

APPLICABLE MODELS

PA-24, PA-24-250, PA-24-260, PA-24-400

KNOTS 2U, INC

DORSAL FIN

INSTALLATION MANUAL

ISSUE DATE 10/15/88

/ FAA
APPROVED

NOV 18 1996

CHICAGO AIRCRAFT
CERTIFICATION OFFICE
CENTRAL REGION

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REVISIONS

REV. No.	DATE	PAGE	EFFECT
H	10/25/96	ALL	Added Revisions to cover, changed installation procedures. See Knots 2U, Inc. Report Number SA526GL for previous revisions

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SECTION 1.0 BASEPLATE INSTALLATION

NOTE #1:

There are three fuselage skin seams which intersect the new dorsal fin. For the purposes of this manual we will reference the rear skin seam, the second seam forward of the front spar of the vertical fin and the forward skin seam (Station 157.0), the third skin seam forward of the front spar of the vertical fin. (see Detail #1)

1.1 LOCATING FIN MOUNTING POSITION.

Remove existing dorsal fin assembly by drilling out rivets. Remove mounting screws and existing fairing assembly. Mark a centerline on top of the fuselage by centering between the holes just drilled. Extend the centerline far enough forward to meet the forward skin seam at STA 157.0 (See Detail #1)

1.2 LOCATING DORSAL FIN ON FUSELAGE.

Referencing Detail #1, and using the rear skin seam, the 2nd seam forward of the front fin spar, and the marked centerline as reference, lay the baseplate **P/N BP** on the fuselage with the trailing edge 9.75 aft of the rear skin seam and properly centered through its entire length. Extend the centerline of the baseplate forward to STA 157 and rotate the leading edge baseplate .75 to the left to coincide with the displaced centerline. Mark the three hole locations (one at the front and two at the rear) through the baseplate and onto the fuselage. Remove the baseplate and drill three #40 holes in these locations. Cleco baseplate in place on the fuselage and trace a line around its perimeter onto the fuselage skin, also trace the airhole. Remove baseplate and clecos.

NOTE #2:

If you are relocating the cabin air inlet to the new dorsal fin skip to SECTION 2.0, at this time.

1.3 LOCATING AND DRILLING DORSAL FIN ATTACHMENT HOLES.

Drill out all roundhead rivets within the baseplate perimeter which will interfere with the proper fit of the baseplate. Cleco baseplate into position and from inside the fuselage bay, using the holes just drilled, mark the locations onto the baseplate. Remove baseplate and drill marked locations. Cleco baseplate in place and referencing Detail #1 drill the remaining attachment holes through baseplate and fuselage, cleco as you go. Check the air hole in the baseplate. It must not cover any of the air hole in the fuselage. Trim Baseplate air hole, as needed, to clear.

1.4 MOVING ORIGINAL FAIRING ATTACH ANGLES.

Drill out rivets attaching the 2 angles which were used as attach points for the original dorsal fin. Using a straight edge extend left and right edges of baseplate aft and mark and reposition the angles .625 (nominal) outboard to match the extended lines. Mark new hole locations onto the fuselage through the existing angle holes. Drill to #30 hole size.

1.5 CLEANING AND DEBURRING.

Deburr all holes and clean shavings from aircraft. Corrosion proof all holes in angles, fuselage and baseplate, with alodine solution or equivalent.

1.6 RIVETING BASEPLATE AND ANGLES TO FUSELAGE.

Cleco baseplate and angles to fuselage. Using **P/N CR3243-4-2** rivets, rivet baseplate in place remove clecos as you go. Also, rivet angles into place and fill original angle attachment holes. Seal edges of baseplate to fuselage and any open areas using RTV.

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SECTION 2.0 RELOCATING REAR SEAT CABIN AIR INLET**NOTE #3:**

KNOTS 2U, INC. does not supply the parts and/or materials to install the relocated rear seat cabin air inlet. It is fully STC'd and can be fabricated and installed per these instructions and Detail #3. The tubing referred to in Detail #3 can be fabricated from 2.625 inch I.D. aluminum tubing or other suitable material, such as PVC pipe. The rest of the parts are standard A/N hardware and SCAT 2 tubing.

