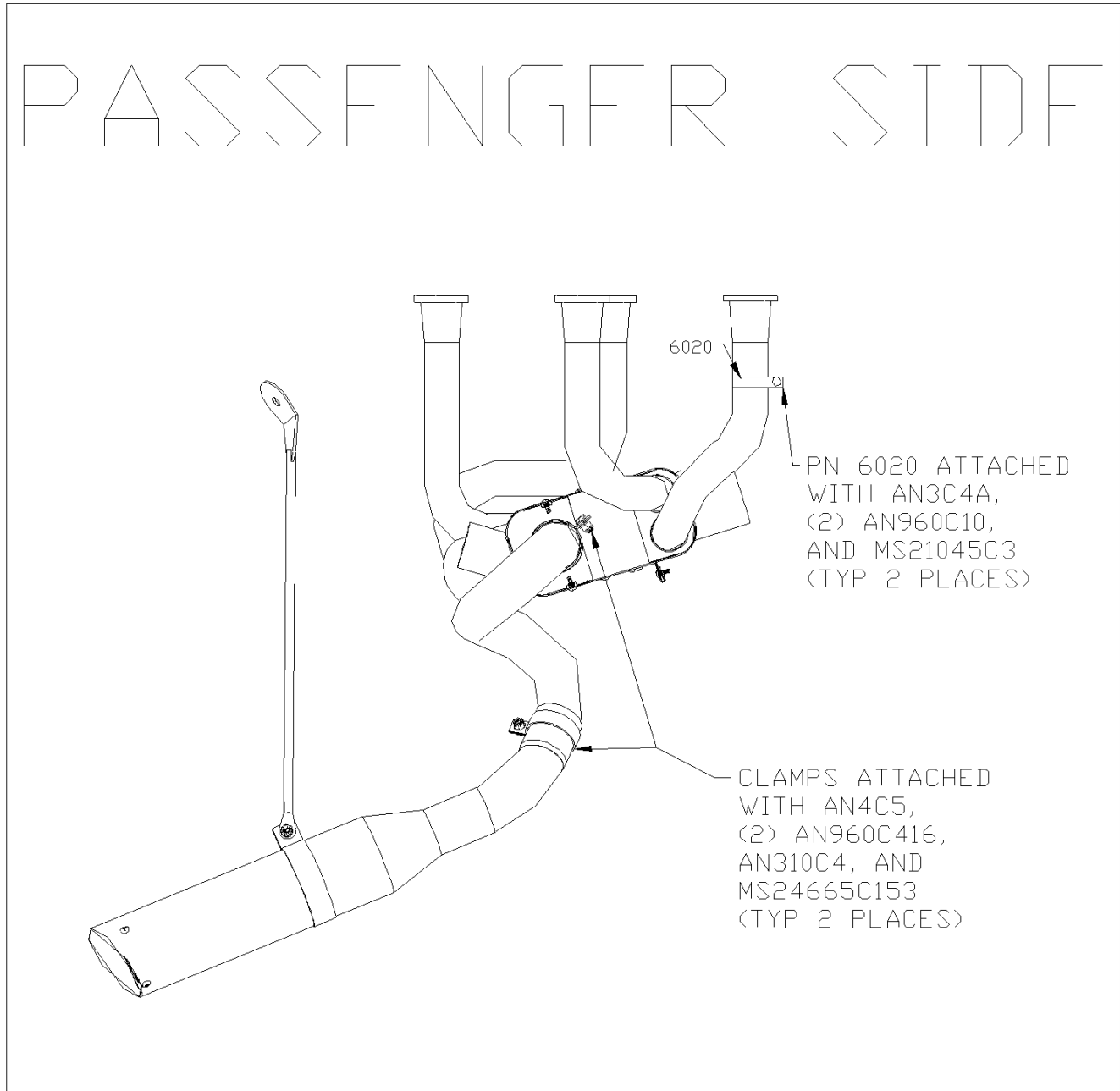
## INSTALLATION OVERVIEW: CLASSIC TAILPIPE



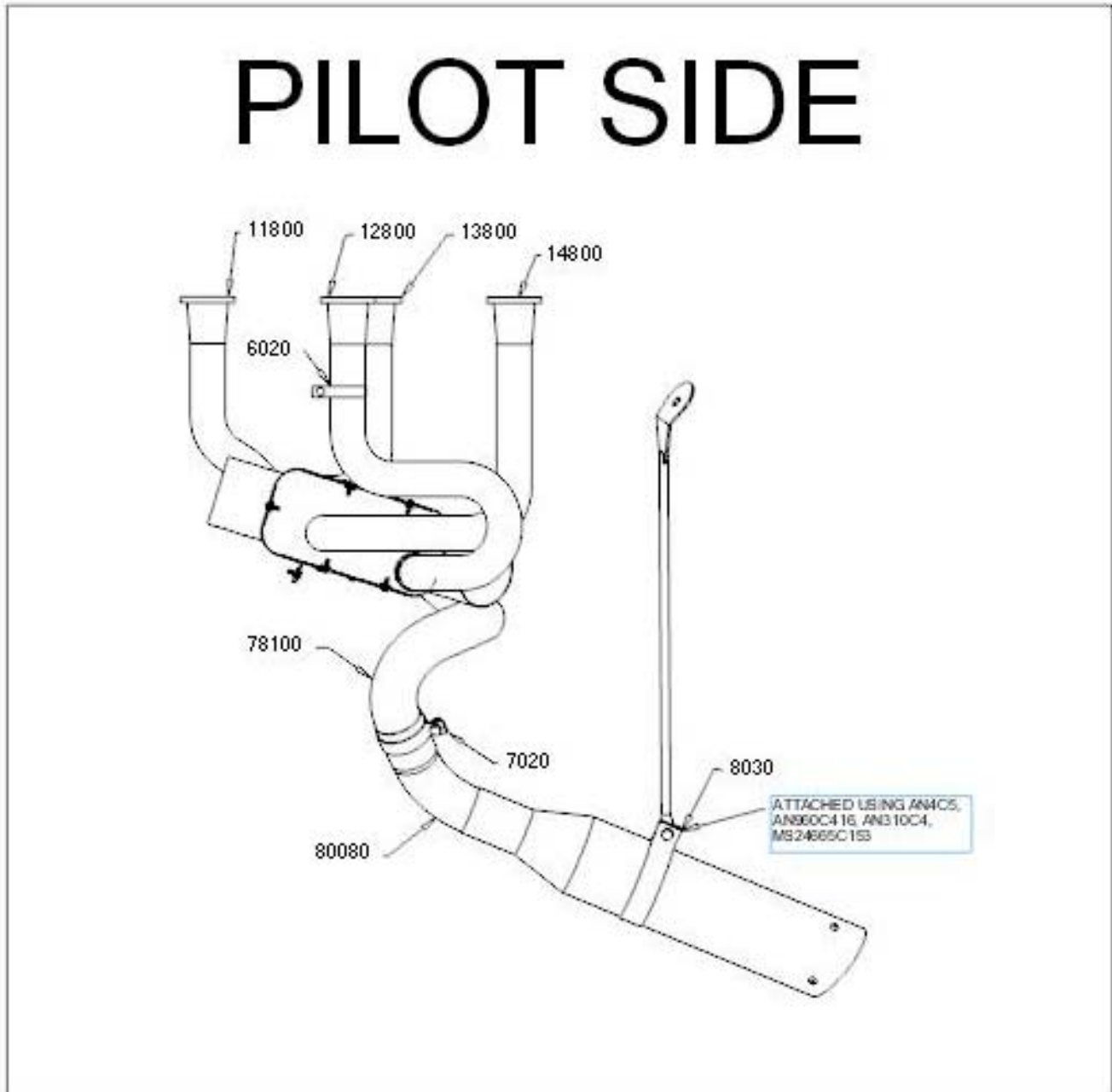
## **INSTALLATION OVERVIEW: SHORT STACK TAILPIPE**



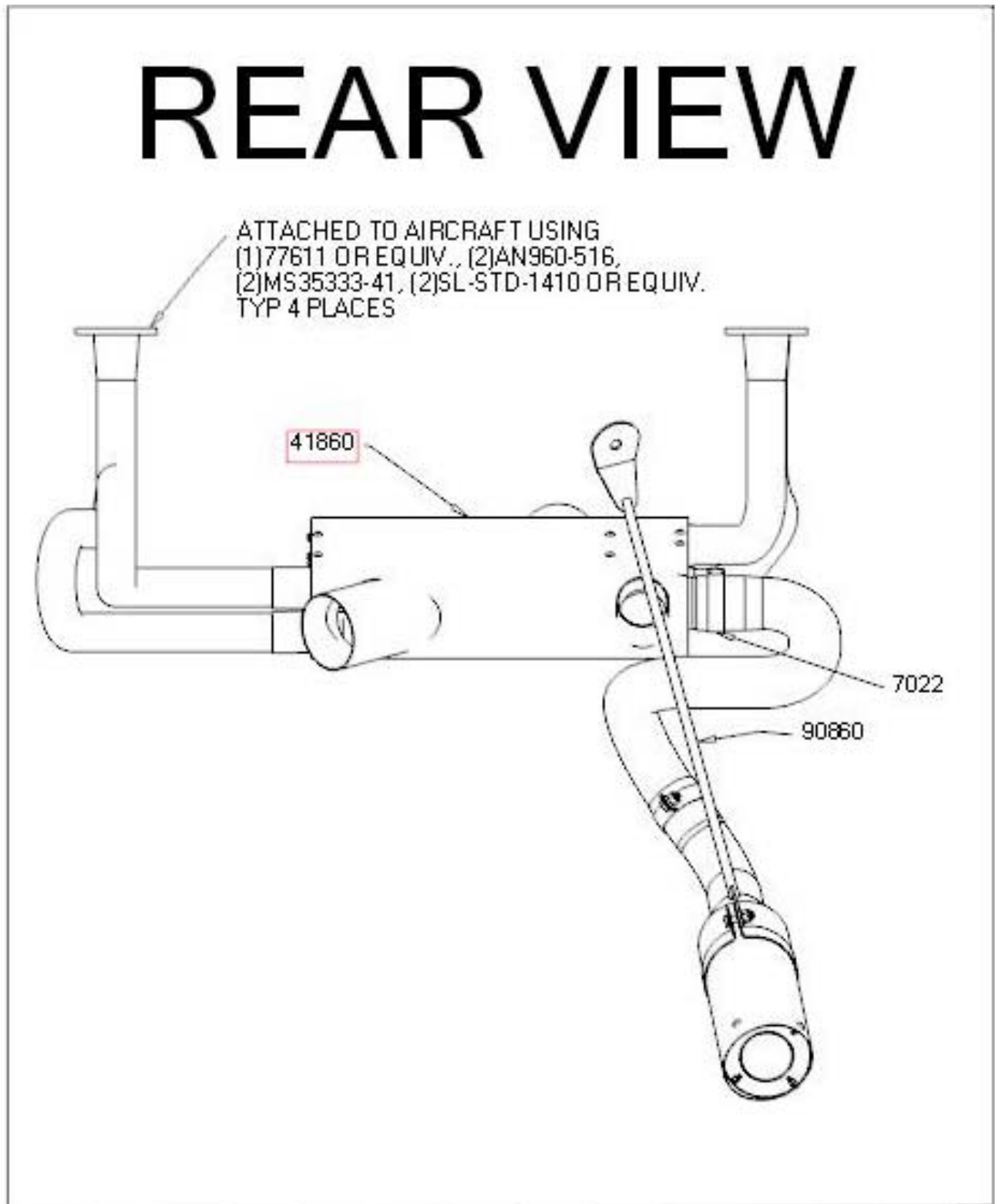
**PASSENGER SIDE VIEW: CLASSIC TAILPIPE**



**PILOT SIDE VIEW: CLASSIC TAILPIPE**



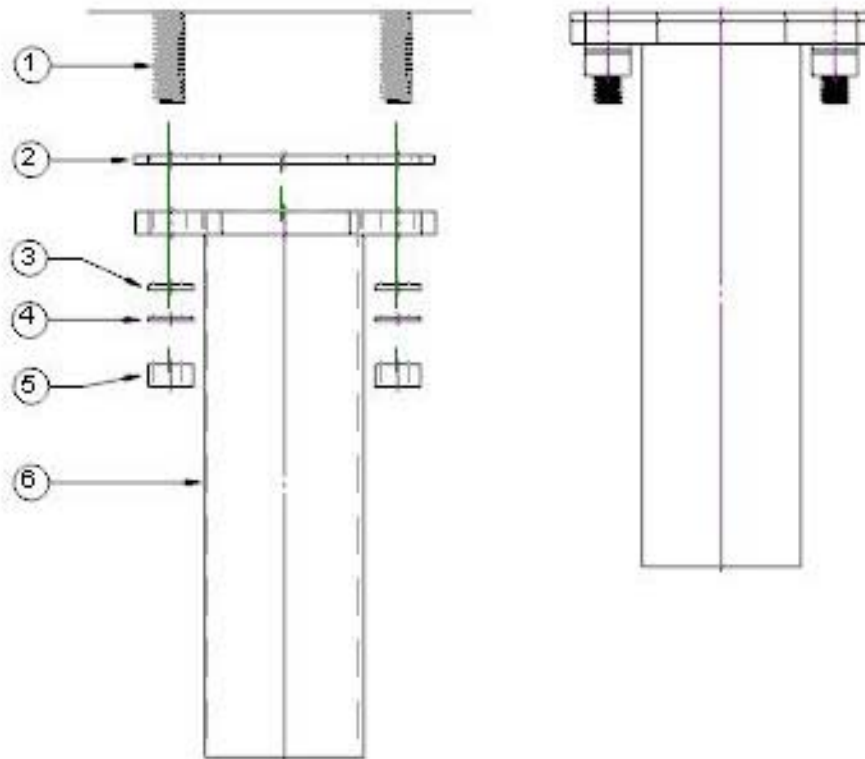
**REAR VIEW: CLASSIC TAILPIPE**



**DETAIL "A"**

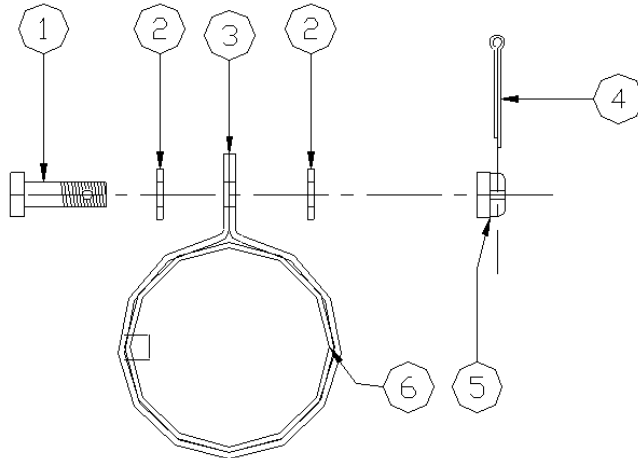
# DETAIL A

- |                    |                 |
