



*Installation Instructions and
Instructions for Continued Airworthiness
Kit: PFS-13704, PFS-13705*

REPORT NAME: PFS-13704, PFS-13705 Tuned Exhaust System Installation
Instructions and Instructions for Continued Airworthiness

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Description of changes (Rev F):

Revised Kit contents to incorporate new shroud design for 1967/1968 first year Cardinal. Identified hardware pack number location of supplied hardware.. Revised installation instructions to show possible conflict of throttle arm to shroud and how to remedy. Added additional notes to several instruction steps based upon customer feedback. Added additional detail to ICA about where to inspect and lubricate slip joints. Revised recommended dynamic balance timeframe from 1000 hours to 400 hours, per industry standard. Added additional detail drawings to show new shroud configurations. Revised existing detail drawings to show correct aircraft model applicability.



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1.0 INTRODUCTION

1.1 General

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.

PFS is the abbreviation for Power Flow Systems.

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.

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.

1.2 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 (kits with classic tailpipes only).

1.3 Upgrades

If you are upgrading from a PFS-13701, PFS-13702, or PFS-13703 (otherwise known as “1st Generation”) exhaust system please note the following:

You have been supplied with all of the parts necessary to install your new PFS-13704 or PFS-13705 exhaust system. For classic tailpipes (large, external pipe), you will need to reuse your existing support rod, muffler, and muffler clamp (the large diameter clamp). New hardware has been provided. If you are installing the short stack then you will not be re-using any parts.

The installer should complete FAA 337 paperwork (or their international equivalent) for this installation because this approval is under a new STC. The STC and separate STC Authorization Letter have been provided with the kit.

The new parts will be warranted for 1 year or 500 tach hours, following their installation, whichever comes first. Parts that are reused will be subject to their original warranty and will be covered based on the time of their initial installation.

If you require a new muffler (Ceramic Coated Mufflers are now available) or muffler insert (P/N PFS-8016), please contact Power Flow Systems, Inc. for details.



2.0 KIT CONTENTS

2.1 Classic Tailpipe Kits

Qty	Part Description	Cessna 177 (O-320)	Cessna 177A, 177B	Hardware Pack
1	#1 Header	11600	Same	
1	#2 Header	12600-1**	12600	
1	#3 Header	13600	Same	
1	#4 Header	14600-1**	14600	
4	No-blow Header Gasket	77611	Same	10320
8	Exhaust Nut	SL-STD-1410	Same	10320
8	Lock Washer	MS35333-41	Same	10320
8	Plain Washer	AN960-516	Same	10320
1	Shrouded Collector Assembly	41781*	41780	
1	Exhaust Extension Assembly	78102	Same	
2	Exhaust Clamp (2" with pin)	7020	Same	
3	Bolt	AN4C5A	Same	10320 (2)/ 10362 (1)
3	Lock Nut	MS21045C4	Same	10320 (2)/ 10362 (1)
6	Flat Washer	AN960C416	Same	10320 (4)/ 10362 (2)
1	Adel Clamp size 6	MS21919WH6	Same	10321
1	Adel Clamp size 12	MS21919WH12	Same	10321
1	Locknut	MS21045C3	Same	10321
1	Bolt	MS51958-63	Same	10321
2	Flat Washer	AN960C10	Same	10321
1	Muffler Assembly	80177(-CER)	Same	
1	Support Rod	90030	90030 (C177A only) 90077	
1	Muffler Clamp (3 1/2" no pin)	8030	Same	
1	3" Flange	N/A	6520***	
A/R	3/32 Blind Rivets	N/A	AD32ABS***	
2	Hose Clamps	N/A	QS200M40H***	
20"	SCAT Tubing	N/A	SCAT-12***	
1	45 Degree Fuel Fitting	AN915-1D	Same	

Equivalent hardware may be supplied.

*1967/1968 First year C177 aircraft cowlings have a different cowling design than all other model years. This first year includes an integrated/built-in air box/plenum for filtered engine air to the carburetor.

41781 is a new shroud design that allows for sufficient SCAT hose clearance around the airbox starting with PFS-13704 S/N 119. Earlier s/n received shroud p/n 41780.

**1967/1968 Aircraft converted to O-360 Engines will receive 12600 and 14600 headers.

***Optional, for installation on forward baffle to attach SCAT tube to the cabin heat inlet (1975 & later model years).



2.2 Short Stack Tailpipe Kits

Qty	Part Description	Cessna 177(O-320)	Cessna 177A, 177B	Hardware Pack
1	#1 Header	11600	Same	
1	#2 Header	12600-1**	12600	
1	#3 Header	13600	Same	
1	#4 Header	14600-1**	14600	
4	No-blow Header Gasket	77611	Same	10310
8	Exhaust Nut	SL-STD-1410	Same	10310
8	Lock Washer	MS35333-41	Same	10310
8	Plain Washer	AN960-516	Same	10310
1	Shrouded Collector Assembly	41781*	41780	
1	Short Stack Tailpipe Assembly	80011(-CER)	Same	
1	Exhaust Clamp (2" with pin)	7020	Same	
1	Bolt	AN4C5A	Same	10362
1	Lock Nut	MS21045C4	Same	10362
2	Flat Washer	AN960C416	Same	10362
1	3" Flange	N/A	6520***	
A/R	3/32 Blind Rivets	N/A	AD32ABS***	
2	Hose Clamps	N/A	QS200M40H***	
16"	SCAT Tubing	N/A	SCAT-12***	
1	45 Degree Fuel Fitting	AN915-1D	Same	

Equivalent hardware may be supplied.

*1967/1968 First year C177 aircraft cowlings have a different cowling design than all other model years. This first year includes an integrated/built-in air box/plenum for filtered engine air to the carburetor. 41781 is a new shroud design that allows for sufficient SCAT hose clearance around the airbox starting with PFS-13704 S/N 119. Earlier s/n received shroud p/n 41780.

**1967/1968 Aircraft converted to O-360 Engines will receive 12600 and 14600 headers.

***Optional, for installation on forward baffle to attach SCAT tube to the cabin heat inlet (1975 & later model years).



3.0 PREPARATION

- 3.1 Verify that all contents listed on the preceding pages 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.
- 3.2 Remove lower cowl components in accordance with the latest approved revision of the Aircraft Service Manual.
- 3.3 Disconnect flexible ducts from muffler assembly.
- 3.4 Cover carb heat inlet to prevent debris from entering the carburetor.
- 3.5 Remove EGT probe(s), if installed.
- 3.6 Remove nuts attaching exhaust pipes to exhaust studs.
- 3.7 Remove exhaust pipes and exhaust gaskets.

4.0 INSTALLATION OF PFS EXHAUST SYSTEM

NOTE: Our Carburetor heat adapter for 1969 and later aircraft (shrouded collector p/n 41780) is designed to accept 2 common sizes of SCAT hose connections, 2.0 and 2.5 inch diameter. If your hose is 2.5 inch diameter, cut off and de-burr the reducer portion of the adapter. Starting with kit PFS-13704 S/N 119, 1967/1968 C177 aircraft that have the shrouded collector p/n 41781 are designed for a 2.0 inch diameter SCAT for carburetor heat to match the cowling connection.

4.1 Installing Collector Box assembly and Exhaust Pipes

- 4.1.1 Apply a thin layer of MIL-A-907E or equivalent anti-seize to the inside of all slip joints (the header slip joints come with anti-seize applied from the factory).
- 4.1.2 Insert the number 1 and number 3 exhaust header pipes into the collector assembly as per the numbering on the collector and headers. Be sure to use the alignment marks. If the headers are not numbered and/or there are no alignment marks, use the Pilot and Passenger Side views to determine proper header orientation. The collector assembly should be angled approximately 30 degrees from crankshaft centerline. A minimum of 1 ½ ” penetration is required for proper operation. 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 Insert the number 2 and number 4 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. Be sure to use the new gaskets provided.
- 4.1.4 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. Tighten the exhaust nuts sufficiently to bring the flanges up to the cylinder ports, BUT DO NOT TORQUE YET – see next step.
- 4.1.5 **Verify that your carburetor throttle arm has full range of motion and is not restricted by the heater shroud.** 1967/1968 C177 aircraft have longer throttle arms with 3 positions in them. If the throttle arm is too long, we recommend moving the throttle cable connection to another

position on the arm and then trimming the throttle arm as necessary to remove the excess and unnecessary length. Typically aircraft that are on the third (most outboard) position need to be moved to the middle or second position. Note: You may need to re-index the throttle arm to ensure full and suitable throttle operation/control.