2.1 LOCATING AND CUTTING NEW AIR HOLE.

Install the dorsal fin baseplate onto the top of the fuselage as in step 1.2. Trace an outline of the 3.125 inch air hole in the baseplate, onto the fuselage. Remove the baseplate. Locate the center of the 3.125 inch marking on the fuselage. Using that center location, draw a 2.625 inch diameter circle. Drill out the marked location to a 2.625 inch diameter hole. Deburr the edge of the hole.

2.2 REAR AIR DUCT ADAPTER INSTALLATION.

Locate and drill holes on 5.25 inch .032 Alclad aluminum plate per "PLATE DETAIL" in Detail #3. Fabricate and install angles and rivet 1.75 inch tubing to plate. Position plate inside fuselage and center the large hole directly below the 2.625 inch hole in the fuselage. The front edge of the plate should be parallel to the bulkhead, just forward of the hole. Using the plate as a drilling template, drill matching #40 holes through the fuselage. Cleco as you go. Remove plate, deburr holes and clean drill shavings from aircraft and parts. Corrosion proof with alodine solution, or equivalent. Reinstall plate and rivet, using (6) *P/N AN426-3-4* rivets.

2.3 FORWARD AIR DUCT ADAPTER INSTALLATION.

Drill out rivets which attach original roof mounted airscoop *P/N 18405-00*. Remove airscoop. Drill out rivets which attach air box assembly *P/N 19477-06*. Disconnect drain tube and cabin air ducts from this assembly. Remove air inlet box and cut out the bottom surface. Deburr the edge of cut out. Install 2 inch length of tubing over the bottom of the air inlet box assembly. Notch out tubing to clear air ducts (see Detail #3) to attain .75 inch overlap from the bottom of the air inlet box assembly to the top of the un-notched portion of tubing. Using .375 inch edge distance, locate and drill (4) #27 holes, spaced equally around tubing. Drill these holes through the air inlet box assembly, cleco as you go. Remove tubing and deburr all holes, corrosion proof with alodine solution, or equivalent. Reinstall tubing on air inlet box and rivet using (4) *P/N CR3243-4-2* Cherrymax rivets. Seal the joint with RTV sealant, or equivalent.

2.4 PATCHING ORIGINAL AIR SCOOP LOCATION.

Cut a doubler from a piece of .032 2024T3 aluminum to the same perimeter dimensions as the air inlet box assembly flange. Deburr the edges and corrosion proof with alodine solution, or equivalent. Reinstall air inlet box assembly in original location sandwiching the .032 doubler between the box assembly and the fuselage skin. Drill the original holes through the doubler. Countersink skin holes and rivet the box assembly and doubler in place, using *P/N AN426-3-4* rivets. Countersink the holes which attached the original airscoop. Fill these holes, using *P/N AN426-3-4* rivets. Make a plug patch over the original air inlet hole in the top of the fuselage and rivet to the .032 doubler, using *P/N CR3242-4-2* flush head Cherrymax rivets.

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2.5 CENTER AIR DUCT ADAPTER INSTALLATION.

Cut 3" length of tubing and drill .375 hole at center location. Install *P/N AN840-4D* fitting and two equal length sections of 2.75 I.D. *SCAT 2* Aero-duct hose of adequate length to connect center tubing to forward air duct adapter and to rear air duct adapter. Use *M40* hose clamps to secure, with drain tube facing downward. Ensure that center air duct adapter is the lowest point of the air inlet system. Support Aero-duct, as necessary, to ensure control cable clearance. Attach original system drain line to drain fitting on center tubing. (see Detail #3)

2.6 AIR VENT PARTS LIST.

PART NUMBER	NO. REQ	DESCRIPTION
Tubing	6.75"	2.625 aluminum tubing
CR3243-4-2	4	Cherrymax roundhead rivet
AN426-3-4	12	Countersunk rivet
AN426-3-3	6	Rivet
AN840-4D	1	Hose fitting
M40	4	Hose clamp
Plate	1	.032 2024T3 Alclad aluminum
Angle	3	.032 2024T3 Alclad aluminum
Scat*	2*	2.75 Aero-duct hose (*Length as required)

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SECTION 3.0 HIDDEN ANTENNA INSTALLATION.**3.1 MOUNTING COM ANTENNAS**

Install antennas per Detail #2 and Dorne & Margolin templates and Installation Instructions.