|--------------------|-----------------|
| 1 - EXHAUST STUD   | LYCOMING ENGINE |
| 2 - NO-BLOW GASKET | 77611           |
| 3 - FLAT WASHER    | AN960-516       |
| 4 - LOCK WASHER    | MS35333-41      |
| 5 - NUT            | SL-STD-1410     |
| 6 - HEADER         | VARIOUS         |



**DETAIL "B"**

# Detail "B"



- |   |                  |                 |
|---|------------------|-----------------|
| 1 | Drilled Bolt     | AN4C5           |
| 2 | Flat Washer      | AN960C416       |
| 3 | Exhaust Clamp    | 7020 OR 7022    |
| 4 | Cotter Pin       | MS24665-153     |
| 5 | Castle Nut       | AN310C4         |
| 6 | Muffler Assembly | Varies with Kit |

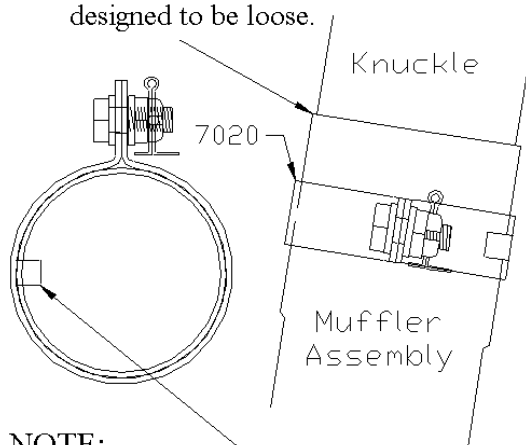
**NOTE:**

**The muffler and clamp are designed to be a loose fit.**

With the large clamp free from the support rod, the lower end of the muffler assembly should be able to 'wobble' 1/2" to 1 1/2" from side to side.