Ensure that the throttle control cable is re-connected IAW the service manual.

IMPORTANT: CONFIRM THAT YOU HAVE FULL AND CORRECT THROTTLE MOVEMENT AND DO NOT HAVE ANY PHYSICAL CONTACT WITH THE EXHAUST SYSTEM SHROUD BEFORE PROCEEDING.

Throttle arm conflict depicted below: - Note washer is coming into contact with shroud.



Throttle arm conflict resolved below:



- 4.1.6 Torque the header flanges I.A.W. the latest approved revision of the aircraft or engine service manual. See Detail "A" and Pilot Side View.
- 4.1.7 Slide the exhaust extension PN: 78102 (classic tailpipes) or tailpipe PN: 80011 (short stack tailpipes) onto the end of the 4-to-1 collector. **DO NOT drill for clamp installation, yet. Push the pipe as far over the 4-1 outlet as it will go (about 2 inches).**

- 4.1.8 Install flexible tubing to shroud connections. The cabin heat outlet is on the aft-pilot side of the shroud and the carb heat outlet is on the passenger side of the shroud PN 41780.
- 4.1.8.1 On First year 1967/1968 C177 aircraft, you will need to oval the Cabin heat source air SCAT to attach to the oval part of the PFS shroud.
- 4.1.8.2 On the Cessna 177B aircraft it may be necessary to attach the 6520 flange to the front baffle with rivets. Put the flange through the air inlet hole from the front of the aircraft to create an attachment for the SCAT tube and rivet in place. The supplied SCAT tube for the fresh air inlet should be trimmed as short as possible and oveled if necessary for clearance to the landing light tunnel.
- 4.1.9 A minimum of 2 inches is required between any exhaust pipe and any fuel or oil line. Use the supplied fuel fitting if necessary to obtain proper clearances.

4.2 Installing Support Rod (for exhausts with large, external tailpipe only)

(Skip this section for short stack tailpipes)

- 4.2.1 Examine the right lower engine mount bolt and nut. If you have one to two threads showing at the nut, it may be necessary remove the large area washer from the aft side of the mount (the support rod tab is the same thickness as this washer). See Detail "D".
- 4.2.2 Loosen and remove the lower right engine Lord mount bolt. Our support rod adapter (the teardrop shaped piece of metal welded to the support rod) goes under the bolt head, on top of the existing large area washer. This large area washer may be omitted if the bolt is too short. See Detail "D". Ensure that the rod clears all engine compartment parts. The support rod will exit the cowl on the right side, through the bottom cowl air outlet.
- 4.2.3 Temporarily install the lower cowl and check for correct positioning of the support rod. You should also verify that the support rod will not interfere with the muffler assembly, the cowling or the cowl flaps (if installed). Check that the outlet of the collector fits through the forward (cowling) hole (where the old exhaust exited) with a minimum .25" clearance on all sides. NOTE: If you have an exhaust fairing installed, ensure that the exhaust does not interfere with it. If so, move the fairing to accommodate the PFS exhaust system.
- 4.2.4 Remove the lower cowl.
- 4.2.5 Tighten the Lord mount bolt, but DO NOT TORQUE TO VALUE YET. You will fully torque the mount once the position and adjustment of the support rod is complete.
- 4.2.6 Secure the support rod to the engine tubular mount with supplied ADEL clamps. Position the smaller clamp approximately 2/3 of the way down the support rod. Position the larger ADEL clamp around the engine tubular mount that comes closest to the support rod. The objective here is not to change the angle of the support rod, but just to help dampen any lateral motion that can occur. Secure the ADEL clamps with the supplied hardware.

Note: MODIFYING THIS SUPPORT ROD OR FABRICATING ADDITIONAL SUPPORT MAY CAUSE PARTS TO FAIL AND WILL VOID YOUR WARRANTY.

- 4.2.7 Slide the muffler assembly, P/N 80177, over the exhaust extension 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 exhaust extension assembly. 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.

- 4.2.8 Position the large support clamp, P/N 8030, around the muffler so that it will attach to the support rod with a bolt.
- 4.2.9 If a nose pant is installed, 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.

Warning: Fuel strainer outlet must be redirected so that it does not spray fuel on tailpipe during fuel strainer drain operation.

4.3 Installing Exhaust Extension and Muffler

(Skip this section for short stack tailpipes)

- 4.3.1 Install the large clamp (without the pin) so that the holes will align with the hole in the support rod. See Detail “C”.
- 4.3.2 Drill a 0.25” hole through the pilot hole in the muffler through the exhaust extension. If your muffler does not have a pilot hole, drill on the outboard side 1.0” from the top of the flare.
- 4.3.3 Drill a 0.25” hole through the flared end of the exhaust extension, about one inch from the end of the flare. Drill through the exhaust extension and the 4 to 1 collector. Be sure to de-burr all the holes or later removal of muffler components will be difficult.
- 4.3.4 Clamp the exhaust extension to the 4 to 1 using one of the provided 2” clamps (PN 7020). See Detail “B”. The pin should insert with minimal force. If any binding exists, the hole may need further reaming.
- 4.3.5 Remove the muffler and re-install the lower cowl. Install the muffler assembly and clamp to the exhaust extension with the other 2” clamp. See Detail “B”. Again, if the pin is a tight fit, further reaming of the hole may be necessary.
- 4.3.6 Clamp the muffler assembly to the support rod with the provided 3.5” clamp. See Detail “C”.
Note: The ears of the muffler clamp must be brought together and the support rod will be installed on one side of the two ears. **DO NOT SANDWICH THE SUPPORT ROD BETWEEN THE TWO EARS OF THE CLAMP.**
- 4.3.7 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.

CAUTION

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.

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.

4.4 Installing The Short Stack Tailpipe

(Skip this section for Classic Tailpipes)

- 4.4.1 Install the lower cowling with enough fasteners to obtain the correct cowling angle.
- 4.4.2 Rotate the tailpipe about the axis of the slip fit to obtain maximum clearance to the outlet hole in the cowling.
- 4.4.3 If insufficient outboard clearance (less than 0.5") exists, up to 0.5" may be trimmed from the end of the 4-1 outlet and the slip-fit end of the tailpipe. This would allow the tailpipe to be positioned up to 0.5" further inboard.
- 4.4.4 Once the proper tailpipe angle is obtained, mark the slip joint in a manner to allow returning to the proper angle, were tailpipe to move during cowling removal.
- 4.4.5 Remove the lower cowling.
- 4.4.6 Drill a 0.25" hole through the slip joint, about one inch from the end of the flare in the tailpipe. Drill through the tailpipe and the 4 to 1 collector. Be sure to de-burr all the holes or later removal of muffler components will be difficult.
- 4.4.7 Clamp the exhaust extension to the 4 to 1 using the provided 2" clamp (PN 7020). See Detail "B". The pin should insert with minimal force. If any binding exists, the hole may need further reaming.

5.0 INSPECTION AND PAPERWORK

- 5.1 Be sure that the final installation allows a minimum of 2" clearance between unshielded exhaust tubes and fuel and oil lines or battery cables. Verify that fuel, oil, and electrical lines are properly supported. Nylon, plastic, or rubber ties can melt and cause fuel, oil, or electrical lines to fall onto exhaust system components.
- 5.2 Verify that you have full Throttle and mixture control operation at the carburetor and ensure that no part of the controls are in contact with the exhaust system shroud.
- 5.3 Install the placard (enclosed) 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."
- 5.4 Make appropriate entries in the logbook and on FAA Form 337. This modification is considered a major *airframe* change. The STC is located at the back of this instruction set for easy removal.
- 5.5 Typical Weight and Balance Information:
 - 5.5.1 The Power Flow Systems, Inc. tuned exhaust system with the classic tailpipe weighs approximately 23lbs at station 42.
 - 5.5.2 The Power Flow Systems, Inc. tuned exhaust system with the short stack tailpipe weighs approximately 19lbs at station 40.
 - 5.5.3 Since the weight of stock exhaust systems can vary, it is recommended that the installer weigh both the stock and Power Flow systems for an exact differential.



5.6 If the aircraft is equipped with a Hartzell 3-blade propeller model HC-C3YR-1RF/F7282 installed via STC # SA1556GL, perform the following additional steps:

5.6.1 Verify the Hartzell Flight Manual Supplement is P/N AFMS_011210 Revision B or later.

5.6.2 Install a placard between the manifold pressure gage and tachometer that reads: **“AVOID CONTINUOUS OPERATION BELOW 22 INCHES HG BETWEEN 1950 AND 2350 RPM”** (Replace the existing placard if it reads differently).

