REPORT NAME:
INSTALLATION INSTRUCTIONS

REPORT NUMBER: PFS-0047-00

KIT NUMBER: PFS-13802

REVISION: F

REPORT DATE: 05/04/2009

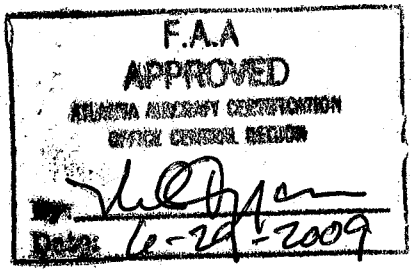
STC NUMBER: SA02448AT

AIRCRAFT APPLICABILITY: Grumman AA5, AA5A

PREPARED BY: Tom Strohmayer

DISTRIBUTION: FAA ATL ACO, END USER

POWERFLOW SYSTEMS, INC
1585 Aviation Center Parkway
Hangar 804
Daytona Beach, FL 32114



REVISION CONTROL

REVISION	DATE	REMOVE PAGES	INSERT PAGES
IR	06/22/01	N/A	N/A
A	05/20/02	ALL	ALL
B	08/13/02	3,4,6-8	3,4,6-8
C	06/17/03	4,6-12,14,15	4,6-12,14,15
D	03/02/05	1-8	1-9,11,21
E	04/16/09	ALL	ALL
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PFS-13802

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

Quantity	*Part Description*	*Part Number*
1	#1 Header	11800
1	#2 Header	12800
1	#3 Header	13800
1	#4 Header	14800
1	Shrouded Collector Assembly	41860
1	Airbox Assembly	60802
1	Wide Exhaust Clamp (2” with pin)	7022
1	Muffler Clamp (3 1/2” without pin)	8030
2	Baffle Stand-Off Clamps	6020
4	No-blow Header Gasket	77611
8	Exhaust Nut	SL-STD-1410
8	Lock Washer	MS35333-41
8	Plain Washer	AN960-516
6	Floating Nutplates	MS21059-L3K
12	Countersunk Rivets	MS20426AD3-3
A/R	3/16” Self-Adhesive Rubber Seal	60802-9
A/R	3/8” Self-Adhesive Rubber Seal	60802-10
1	Air Filter	BA347E
28”	SCAT Tube	SCAT-8
2	Bolt	AN3C4A
4	Flat Washer	AN960C10
2	Lock Nut	MS21045C3
2	Bolt	AN4C5A
2	Lock Nut	MS21045C4
4	Flat Washer	AN960C416

External Tailpipes

1	Intermediate Tube	78101
1	Exhaust Clamp (2” with pin)	7020
1	Tailpipe	80080
1	Support Rod	90860
1	Bolt	AN4C5A
1	Lock Nut	MS21045C4
2	Flat Washer	AN960C416

Internal Tailpipes

1	Intermediate Tube	78104
1	Tailpipe	80061
1	Support Rod	90861
1	Balljoint Flange	510
3	Cotter Pin	MS24665-153
1	#12 Adel Clamp	MS21919WH12
1	#6 Adel Clamp	MS21919WH6
2	Stainless Screw	MS51958-63
5	Flat Washer	AN960C10
2	Locknut	MS21044C3
3	Drilled Bolt	AN3C12
3	Balljoint Springs	33703
3	Castle Nut	AN310C3
1	Aluminum Strap	201

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 - 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.
3.4 – Apply high temperature anti-seize to 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 Views.
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 - Attach the front baffling to the #1 and #2 headers using clamps PN 6020. See Detail "F".
4.1.6 - 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 PFS Airbox (AA5 S/N 641 & Later and AA5A)

4.2.1 - Line the front face (intake side) of the airbox up with the forward edge of the lower cowling, centered left to right. Mark the nutplate locations through the existing mounting holes in the cowling.
4.2.2 - Drill out the holes and attach the supplied nutplates to the airbox with the supplied rivets.
4.2.3 - Mark the orientation of the carb heat door on the stock airbox assembly (after verifying it was originally installed correctly).
4.2.4 - Remove the three screws that attach the carb heat door lever to the carb heat door.
4.2.5 - Remove the carb heat door and lever assembly from the stock airbox.

4.2.6 - Measure carb heat door lever hole locations on the stock airbox and transfer holes to the PFS airbox.
4.2.7 - Remove grommets/bushings from the stock airbox and install on the PFS airbox.
4.2.8 - Install the carb heat door and lever assembly in the same manner as the stock airbox using existing hardware, double-checking freedom of movement and range of motion.
4.2.9 - Degrease front and bottom flanges of the airbox.
4.2.10 - Cut the 3/16" thick rubber seal to shape and adhere it to the bottom flanges to insure an airtight seal to the cowling. Trim along inside edge of flange.
4.2.11 - Using an awl or drill bit, transfer mounting holes through the seal.
4.2.12 - Cut the 3/8" thick rubber seal to shape and adhere it to the front face of the airbox.
4.2.13 - Attach the airbox to the rubber boot on the carburetor in the same manner as the stock airbox, using the original hardware. See Detail E.
4.2.14 - Install the supplied air filter, PN BA347E, into the airbox, be sure to orient it correctly (note "ENGINE SIDE" markings on air filter).
4.2.15 - Torque and safety wire, if necessary, all four bolts that connect airbox to carburetor in accordance with the latest approved 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. The cowl may be installed and clearances checked by looking through the louvers and/or using a mirror and light.
4.2.16 - Reconnect carb heat control cable and carb heat scat tubing (use supplied SCAT tube for carb heat).

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: 78101 all the way (at least 2") 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 all the way (at least 2") onto the end of the intermediate tube PN: 78101. 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 78101) 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 - 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**.**

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 all the way (at least 2") over the 4-1 outlet.

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 – Install the 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 Short Stack Tailpipe

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 through the hole in the flared end of the intermediate tube.

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 (be sure the hole is lined up with the mark made in the previous step). 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 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. Make sure electrical, fuel and oil lines are properly secured. Plastic, rubber, or nylon ties may melt in proximity to exhaust system components and allow lines to fall onto hot exhaust pipes.

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.