**CAUTION**

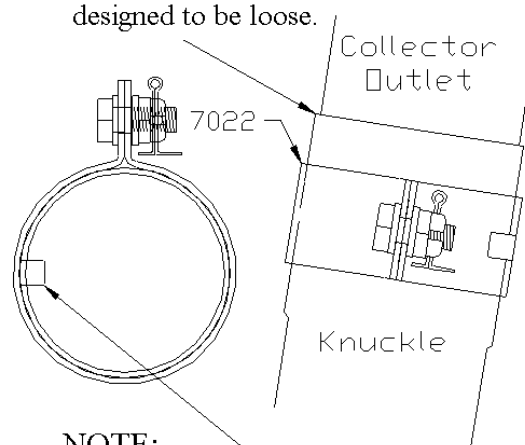
The connection is designed to be loose.



**NOTE:**  
 The pin should **NOT** be a tight fit.

**CAUTION**

The connection is designed to be loose.



**NOTE:**  
 The pin should **NOT** be a tight fit.

Revision D  
 June 17, 2003

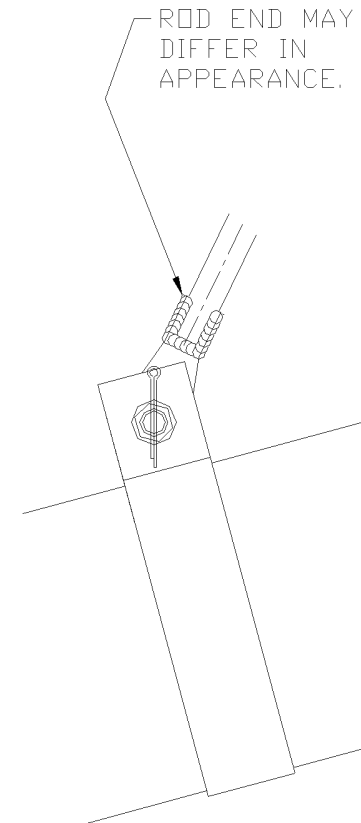
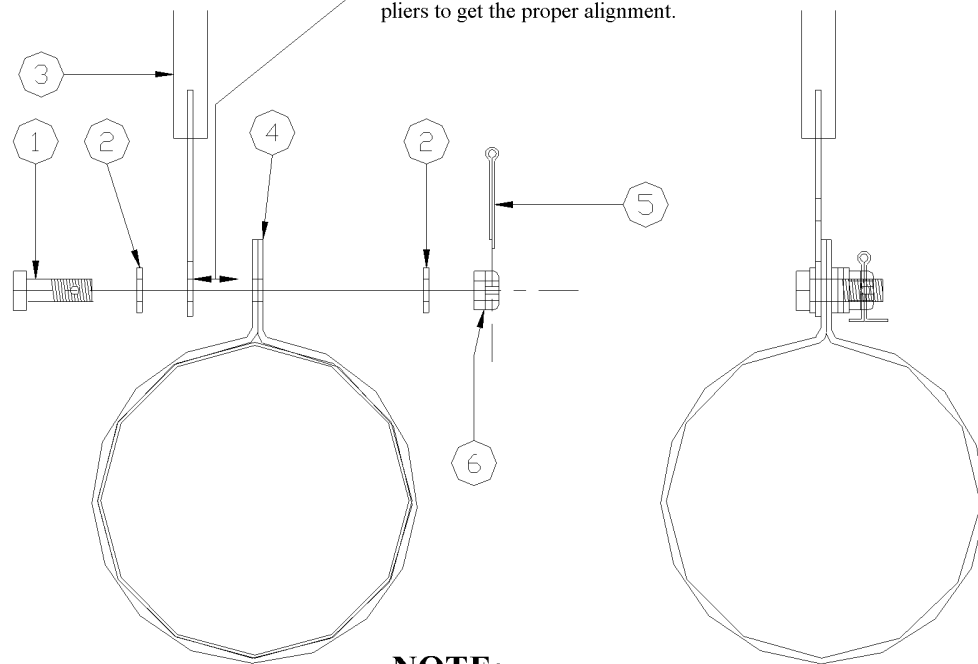


**DETAIL "C"**

- 1 Drilled Bolt AN4C5
- 2 Flat Washer AN960C416
- 3 Support Rod Varies with Kit
- 4 Muffler Clamp 8030
- 5 Cotter Pin MS24665-153
- 6 Castle Nut AN310C4

# Detail "C"

**NOTE:**  
 The tab should sit flat against the side of the clamp. If necessary, twist the end tab with pliers to get the proper alignment.