3.2 ANTENNA INSTALLATION PARTS LIST.

PART NUMBER	NO. REQ	DESCRIPTION
DM C63-1/A	2	Dorne/margolin antenna
MS24693C274	6	Screw
MS20365C1032A	6	Locknut
MS35335-60	6	Lockwasher

SECTION 4.0 FINAL INSTALLATION OF DORSAL FIN.**4.1 NOTCHING BASEPLATE FOR AIRBOX.**

Referring to Detail #1 place fin on top of baseplate and mark the areas where the baseplate sides will interfere with the airbox and naca duct. Trim these areas on baseplate, radius all corners.

4.2 SECURING LEADING EDGE OF DORSAL FIN.

Position fin properly over baseplate and drill a #21 hole through the leading edge of the fin at a position 1" aft of the forward tip. Where the dorsal fin intersects the forward skin seam (STA 157.0) drill (2) #30 pilot holes, one centered on the flange of the fin on each side, and in line with existing rivet row. Counter sink flange holes to 100 degrees and countersink the leading edge hole to accept the *P/N DP1075-12SS Washer*. Remove fin and install (3) *P/N A6-75* rivnuts in the fuselage at these locations. Install fin and secure leading edge with a *P/N MS24693C29* screw and *P/N DP1075-12SS Washer*. Secure flanges with (2) *P/N AN507-632-R10 Screws*.

4.3 LOCATING AND DRILLING FIN ATTACHMENT HOLES.

Make sure dorsal fin is snugly fit onto the fuselage. Sand bags or an appropriate method of weight can be used to hold dorsal fin firmly onto fuselage. Beginning on the right side drill a #40 hole 1" forward of the aft end of the baseplate .50 up from the lip. Drill another #40 hole 1.5 aft of the forward edge of the baseplate .5 up from the lip. Repeat on the left side and Cleco the dorsal fin in position at these 4 locations. Using 6" (nominal) spacing move aft on the right side of the fin and drill (6) #40 holes (omitting hole at the airbox notch). Using the same hole positioning drill (7) #40 holes on the left side of fin. Cleco as you go. Referencing Detail #1 move back to the original attach angles and using a hole finder locate and drill all holes in front of the angles. Also, locate and drill all aft edge mounting holes along vertical fin.

4.4 FINAL ATTACHMENT OF DORSAL FIN.

Remove dorsal fin from baseplate. Enlarge side holes on baseplate to #16 hole size. Attach Clip nuts *P/N A1785-6Z1D* over holes. Enlarge side holes in fin to fit the *P/N DP1075-12SS* washers. Install foam tape around bottom perimeter of dorsal fin and place fin back onto fuselage. Secure in place using *P/N NAS548P6-10* screws into tinnermans clip nuts. Use supplied *P/N A3235-020-24A* washers and *P/N FHA10X3/4* screws to secure trailing edge to vertical fin and *P/N A3135-017-24A* washers and *P/N FHA8X3/4* screws to secure fin to the relocated attach angles. The edge of the fin may be sealed to the fuselage with a bead of RTV, at this time.

SECTION 5.0 PAPERWORK.

5.1 DORSAL FIN INSTALLATION PARTS LIST

PART NUMBER	No. REQ.	DESCRIPTION
RDF	1	Removable Dorsal Fin
BP	1	Baseplate
189-715	16 FT	Piper Window Seal
A3235-020-24A	10	C/S Washer
FHA10x3/4	10	C/S Screw
A3135-017-24A	8	C/S Washer
FHA 8x3/4	8	C/S Screw
A1785-6Z1D	15	Tinnerman Clip Nut
DP1075-12SS	16	C/S Washer
NAS548P6-10	15	C/S Screw
MS24693C29	1	Screw
AN507-632-R10	2	C/S Screw
A6-75	3	Rivnut
CR3243-4-2	55	Cherrymax Rivet

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5.2 WEIGHT AND BALANCE DATA.