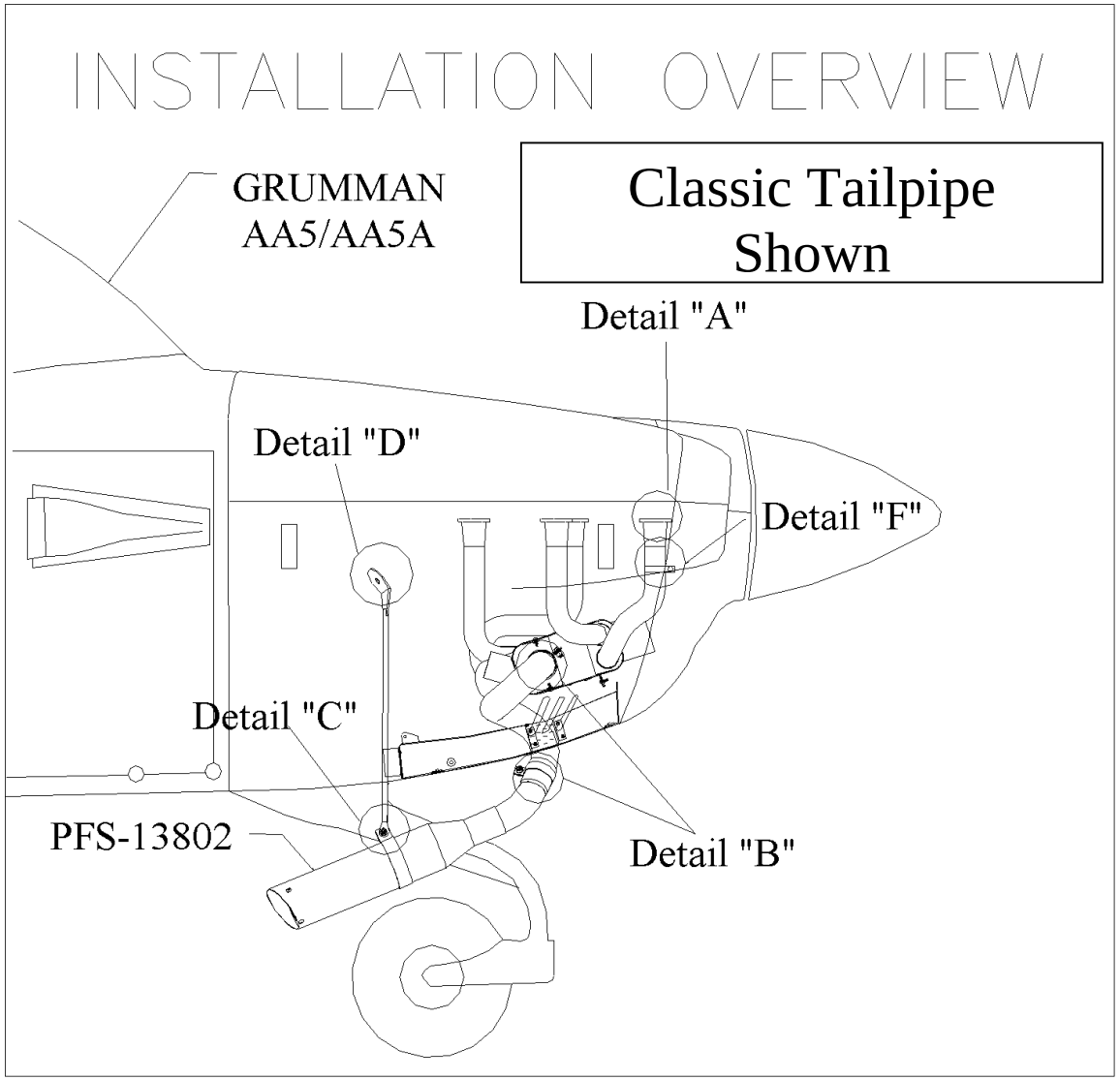
5.4 - Create a placard and install in clear view of the pilot that reads:
"The Power Flow Systems, Inc. tuned exhaust system may cause the aircraft to burn more fuel at high power settings when running a rich mixture. It is the Pilot's responsibility to determine what, if any, change in fuel flow exists and to plan accordingly."

5.5 - Make appropriate entries in the logbook and on FAA Form 337. This modification is considered a major ***airframe*** alteration. The STC is located at the back of this instruction set for easy removal.

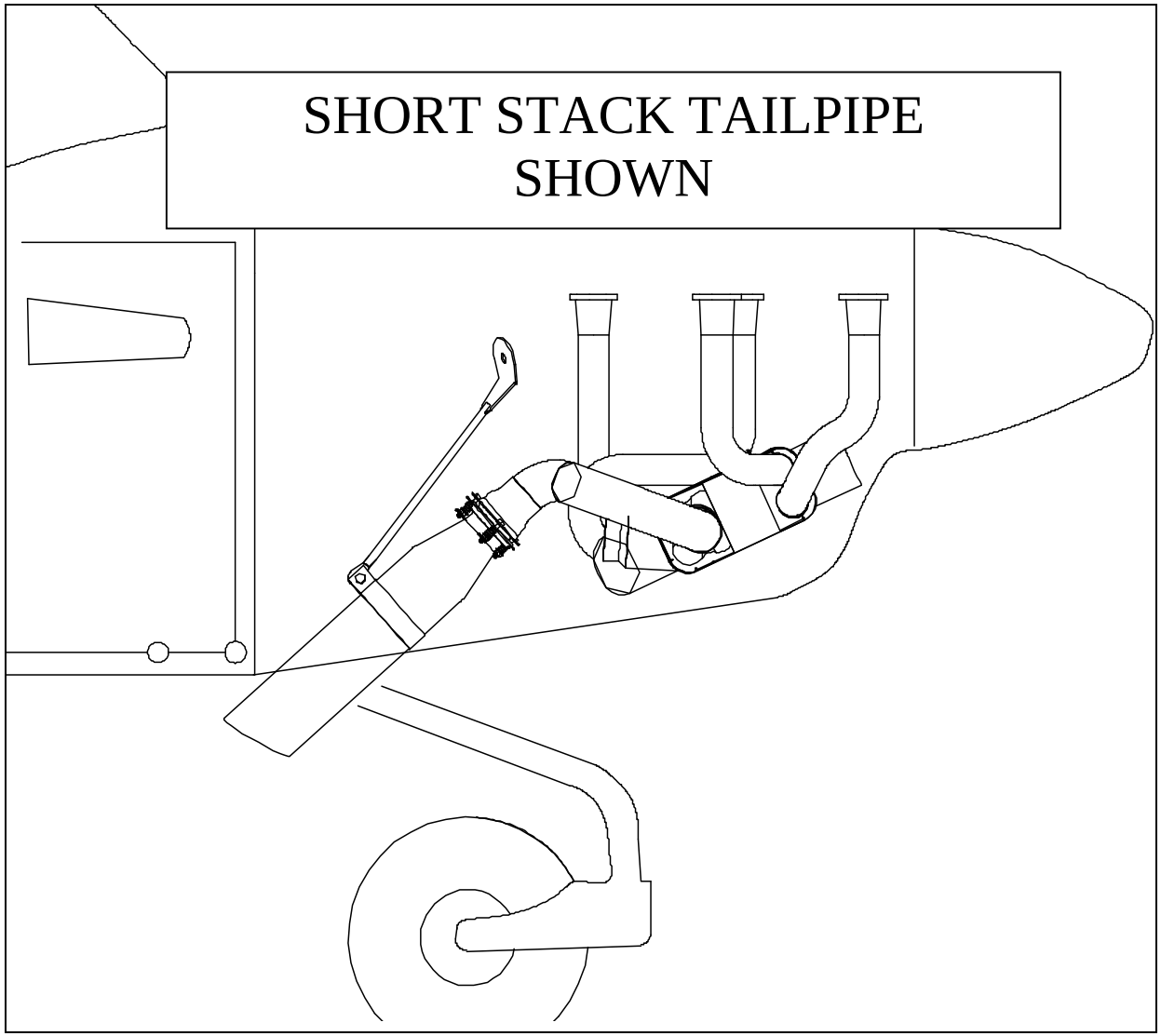
5.6 - Typical Weight and Balance Information: The short stack system weighs 23.75 lbs at station 25.5, including the airbox. The classic system weighs 24.75 lbs at station 25.5, including the airbox -- It is recommended that the installer weigh both the stock and Power Flow systems for an exact differential.

5.7 - Please see accompanying report, PFS-0049-00, for Instructions for Continued Airworthiness.