5.6.3 Contact Power Flow Systems, Inc. or Hartzell Propeller for the AFMS and Placard if required.

6.0 INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

It is the responsibility of the aircraft owner/technician to ensure that the most recent revision of these instructions is followed. The most recent revision of this report can be obtained by calling Power Flow Systems, Inc. at (386) 253-8833 or online at www.powerflowsystems.com

6.1 Basic Operation

Basic operation of the airplane remains the same. The pilot must watch to ensure that redline of the RPM is not exceeded.

6.2 Airworthiness Limitations

“The Airworthiness Limitations section is FAA approved and specifies maintenance required under §§43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.”

6.2.1 Mandatory Replacement Time – None. Any collector assembly that is damaged and/or fails the pressure test described below must be replaced.

6.2.2 Structural Inspection Interval – At 100 hour or Annual intervals, depending on the service regime of the aircraft. **WARNING:** Carbon Monoxide gas present in exhaust gases can lead to pilot incapacitation and/or death. A damaged exhaust system has the potential to allow Carbon Monoxide into the aircraft cabin. To prevent such an occurrence, it is imperative that the exhaust system is inspected using the intervals and procedures described in this report. It is recommended that in-cabin Carbon Monoxide levels be measured periodically. Concentrations of greater than 50ppm will require immediate exhaust system repair or replacement.

6.2.3 **All slip joints must be disassembled and lubricated with a high-temperature anti-seize compound meeting or exceeding MIL-A-907E at 500hr or Annual intervals (whichever comes first).** While disassembled, inspect the four slip joints and four headers for wear or galling. Lubrication shall be performed more frequently if headers seize between inspections.

6.2.4 Structural Inspection Procedure – See Section 6.6 below.

6.3 Troubleshooting

Problem	Possible Cause	Solution
Exhaust smell or carbon monoxide in cockpit	Exhaust Leak, opening in firewall or fuselage	Immediately inspect exhaust system and airframe for leaks, do not return to service until problem is resolved.
Excessive vibration	Tailpipe or support rod contacting cowling	Check for wear marks on the engine cowling, reposition tailpipe or trim opening as necessary.
	Collector not centered on header pipes	Reposition collector -- ensure minimum of 1 1/2" penetration per header into central collector system
	Broken Clamps	Replace Broken Clamps
	Propeller not properly balanced	Have propeller dynamically balanced to at or below 0.2 ips.
	Worn Engine Mounts	Inspect Engine mounts and replace if necessary. Verify that mounts are shimmed in accordance with the Cessna Cardinal Service Manual.
Excessive noise	Muffler insert damaged or missing	Contact PFS, Inc. for new muffler insert kit, PN PFS-8011 (short stack) or PFS-8016 (classic).
Staining at or near slip joints.	Exhaust Leak or Anti-Seize stain.	Anti-Seize will creep from slip joints and appear as a stain, this is not a problem. Exhaust leaks from slip joints are extremely rare, but if stains are determined to be from exhaust, the slip joints should be reworked for better fit by carefully expanding the inside tube until it fits tightly within the outer tube.



6.4 Maximizing Service Life

To get the maximum possible service life from your Power Flow Systems Tuned Exhaust, follow the following steps:

- 6.4.1 Dynamically balance your propeller to below 0.2 ips (inches per second) every 4 years or 400 hours (whichever occurs first).
- 6.4.2 Dynamically balance your propeller to below 0.2 ips after modifying, overhauling, dressing, or replacing any rotating component on the engine or propeller.
- 6.4.3 Keep slip joints lubricated with a high temperature anti-seize (MIL-A-907E or equivalent).
- 6.4.4 Maintain even engine compressions above 70/80 psi.
- 6.4.5 Keep magnetos in good working order and ensure that mag drops are even and less than the maximum recommended by the aircraft manufacture.

PLEASE NOTE THAT FAILURE TO COMPLY WITH ONE OR MORE OF THESE STEPS MAY IMPACT THE PRODUCT WARRANTY. PLEASE CONSULT YOUR WARRANTY DOCUMENTATION FOR FURTHER DETAILS.

6.5 Removal

- 6.5.1 Disconnect muffler support rod P/N 90030 or 90077 from muffler clamp P/N 8030. (Classic tailpipes only)
- 6.5.2 Disconnect exhaust clamp P/N 7020 and remove muffler assembly P/N 80177 from exhaust extension P/N 78102. (Classic tailpipes only)
- 6.5.3 Remove lower cowl IAW the latest FAA approved revision of the Aircraft Service Manual
- 6.5.4 Disconnect flexible ducts from collector assembly.
- 6.5.5 Remove EGT probes if installed.
- 6.5.6 Mark each of the header pipes with their respective cylinder number with a felt tipped pen or marker. Also mark the insertion depth and rotation angle of the header slip joints. **DO NOT MARK EXHAUST PIPES WITH A PENCIL OR ANY OTHER GRAPHITE OR CARBON BASED MARKING DEVICE.**
- 6.5.7 Remove exhaust pipes from cylinders 2 and 4 and separate them from the collector assembly.
- 6.5.8 Remove the collector assembly by pulling out from the 1 and 3 cylinder side.
- 6.5.9 Remove the 1 & 3 headers.
- 6.5.10 Remove the engine mount bolt and support rod if necessary (classic tailpipes only).

6.6 Inspection

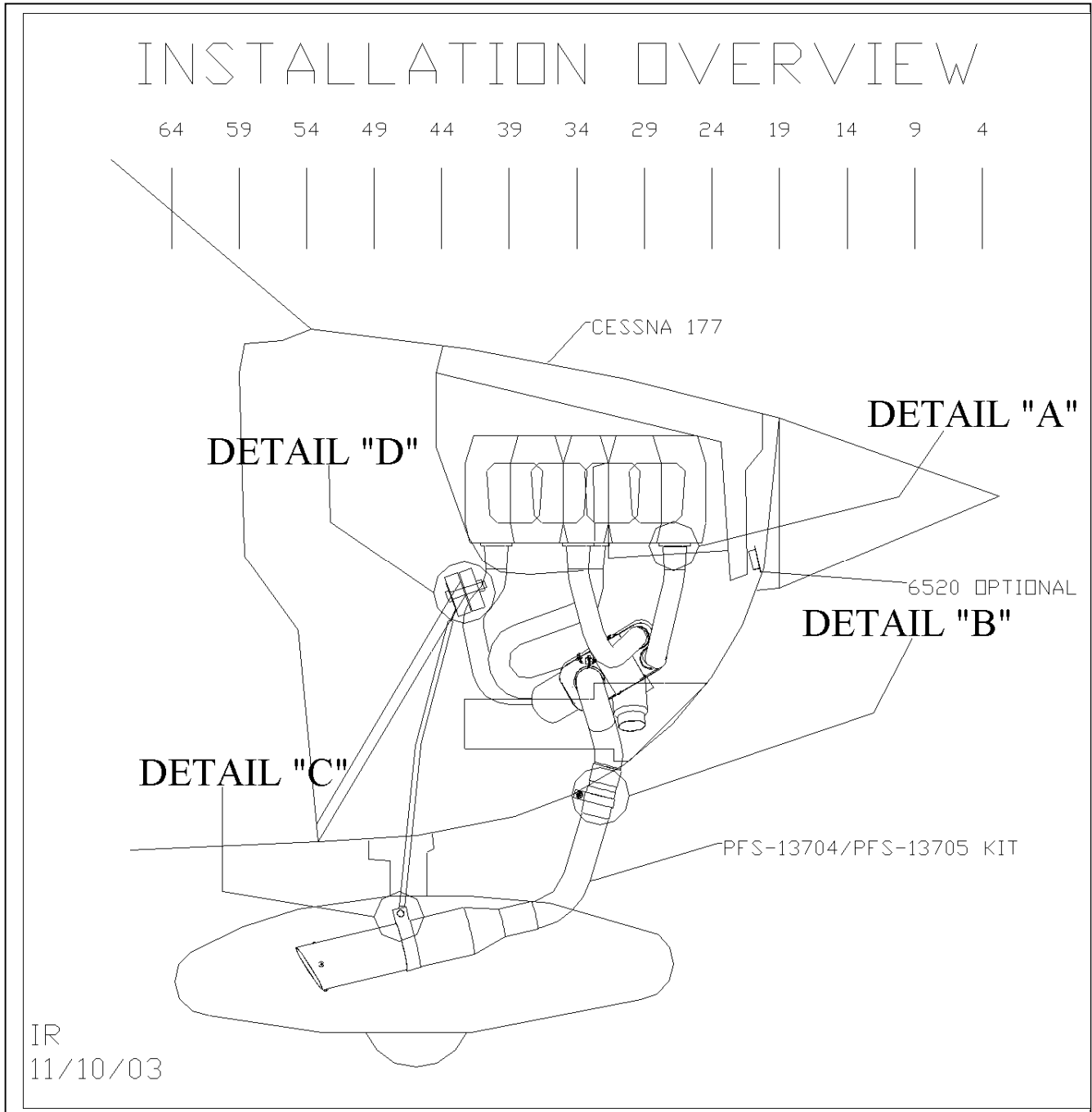
The exhaust system must be thoroughly inspected, especially within the heat exchanger section. A detailed inspection of the exhaust system must be performed in accordance with the latest revision of this document at either 100 hour or Annual intervals. All components displaying cracking or general deterioration must be replaced with new parts or repaired in accordance with the latest approved revision of AC 43.13.