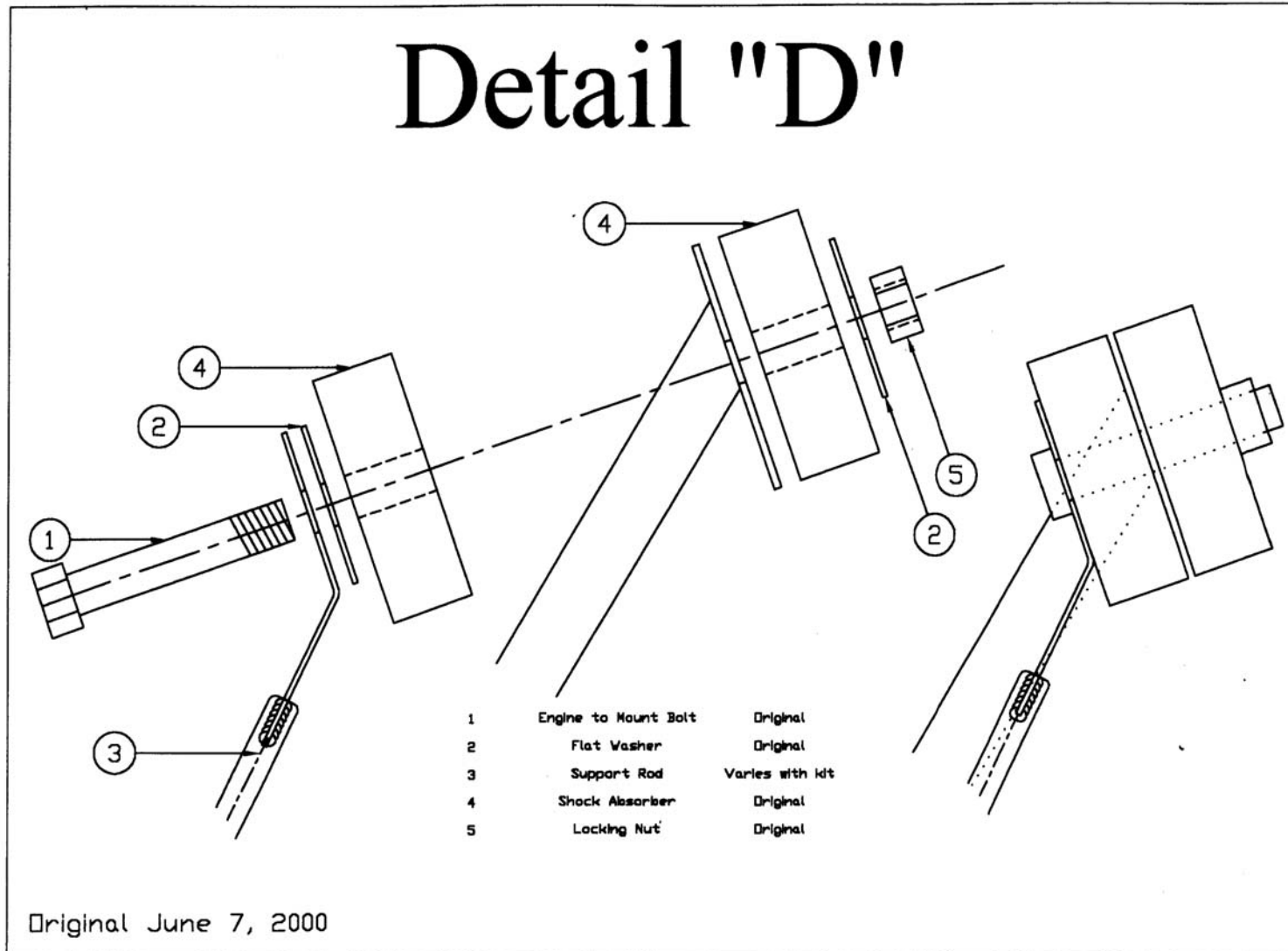


**NOTE:**  
**The muffler is designed to be a loose fit to the 4 to 1 outlet.**

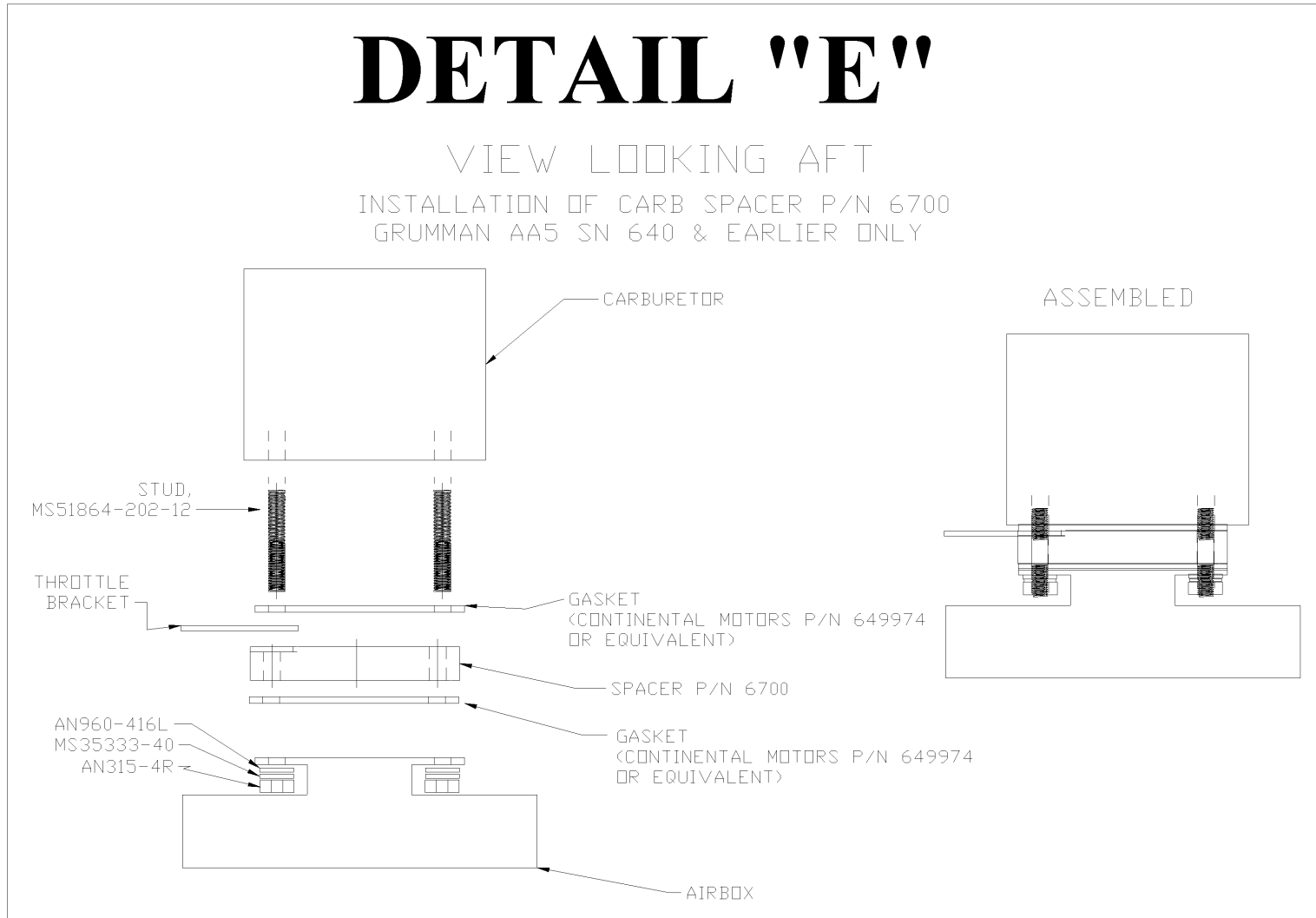
With this clamp free from the support rod, the lower end of the muffler assembly should be able to 'wobble' at least 1/2" to 1 1/2" from side to side.