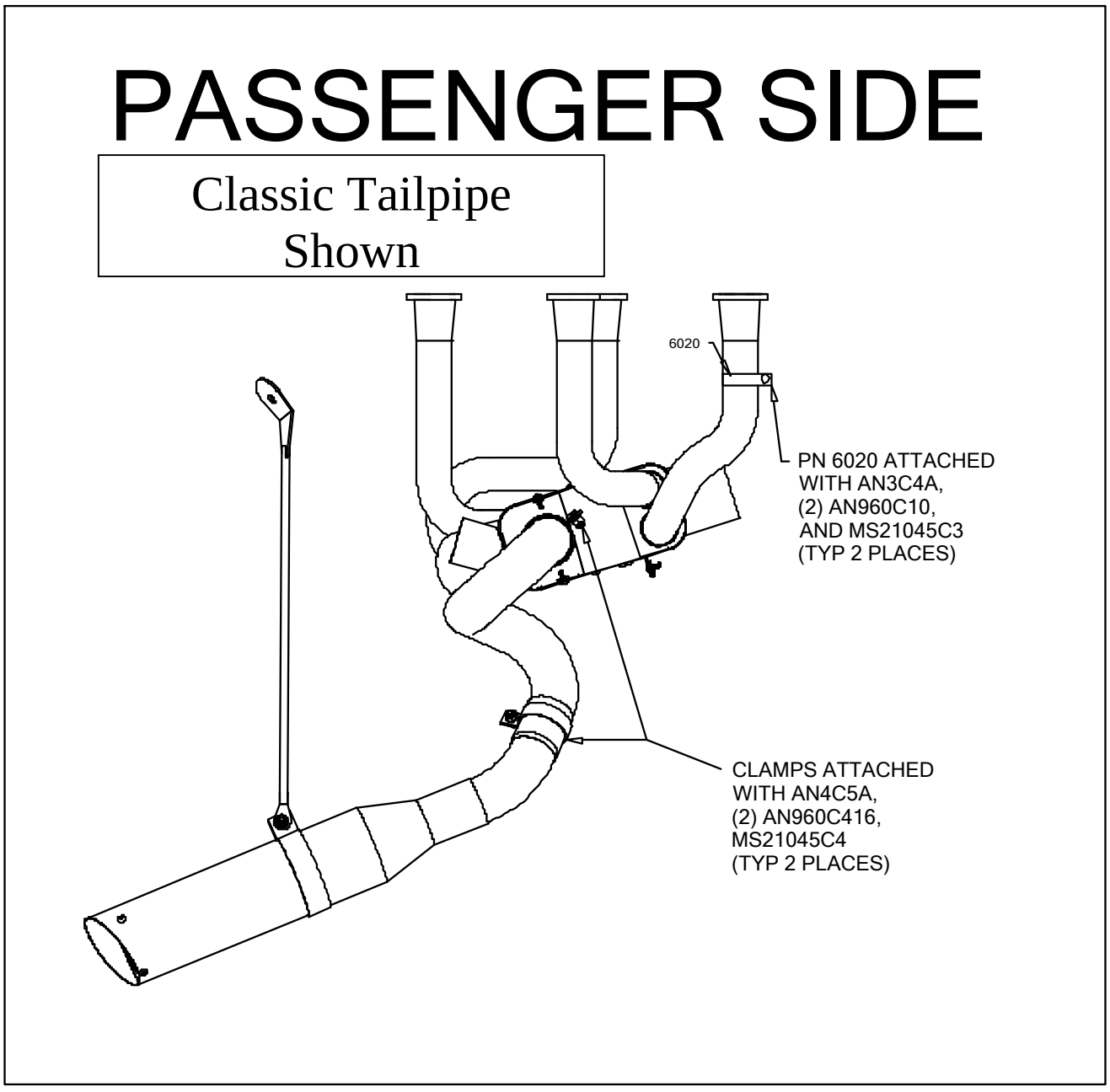
INSTALLATION OVERVIEW: CLASSIC TAILPIPE



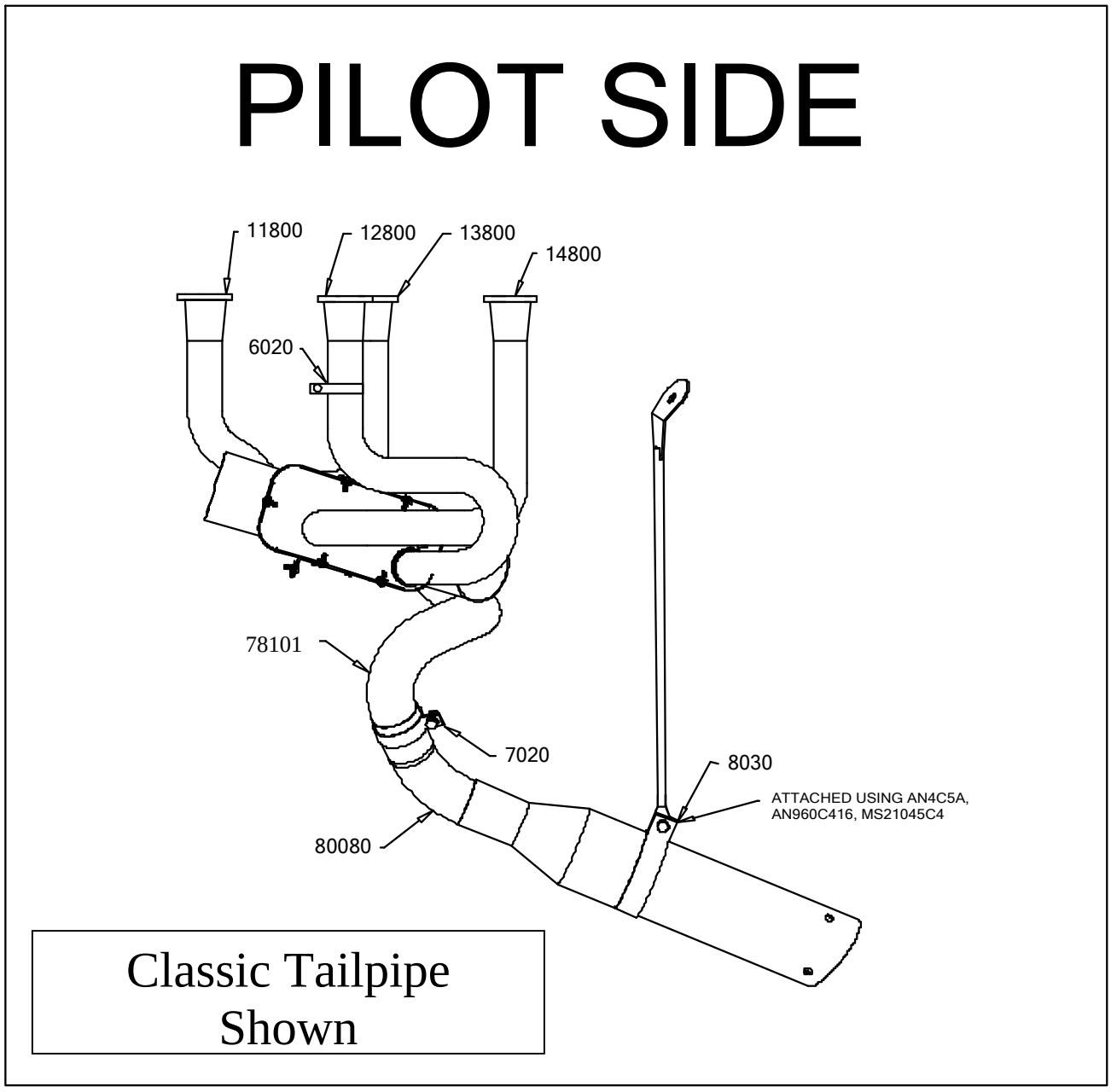
INSTALLATION OVERVIEW: SHORT STACK TAILPIPE



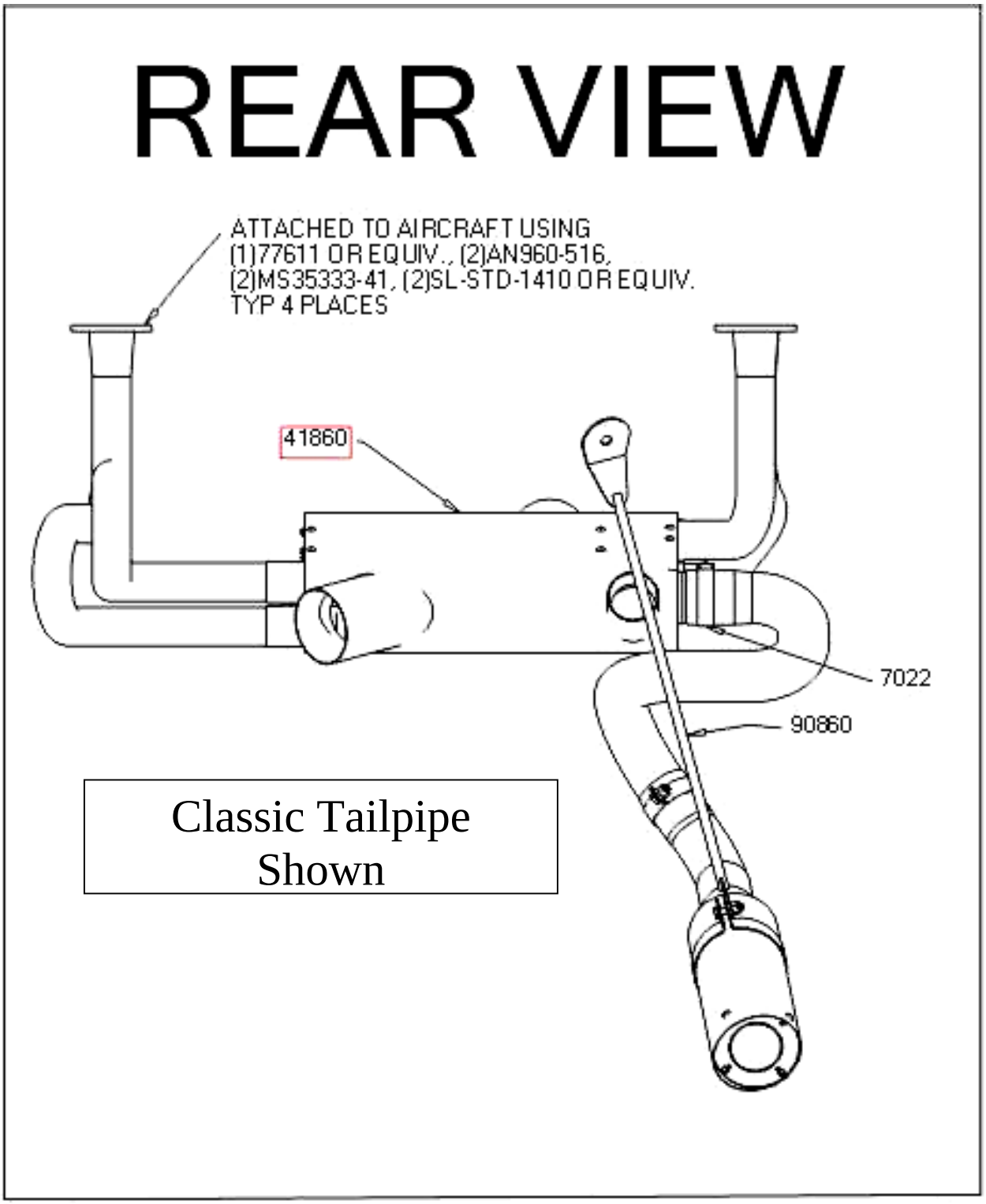