- 6.6.1 Remove engine cowling
- 6.6.2 Loosen shrouds so that all surfaces of the exhaust system are visible.

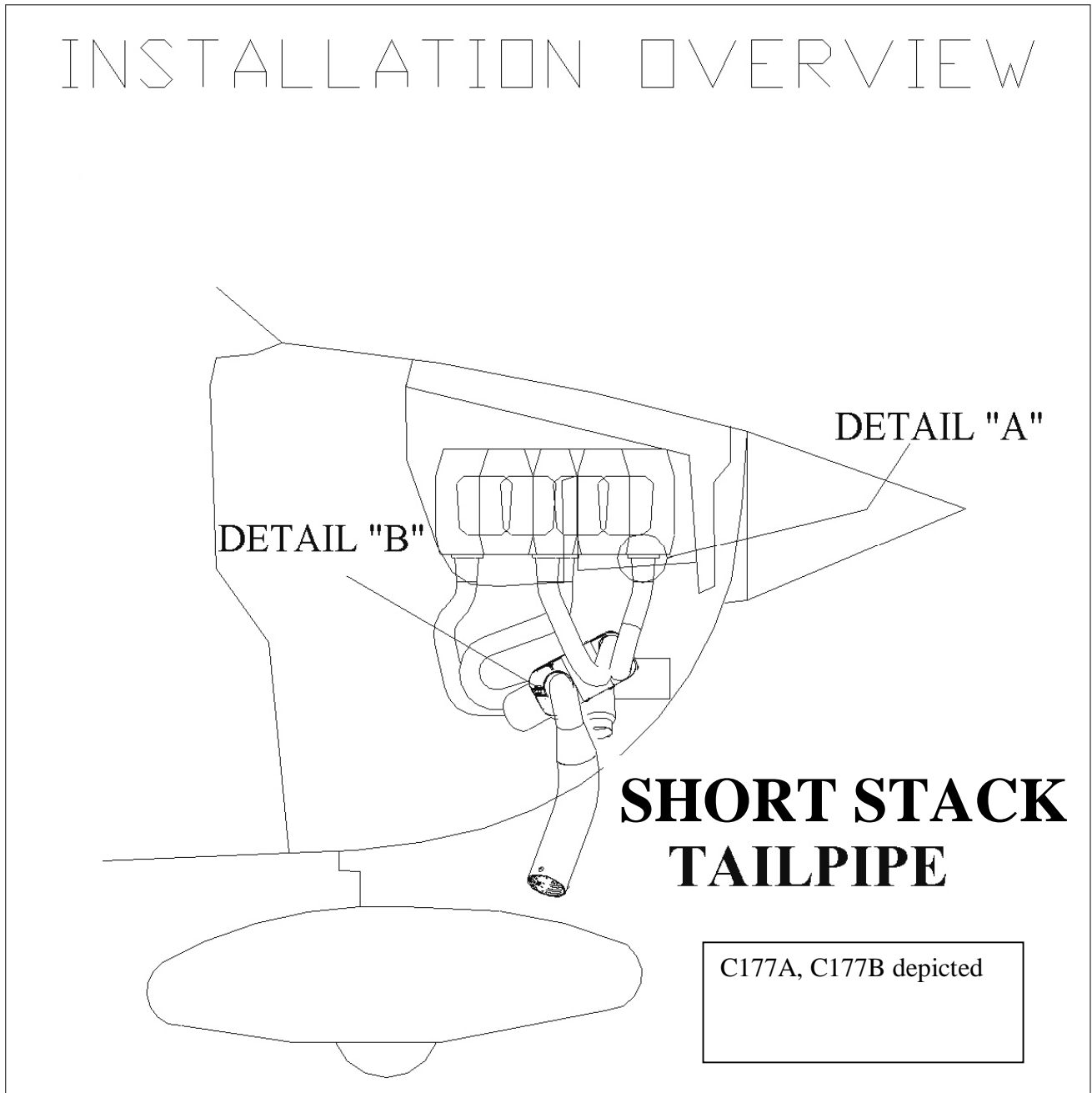
- 6.6.3 Check for holes, cracks, and burned spots. Especially check areas adjacent to welds. Look for exhaust gas deposits in surrounding areas. Look for unusual tube discoloration. This may indicate an exhaust leak.
- 6.6.4 Inspect the packing material in the muffler body. If the packing (or silencer cone on short stack tailpipes) is missing or deteriorated, it will require replacement. New packing inserts and silencer cones are available from Power Flow Systems, Inc.
- 6.6.5 Inspect the ball joint for freedom of movement (classic tailpipes only). A seized ball joint may cause other components to crack. If penetrating lube won't free a seized ball joint, please contact Power Flow Systems, Inc. for a replacement.
- 6.6.6 Verify that a placard is installed in clear view of the pilot that reads: "The Power Flow Systems, Inc. tuned exhaust system installed on this aircraft may cause the aircraft to burn more fuel at certain power settings. It is the Pilot's responsibility to determine what, if any, change in fuel flow exists and to plan accordingly."
- 6.6.7 Inspect screen covering carb heat outlet. Screens must be secure with no risk of material breaking off.
- 6.6.8 Inspect pins on clamps. Pins should not indicate excessive wear or cutting. If worn or cut contact Power Flow Systems, Inc. for replacement.
- 6.6.9 Inspect holes that pins are inserted in for elongation. If elongated contact Power Flow Systems, Inc. for replacement.
- 6.6.10 **All slip joints must be disassembled and lubricated with a high-temperature anti-seize compound (MIL-A-907E or equivalent) at 500hr or Annual intervals, whichever comes first. This should be performed more frequently if headers seize between inspections.** While disassembled, inspect collect and header slip joints for wear or galling.
- 6.6.11 If any defects (cracks, burns, etc.) on the collector assembly (other than on the shroud) are noted during the visual inspection, then the collector needs to be pressure tested using the procedure below:
- Remove exhaust pipes and heat exchanger assembly.
 - Remove shrouds.
 - Seal openings with expansion rubber plugs.
 - Submerge the collector assembly in water.
 - Using a manometer or pressure gauge, apply 3.0 to 3.5 PSI (approximately 7" Hg) of air pressure.
 - Let the unit sit pressurized for 10 to 30 seconds. The leak rate should be zero.
 - If a leak is found in the collector assembly, replace before further flight.
 - If no leaks are found, dry components and install on airplane.