Revision D  
 JUNE 10, 2003

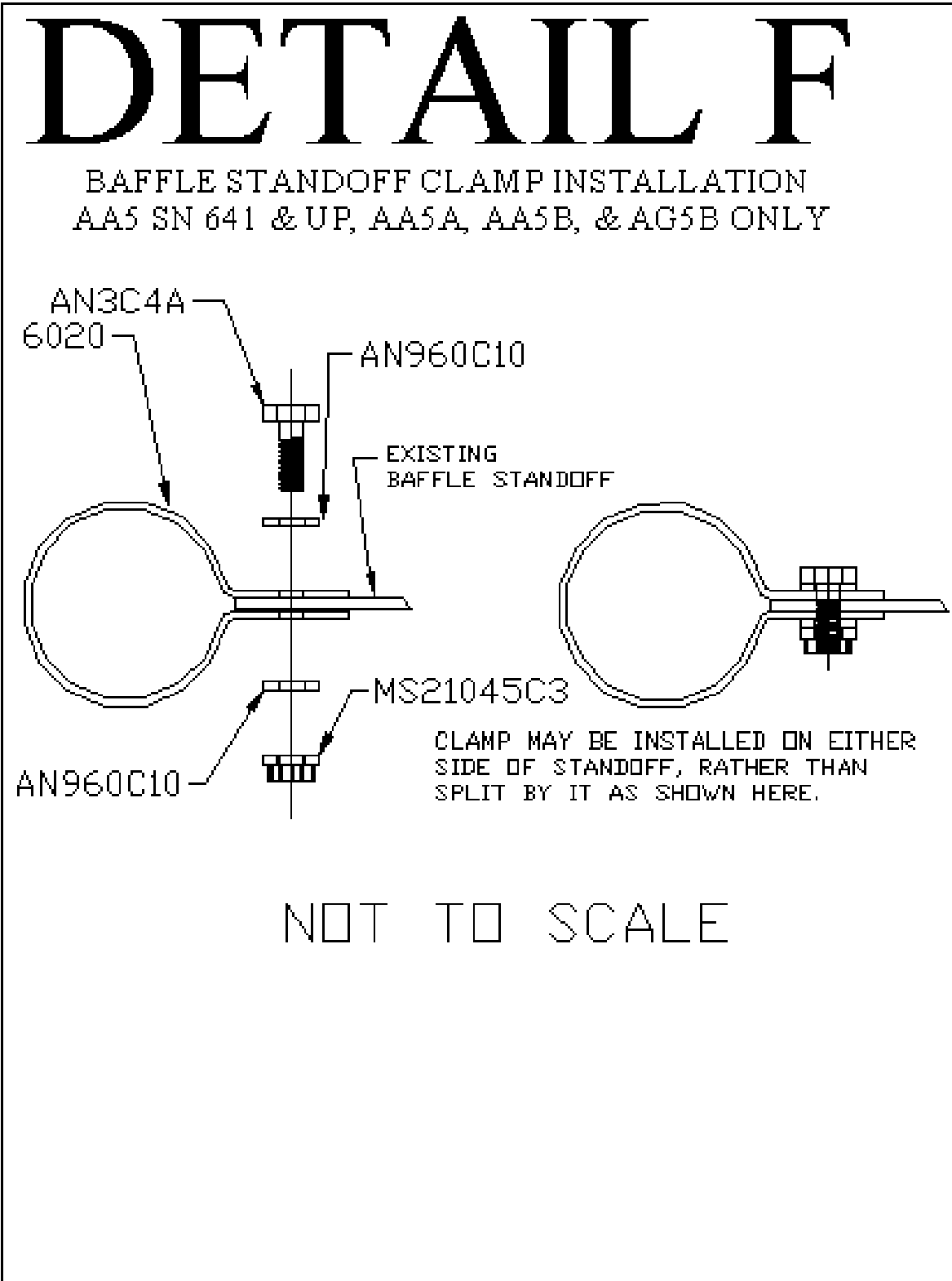
**DETAIL "D"**



## DETAIL "E"



**DETAIL "F"**

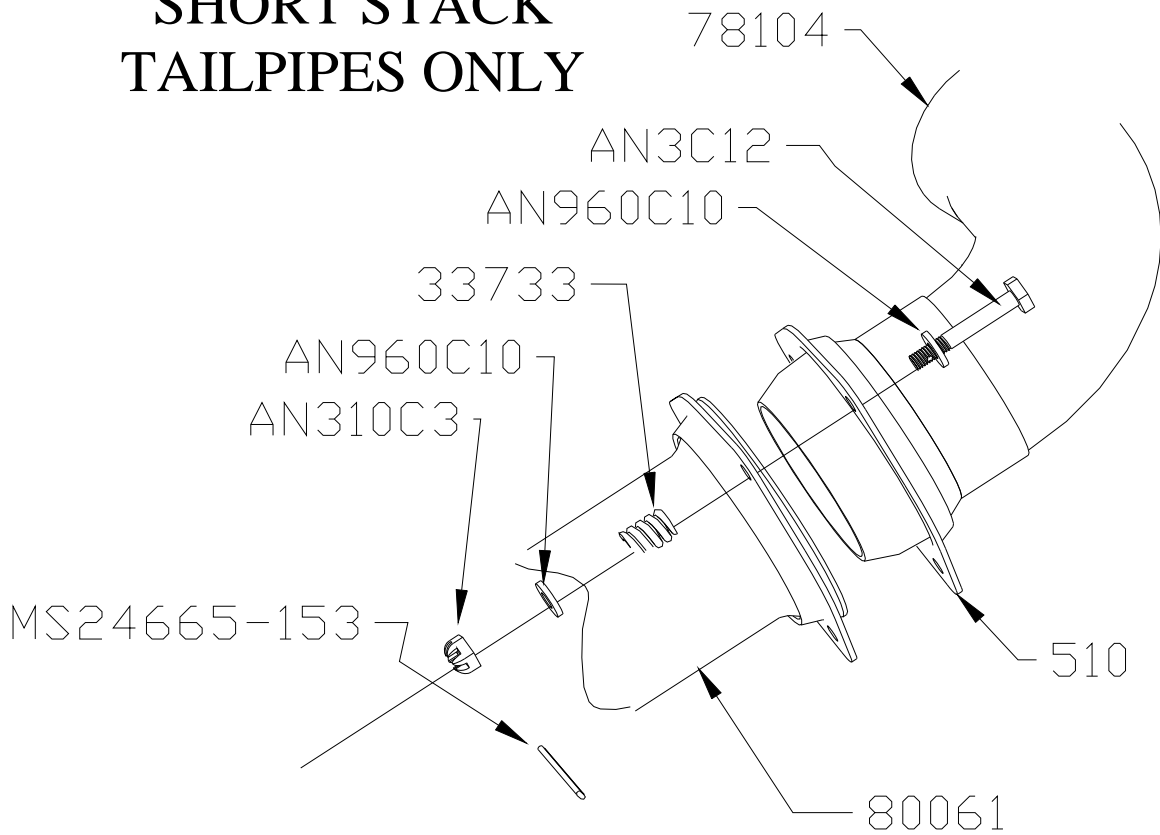


**DETAIL "G"**

# DETAIL G

BALLJOINT DETAIL

## SHORT STACK TAILPIPES ONLY



Assembled Spring Height: 0.430 to 0.475". Add or subtract washers as necessary.

HARDWARE TYP×3  
(EQUIVALENT HARDWARE MAY BE USED)