PASSENGER SIDE VIEW: CLASSIC TAILPIPE



PILOT SIDE VIEW: CLASSIC TAILPIPE



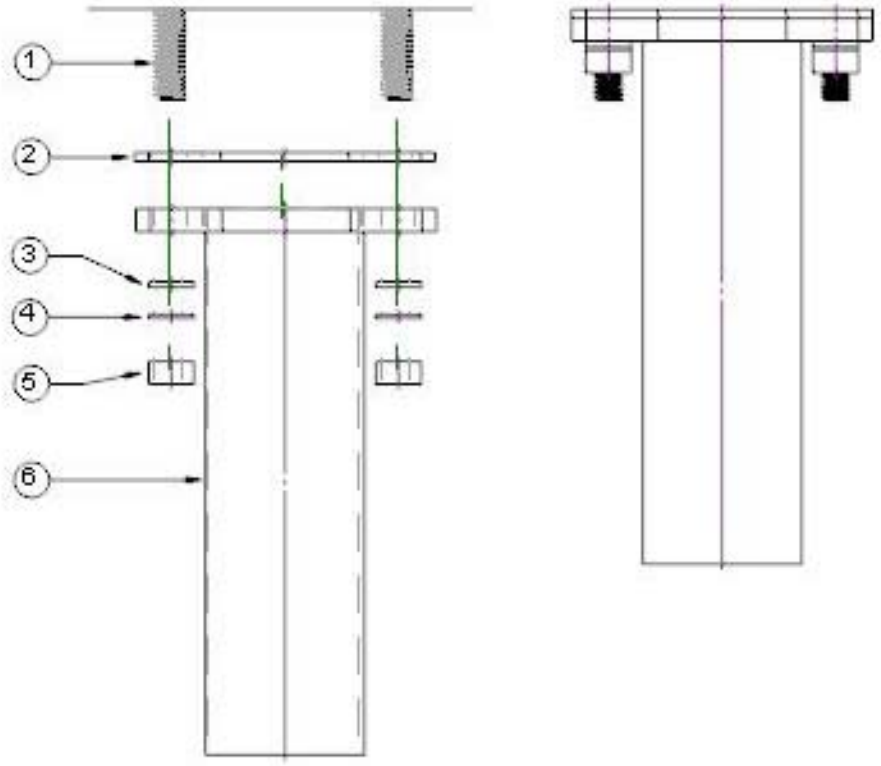
REAR VIEW: CLASSIC TAILPIPE



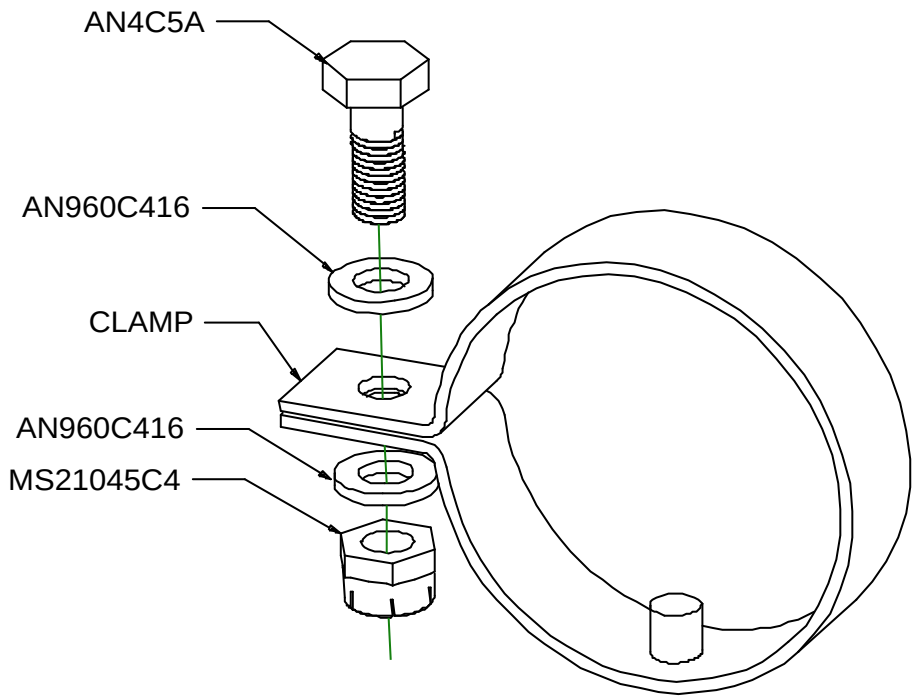