INSTALLATION OVERVIEW

Classic Tailpipe

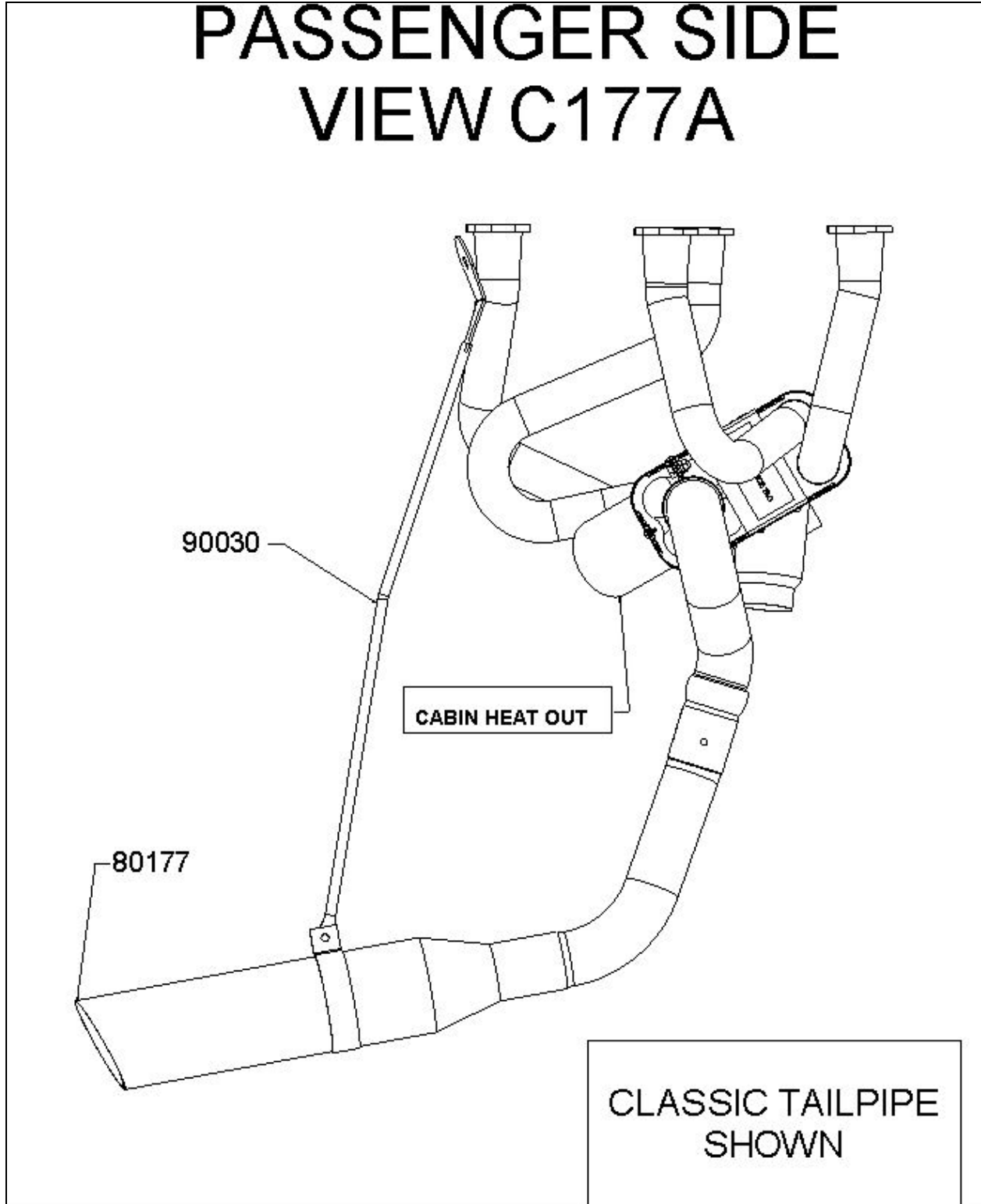


Short Stack Tailpipe

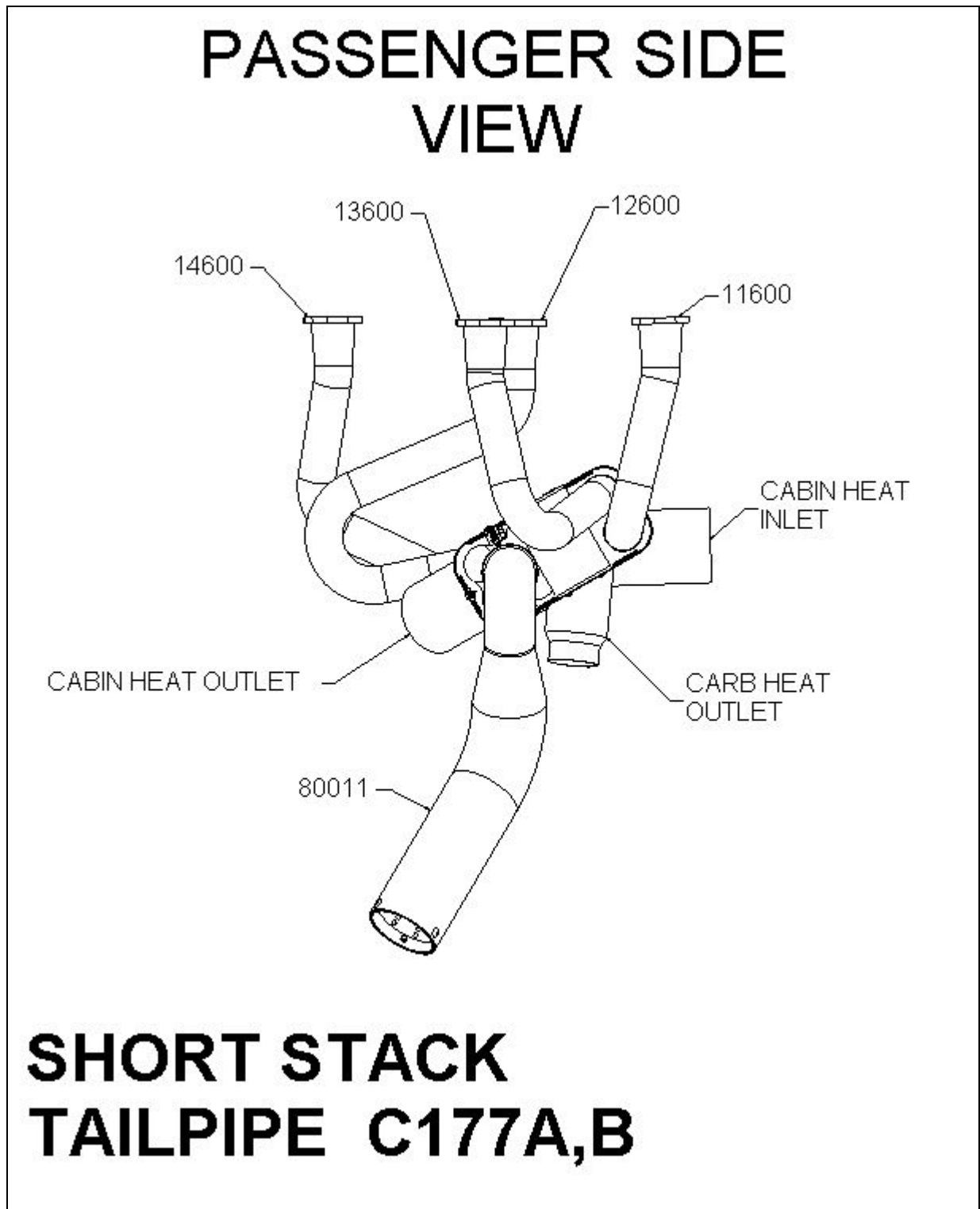


Note: Heat shroud may differ in appearance.