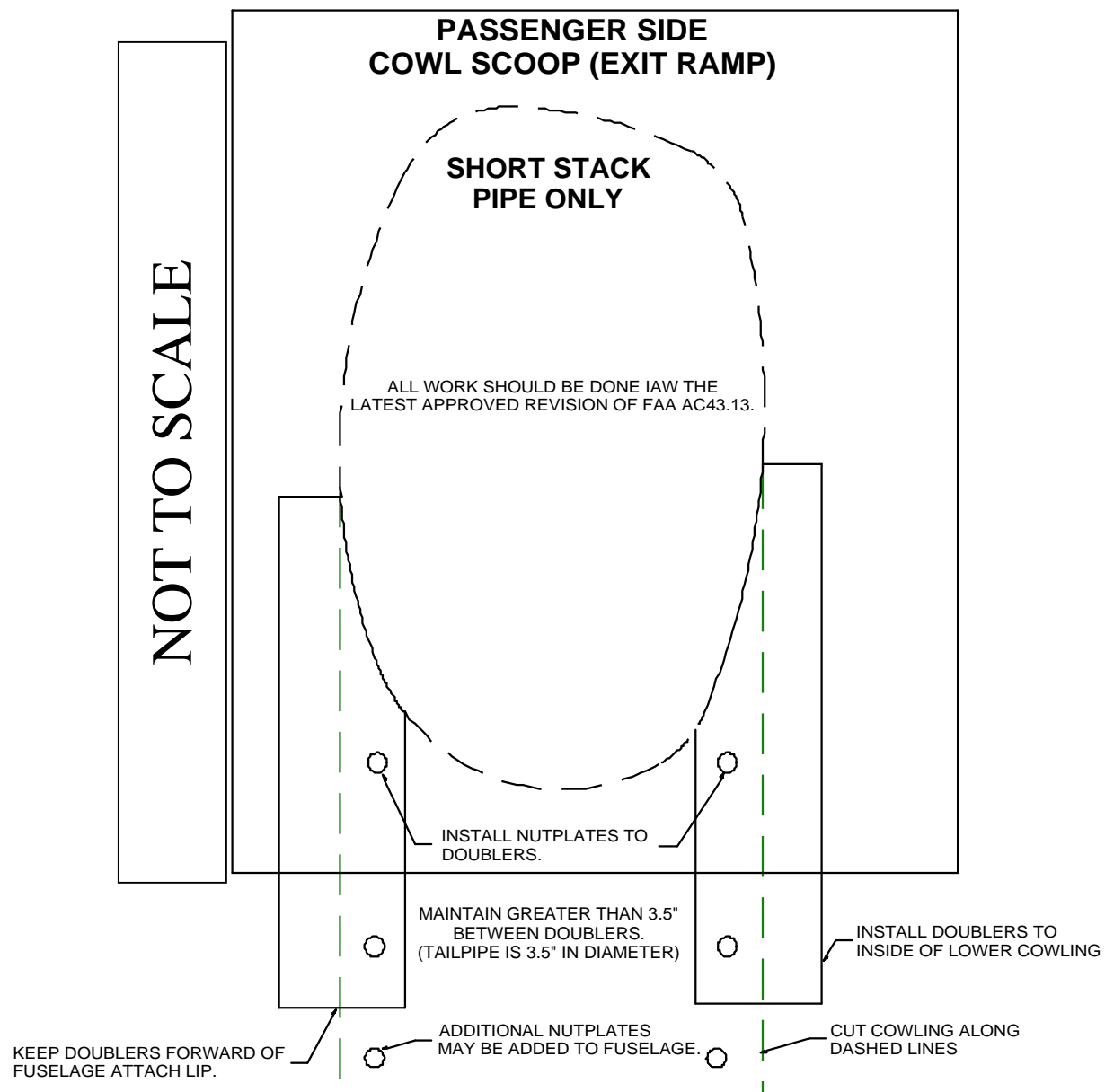
## DETAIL ‘H’

### OPTIONAL COWL SLOT

This additional modification may be performed to the lower cowl to facilitate cowl removal and installation. This modification can only be performed on AA5B and AG5B aircraft. Power Flow Systems, Inc. does not supply the parts required for this modification.

Cut the lower cowl from the widest points of the cut made earlier straight back to the aft edge of the lower cowl. This will create a “slot” that the tailpipe can slide through when installing and removing the cowl.

Rivet doublers into position on either side of this slot as shown. Note: Rivets should be squeezed, not bucked into composite cowlings, as bucking may crack the composite. Install nutplates into the doublers to reattach the cutout. The aft edge of the cutout should contain at least one hole for attaching to the fuselage. If this hole does not already exist, one should be drilled and a corresponding nutplate installed on the fuselage. All new hardware must be the same type and size as the existing cowl hardware. All work must be done in accordance with the latest FAA Approved Revision of AC43.13.



# PHOTOCOPY OF STC

United States of America

Department of Transportation -- Federal Aviation Administration

## Supplemental Type Certificate

*Number* SA02448AT

*This certificate issued to*

Power Flow Systems, Inc.  
1585 Aviation Center parkway  
Hangar 804  
Daytona Beach, FL 32114

This STC is not valid without a letter of authorization for a specific aircraft registration number from Power Flow Systems, Inc.

*certifies that the change in the type design for the following product with the limitations and conditions therefor as specified herein meets the airworthiness requirements of Part 23 of the Federal Aviation Regulations.*

*Original Product - Type Certificate Number:* A16EA

*Make:* American General

*Model:* AA-5 ; AA-5A ; AA-5B ; AG5B

*Description of Type Design Change:*

Replace the exhaust system with a tuned exhaust system per Power Flow Systems Inc., Master Drawing Lists, Report No. PFS-0048-00, Rev. IR, dated 06/22/01, or later FAA approved revisions, and Installation Instructions, Report No. PFS-0046-00 or PFS-0047-00, as applicable, Rev. IR dated 06/22/01 or later FAA approved revisions.

*Limitations and Conditions:*

An Airplane Flight Manual Supplement (AFMS) is not part of this STC. "This approval should not be extended to other aircraft of this model on which other previously approved modifications are incorporated, unless it is determine by the installer that the interrelationship between this change and any other previously approved modifications will produce no adverse effect upon the airworthiness of that airplane. If the holder agrees to permit another person to use this certificate to alter the product, the holder shall give the other person written evidence of that permission."

*This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.*

*Date of application:* June 22, 2001

*Date reissued:*

*Date of issuance:* January 08, 2002

*Date amended:*



*By direction of the Administrator*

*Melvin D. Taylor*  
(Signature)

for Melvin D. Taylor  
Manager  
Atlanta Aircraft Certification Office

(Title)

Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.