DETAIL A

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

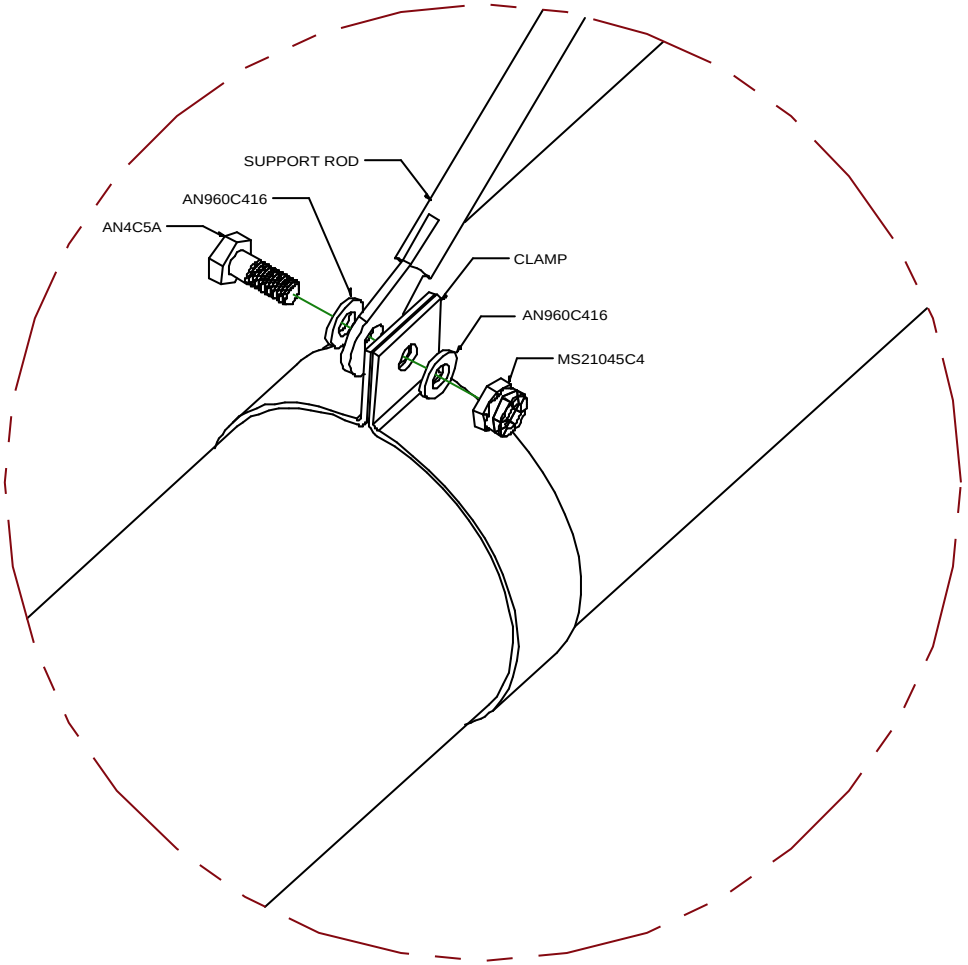


DETAIL B

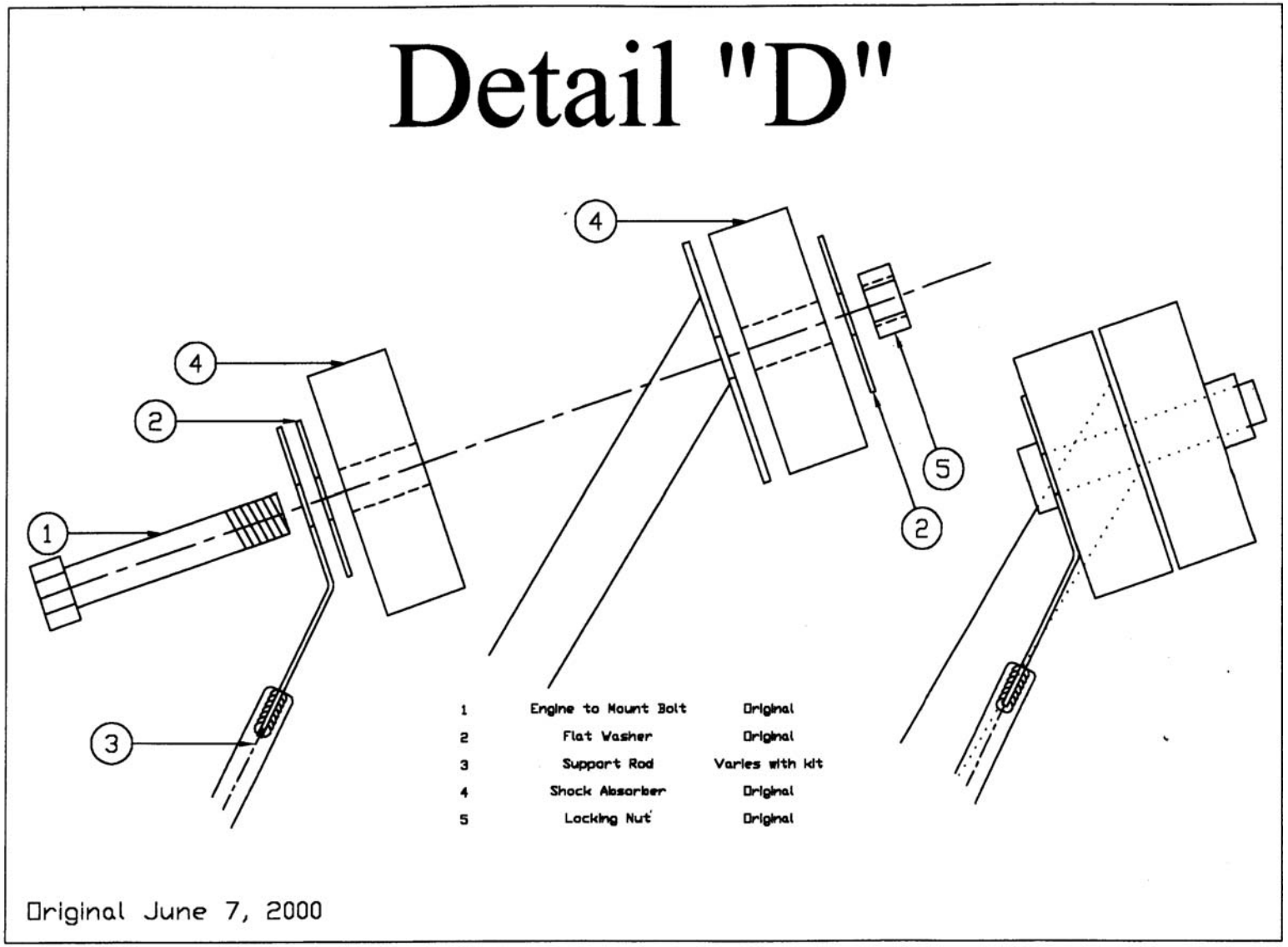


Hardware is used for 7020 and 7022 Clamps.