PASSENGER SIDE VIEW
C177A - Classic Tailpipe

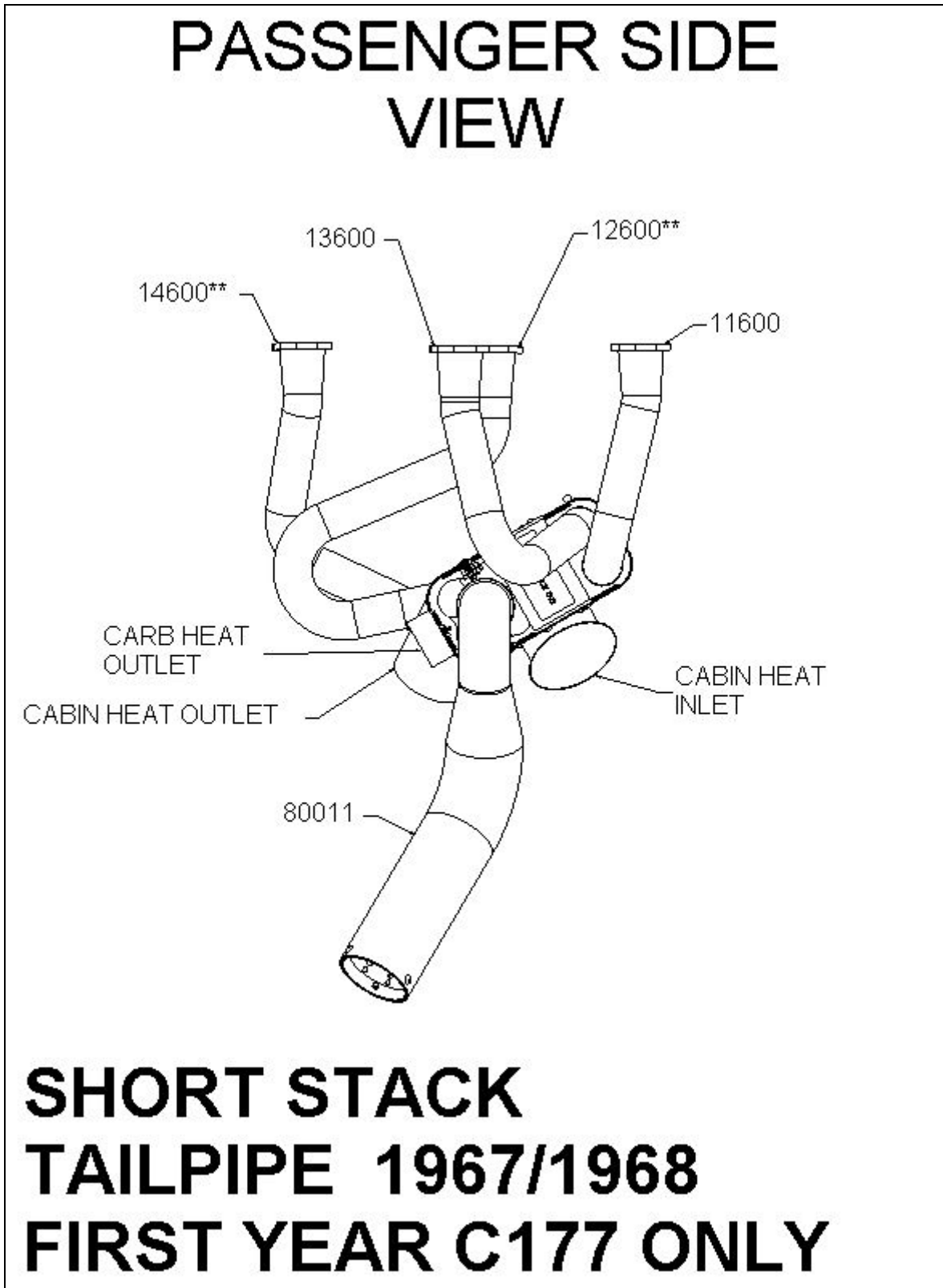


C177A, B - Short Stack Tailpipe

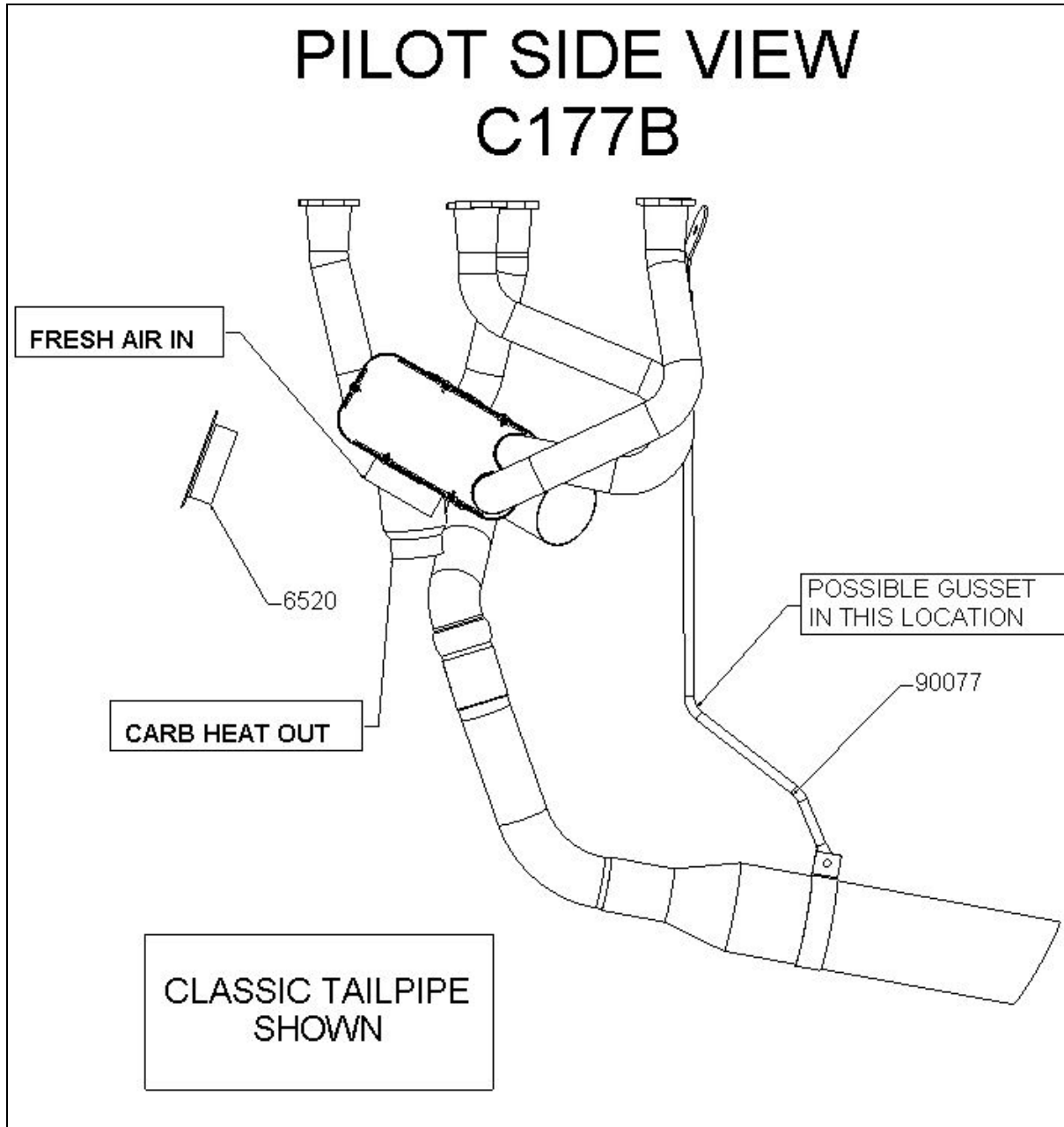


Note: Heat shroud may differ in appearance.