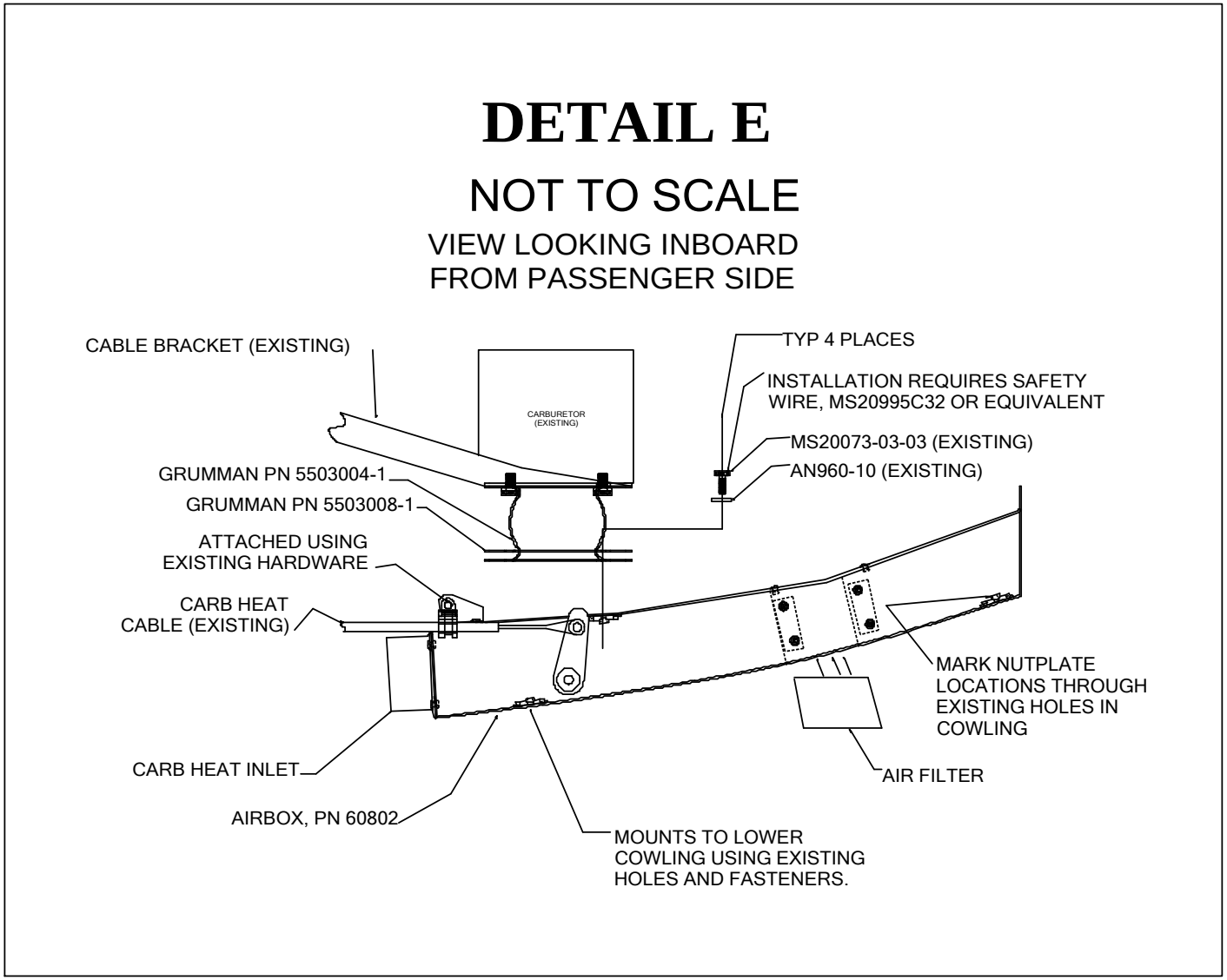
DETAIL C



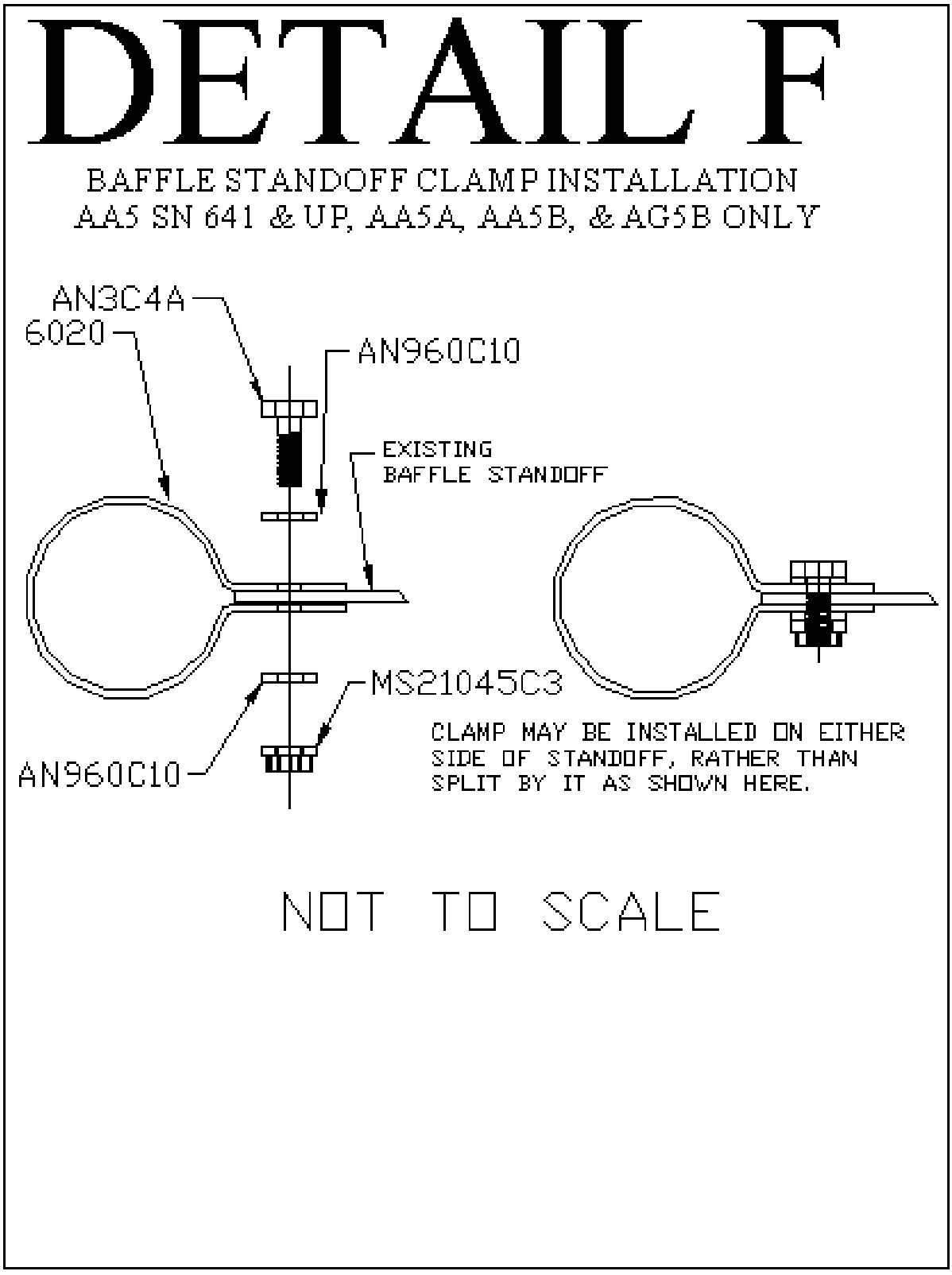
DETAIL D


Detail "D"
4
2
1
3
4
5
2
1 Engine to Mount Bolt Original
2 Flat Washer Original
3 Support Rod Varies with kit
4 Shock Absorber Original
5 Locking Nut Original
Original June 7, 2000

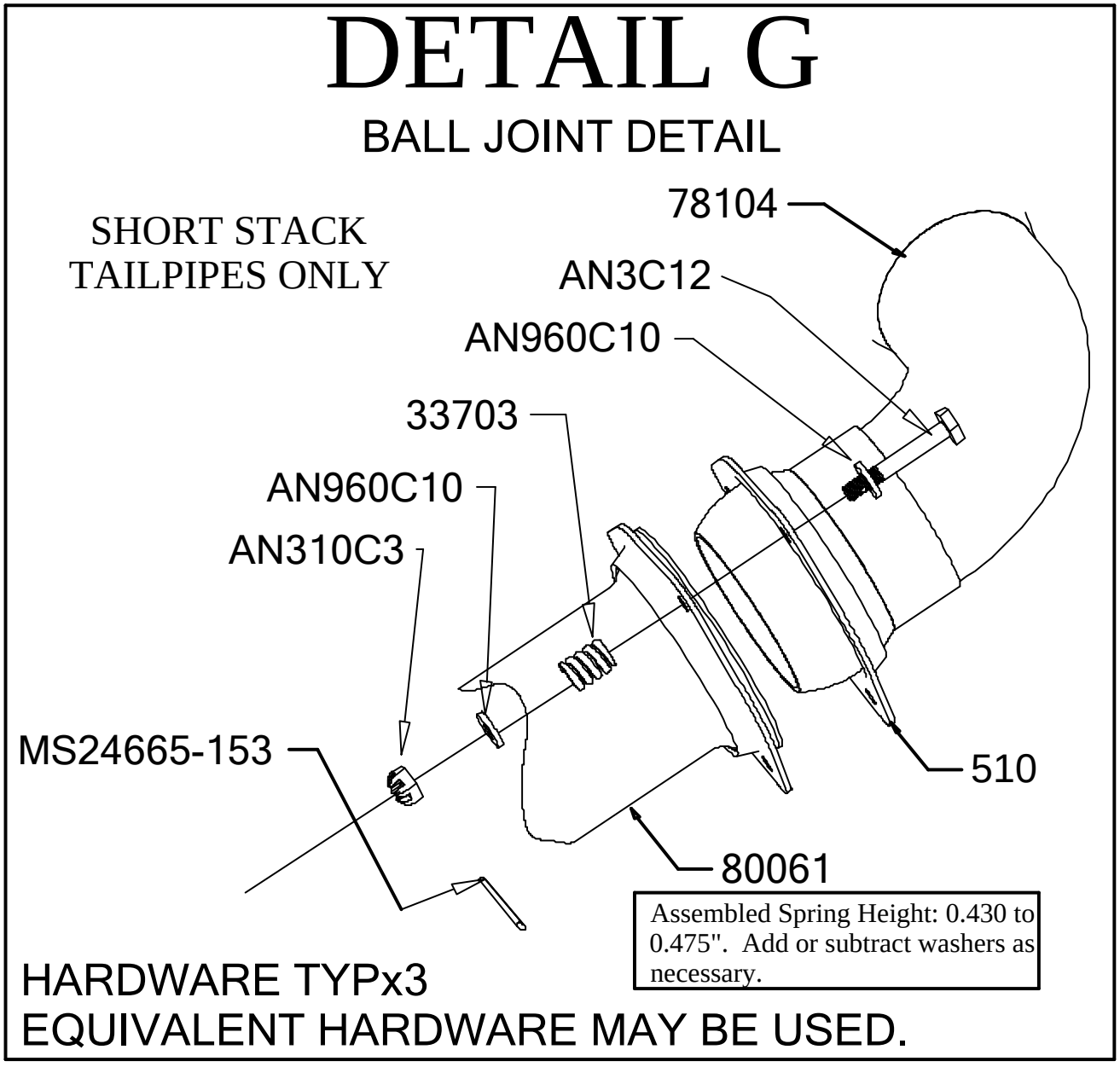
DETAIL E


DETAIL E
NOT TO SCALE
VIEW LOOKING INBOARD
FROM PASSENGER SIDE
CABLE BRACKET (EXISTING)
CARBURETOR (EXISTING)
TYP 4 PLACES
INSTALLATION REQUIRES SAFETY WIRE, MS20995C32 OR EQUIVALENT
MS20073-03-03 (EXISTING)
AN960-10 (EXISTING)
GRUMMAN PN 5503004-1
GRUMMAN PN 5503008-1
ATTACHED USING EXISTING HARDWARE
CARB HEAT CABLE (EXISTING)
MARK NUTPLATE LOCATIONS THROUGH EXISTING HOLES IN COWLING
AIR FILTER
CARB HEAT INLET
AIRBOX, PN 60802
MOUNTS TO LOWER COWLING USING EXISTING HOLES AND FASTENERS.

DETAIL F


DETAIL F
BAFFLE STANDOFF CLAMP INSTALLATION
AA5 SN 641 & UP, AA5A, AA5B, & AG5B ONLY
AN3C4A
6020
AN960C10
EXISTING
BAFFLE STANDOFF
MS21045C3
AN960C10
CLAMP MAY BE INSTALLED ON EITHER
SIDE OF STANDOFF, RATHER THAN
SPLIT BY IT AS SHOWN HERE.
NOT TO SCALE

DETAIL G


DETAIL G
BALL JOINT DETAIL
SHORT STACK
TAILPIPES ONLY
78104
AN3C12
AN960C10
33703
AN960C10
AN310C3
MS24665-153
510
80061
Assembled Spring Height: 0.430 to 0.475". Add or subtract washers as necessary.
HARDWARE TYPx3
EQUIVALENT HARDWARE MAY BE USED.

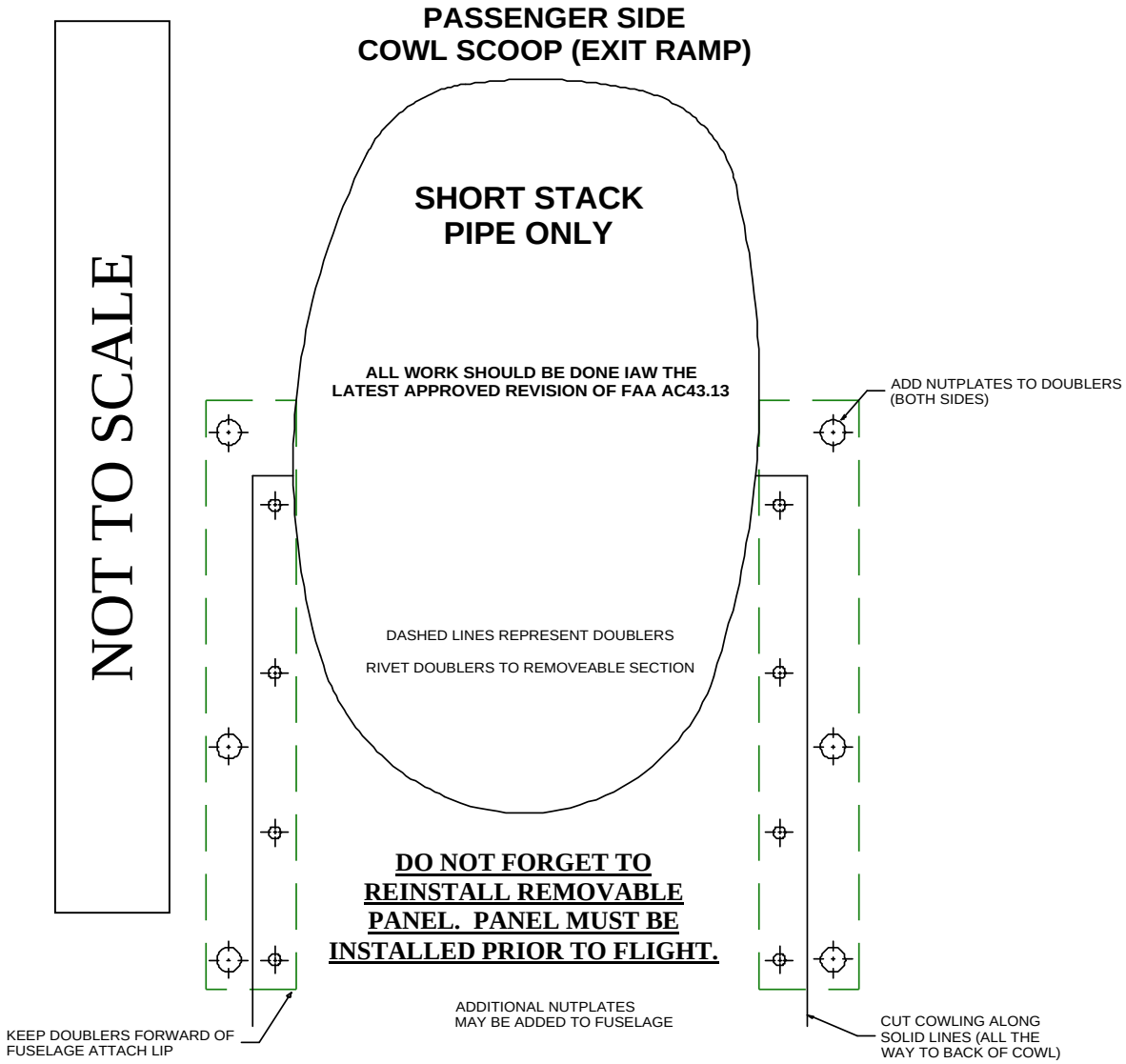
DETAIL H

OPTIONAL COWL SLOT

This additional modification may be performed to the lower cowling to facilitate cowling removal and installation. Power Flow Systems, Inc. does not supply the parts required for this modification.