First year 1967/1968 C177 - Short Stack Tailpipe

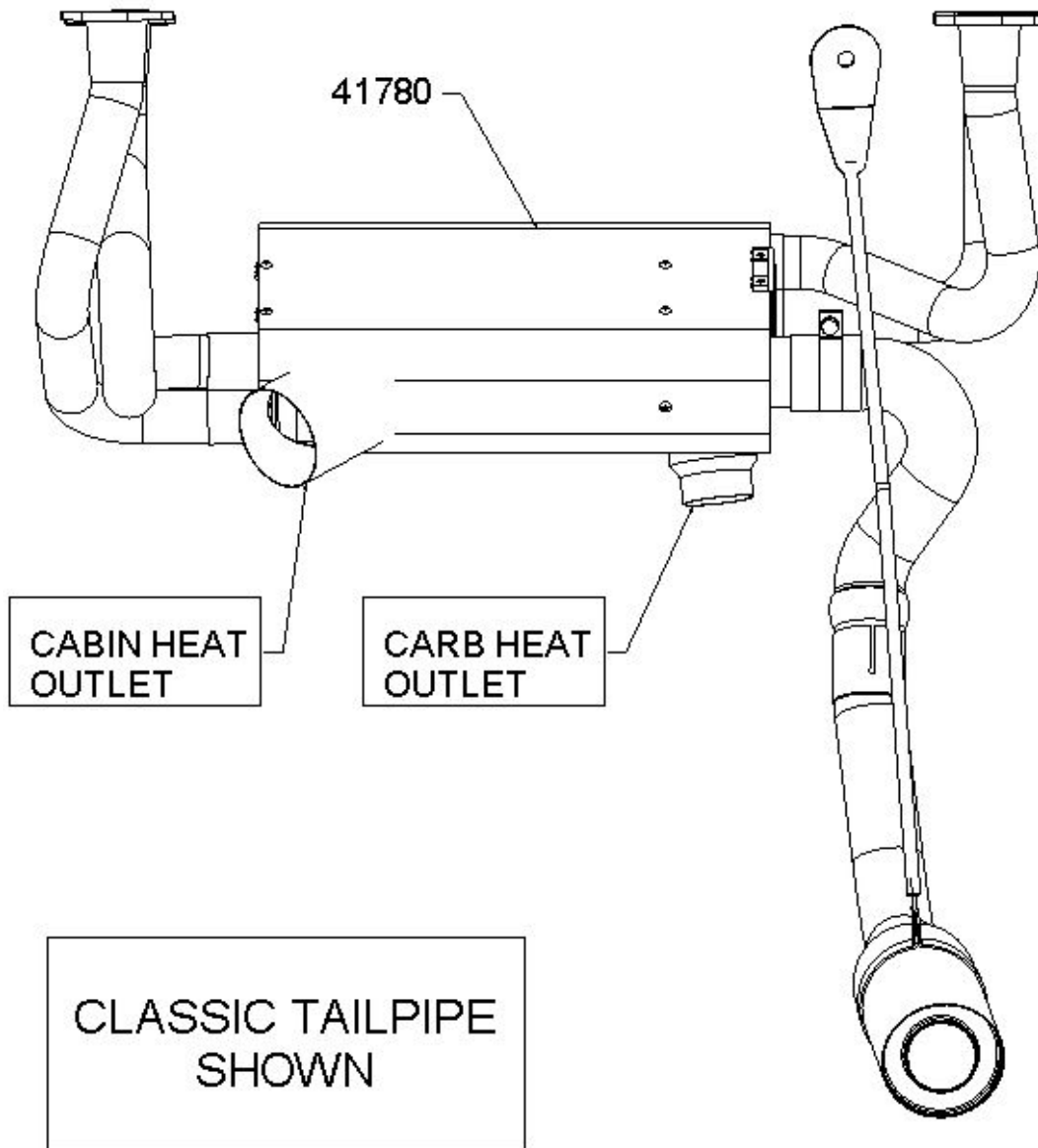


**PILOT SIDE VIEW
C177B - Classic**



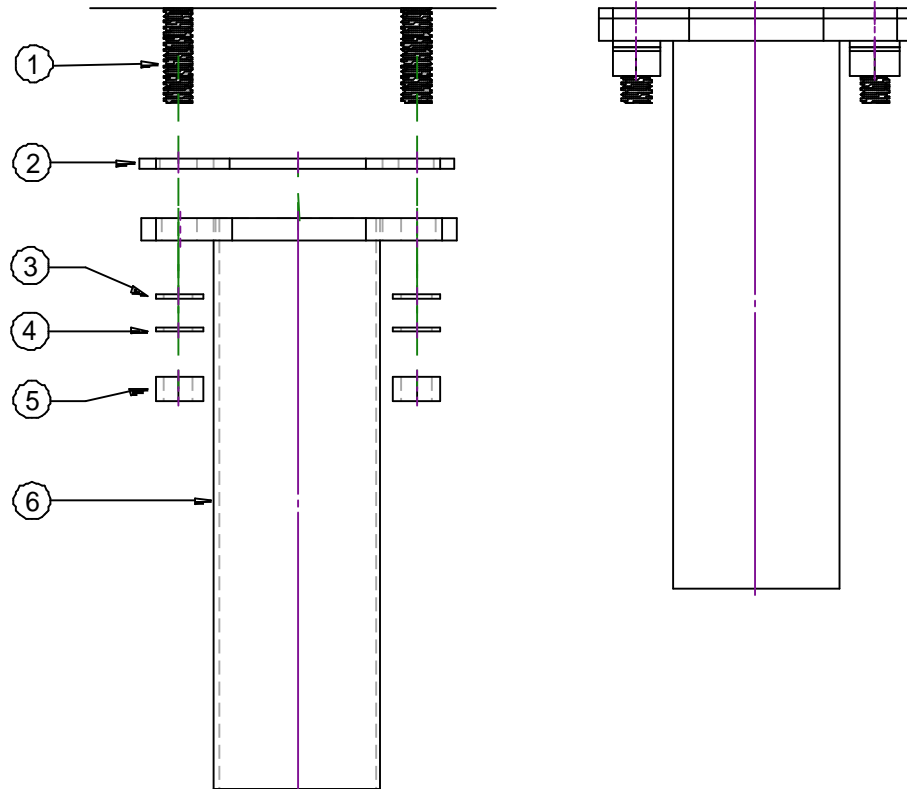
REAR VIEW
C177A - Classic

REAR VIEW C177A



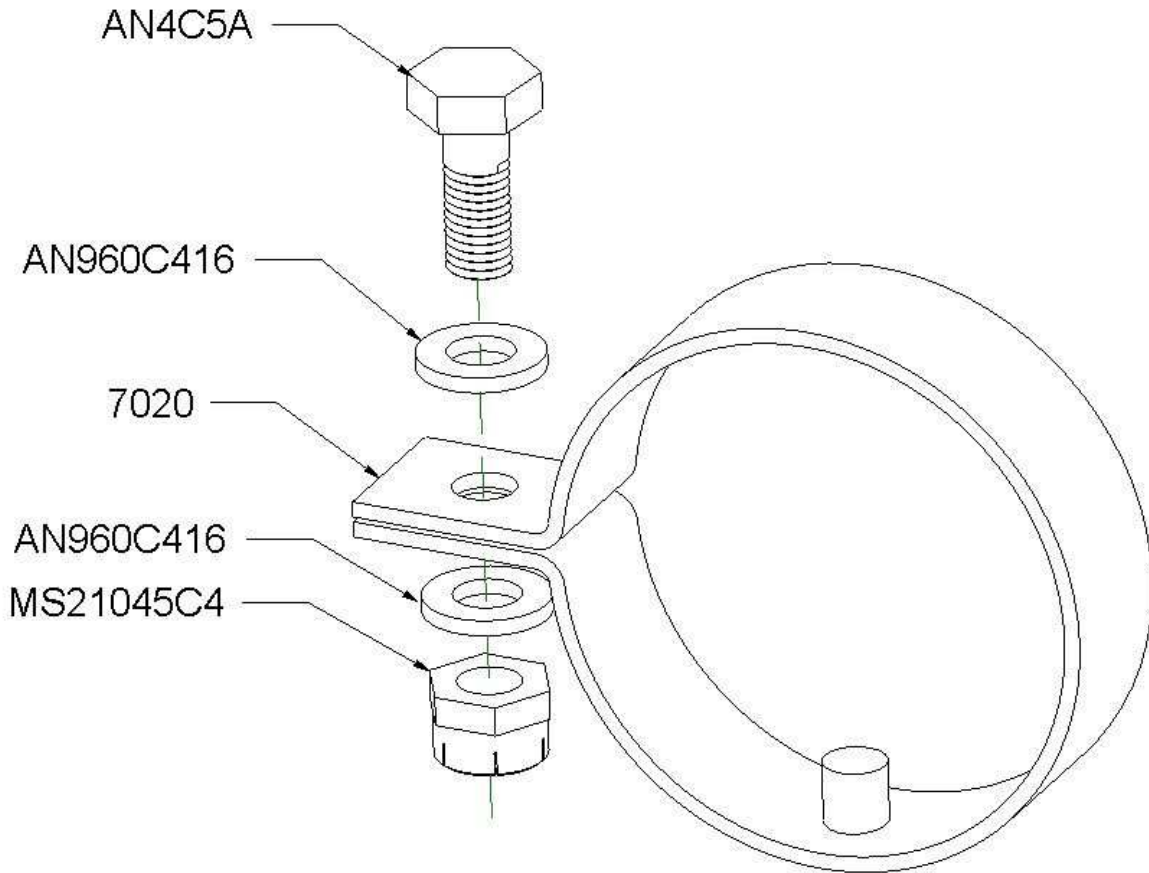
DETAIL A

- | | |
|--------------------|-----------------|
| 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 |