Cut the lower cowling from the widest points of the cut made earlier outward for about ½ inch, then 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 cowling. **This removable panel must be reinstalled on the aircraft prior to flight. CAUTION: Do not return aircraft to service without this panel installed.**

Rivet doublers into position on both sides of the removable panel. 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.



United States of America
Department of Transportation -- Federal Aviation Administration

Supplemental Type Certificate

Number SA02448AT

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

This certificate issued to

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

certifies that the change in the type design for the following product with the limitations and conditions therefor as specified hereon 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 of issuance: January 08, 2002

Date reissued:

Date amended:

By direction of the Administrator

Jerry Robinette
(*Signature*)

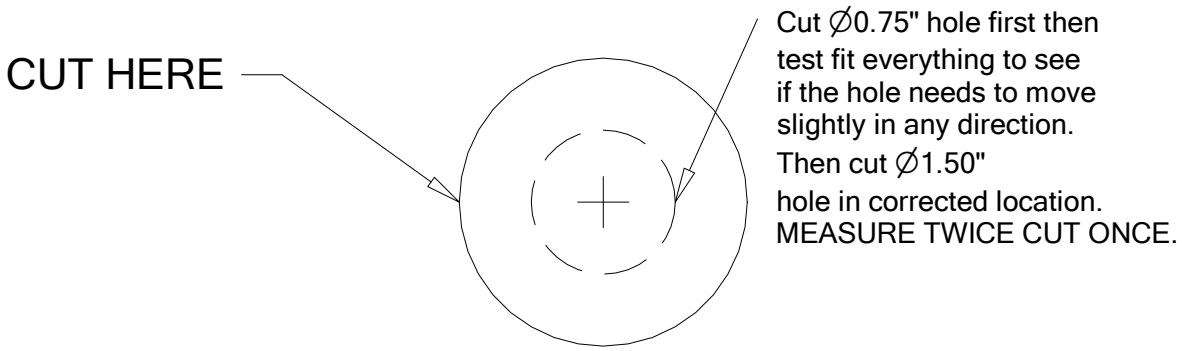
for Melvin D.Taylor
Manager
Atlanta Aircraft Certification Office

(*Title*)

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

This certificate may be transferred in accordance with FAR 21.47.

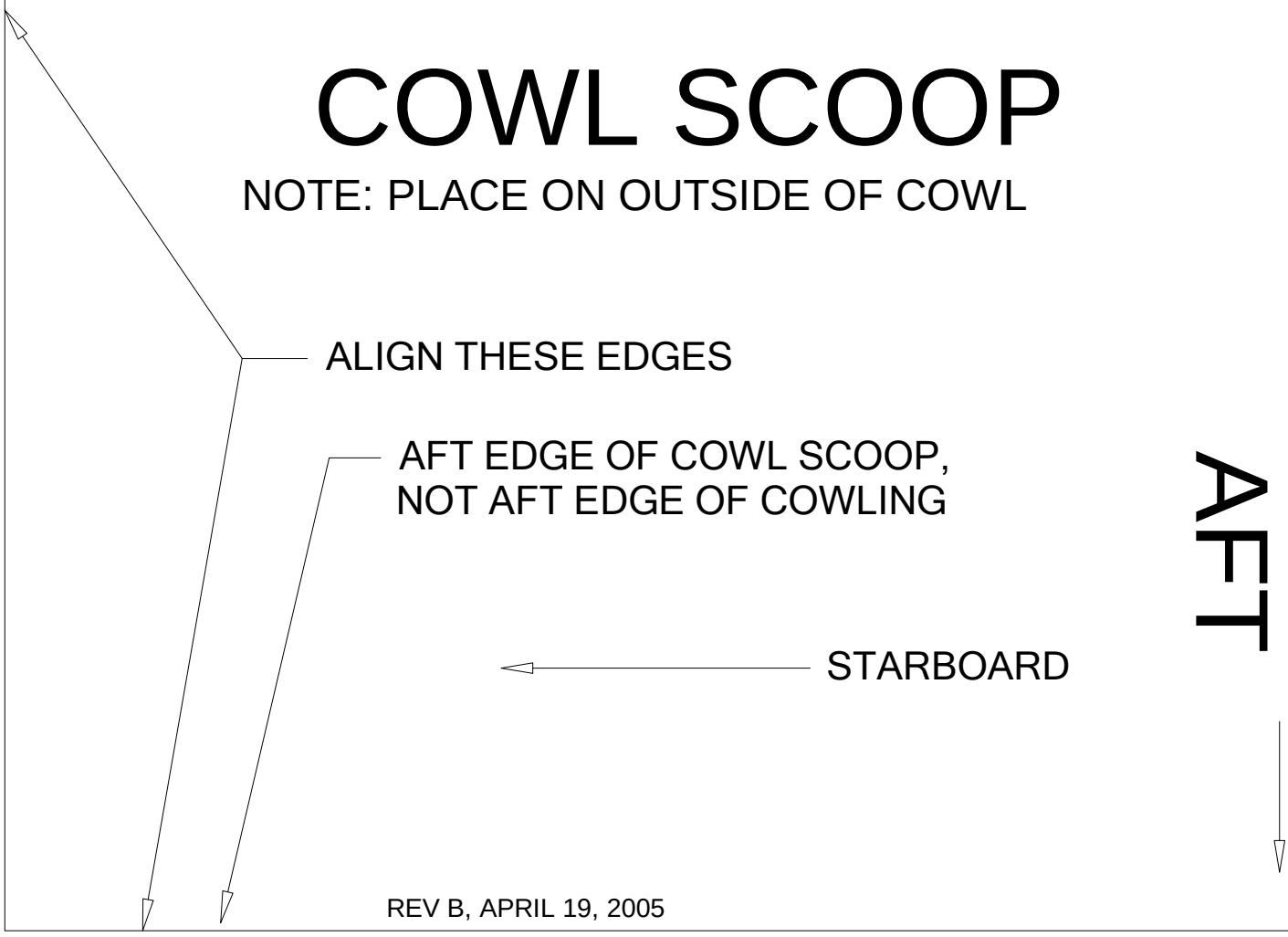
IF YOU HAVE ANY QUESTIONS
CALL 386-253-8833 BEFORE CUTTING HOLE.



SUPPORT ROD CUTOUT TEMPLATE
PFS-13802 CLASSIC EXTERNAL PIPE

PASSENGER SIDE
COWL SCOOP

NOTE: PLACE ON OUTSIDE OF COWL



REV B, APRIL 19, 2005

IF YOU HAVE ANY QUESTIONS, CALL 386-253-8833
BEFORE CUTTING HOLE

Rev: IR
04/07/05

TAILPIPE CUTOUT TEMPLATE
GRUMMAN FLAT BOTTOM COWL
AA5 S/N 641 & HIGHER, AA5A, AA5B, AG5B