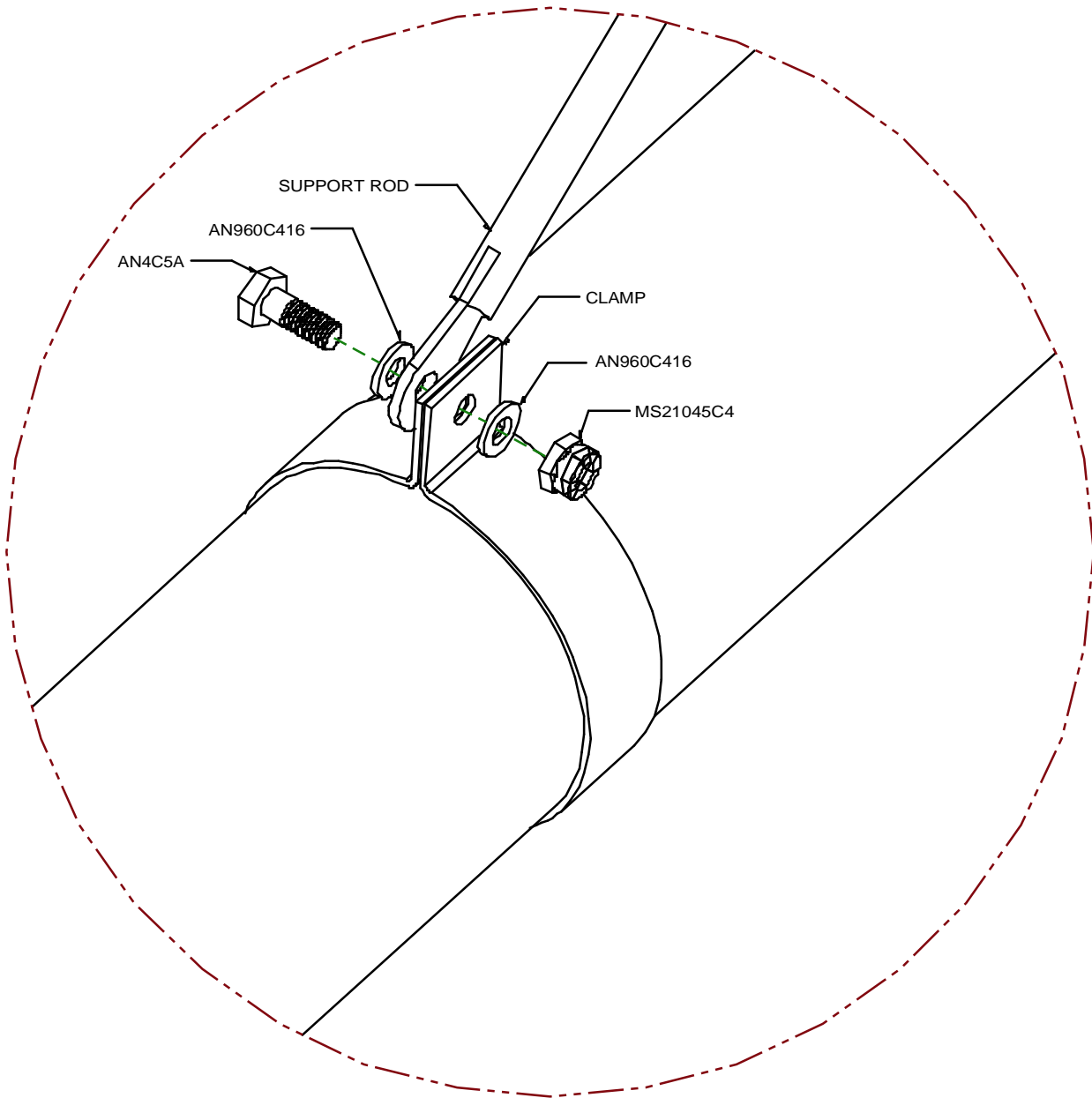
Note: Equivalent hardware may be used.

DETAIL B



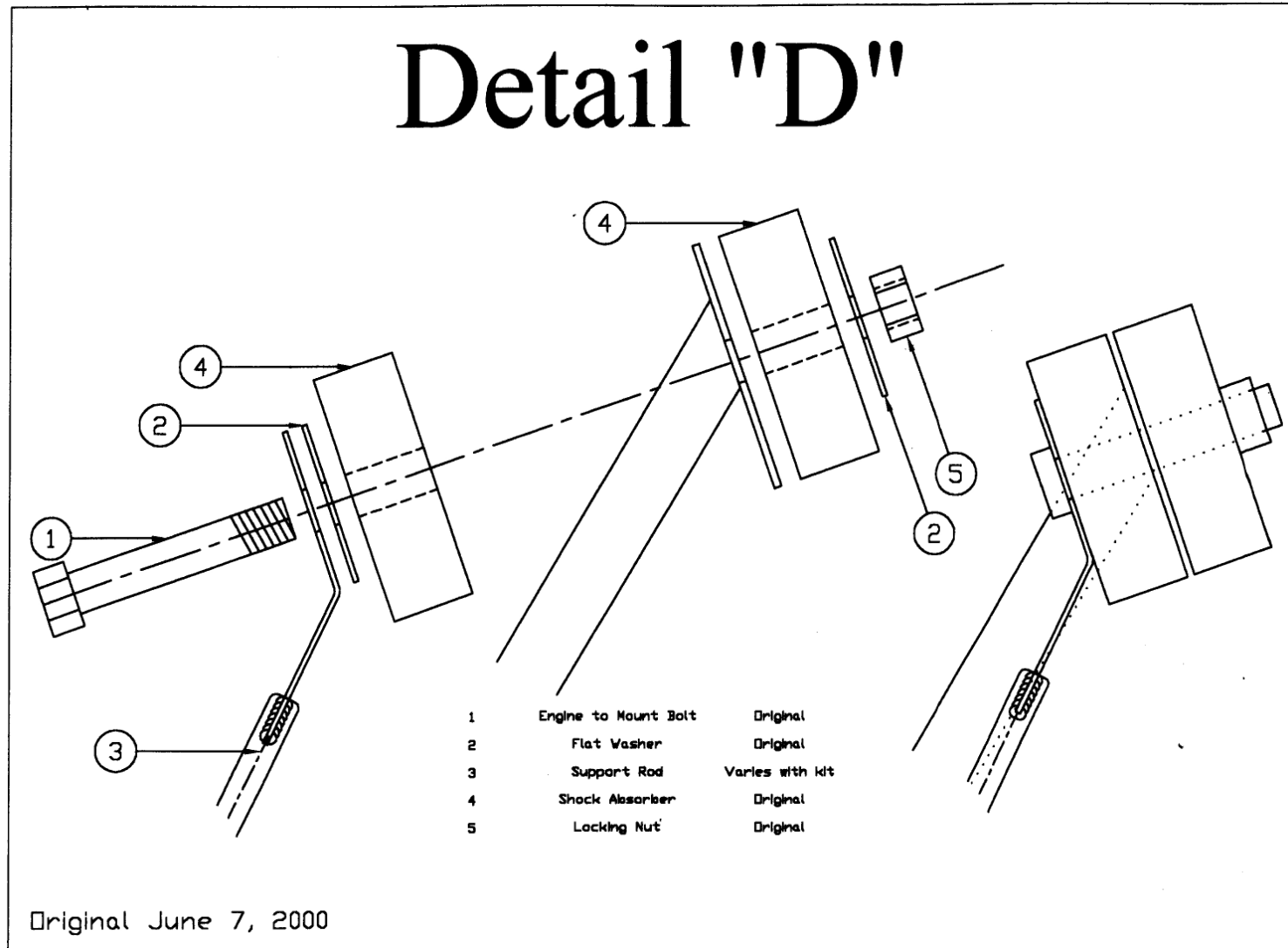
Equivalent Hardware may be supplied.

DETAIL C



Equivalent Hardware may be supplied.

DETAIL D



United States of America
Department of Transportation -- Federal Aviation Administration
Supplemental Type Certificate

Number SA02674AT

This certificate issued to Power Flow Systems, Inc.
1585 Aviation Center Parkway
Hangar 804
Daytona Beach, FL 32114

STC NOT VALID
WITHOUT LETTER OF
AUTHORIZATION 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 hereon meets the airworthiness requirements of Part 23 of the Federal Aviation Regulations.

Original Product - Type Certificate Number : A13CE
Make : Cessna
Model : 177, A, B

Description of Type Design Change:

Modification of engine exhaust system for improved engine performance by installation of Power Flow Systems, Inc. Tuned Exhaust System per Master Drawing List, PFS-13740-00, Revision, IR, dated: 06/05/03 or Master Drawing List, PFS-13741-00, Revision, IR, dated: 11/26/03 and Installation Instructions Report, PFS-13750-00, Revision A, dated: 08/30/02 or Installation Instructions contained in Report PFS-13751-00, Revision, IR, dated: 11/26/03 or later FAA approved revision.

Limitations and Conditions: Airplane Flight Manual Supplement is not part of this STC. Instructions for Continued Airworthiness contained in Report, PFS-13760, Revision A, dated: 08/03/02 or PFS-13751-00, Revision IR, dated: 11/26/2003, as applicable, or later FAA approved revision is 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 determined 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 05, 2003

Date reissued : June 19, 2003

Date of issuance : June 09, 2003

Date amended : December 04, 2003



By direction of the Administrator

Melvin D. Taylor
(Signature)

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.