COMPONENT	WEIGHT	ARM
<u>REMOVED</u>		
Original dorsal fin	- .66 LBS.	188.75
Original fairing assembly	- 1.31 LBS.	213.75
<u>INSTALLED</u>		
New dorsal fin and hardware	+ 6.25 LBS.	212.00
<u>AIR VENT:</u>		
Aft tubing clamp and hose	+ .75 LBS.	212.00
Center tubing, clamps, doubler & fitting	+ 1.81 LBS.	190.00
Forward tubing, clamp, doubler & hose	+ .50 LBS.	168.00
<u>ANTENNAS:</u>		
Forward antenna & hardware	+ .50 LBS.	184.50
Aft antenna & hardware	+ .60 LBS.	223.50

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Perform paperwork work (form 337 and logbook entries). Place ***KNOTS 2U, INC.*** Maintenance manual and supplemental type certificate with logbooks.

SECTION 6.0 MAINTENANCE MANUAL

KNOTS 2U, INC.

PIPER PA-24 DORSAL FIN

PART A. INSPECTION

1. Daily inspection at pre-flight to, check security of dorsal fin attachment to aircraft. Also, check for any obstruction in NACA duct, or cracks in the dorsal fin.
2. During annual or 100 hour inspections inspect for obstructions in NACA duct and inspect attachment hardware for excessive wear or looseness. Check drain for obstructions.

PART B. MAINTENANCE

1. Keep NACA duct clear of obstructions.
2. If any attachment hardware is found to be excessively worn or loose during the 100 hour/annual inspection, it should be replaced.

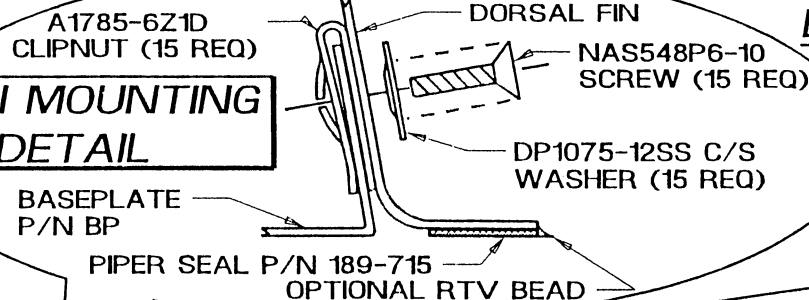
PART C. CRACKING OR DEFECTS

1. If any cracks are found on dorsal fin, they should be stop drilled.
2. If any crack exceeds 2 inches in length; or, if a crack runs from an attachment hole to the outer edge of the dorsal fin, remove the fin and repair the crack according to FAR 43.13-1 Acceptable Methods, Techniques, and Practices - Aircraft Inspection and Repair, Chapter 2.

PIPER PA-24, PA-30 & PA-39 DORSAL FIN INSTALLATION

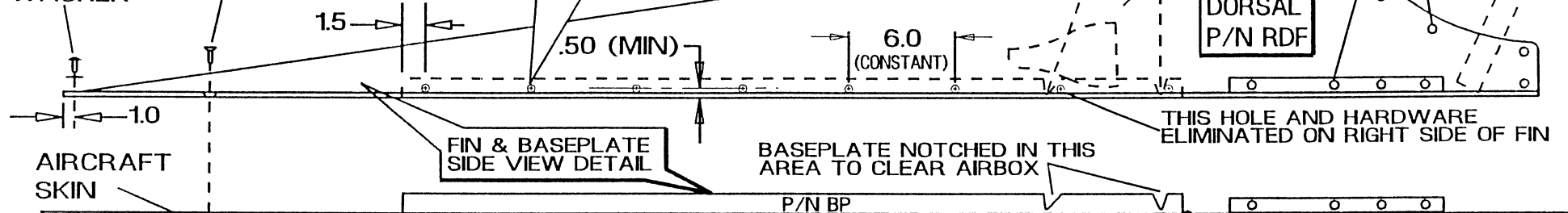
INSTALL (1) AN507-632-R10 SCREW AND (1) A6-75 RIVNUT, CENTERED ON FIN FLANGE, ON EACH SIDE OF FIN, ALIGNED WITH EXISTING RIVET ROW. DRILL RIVNUT HOLE TO #13 DRILL AND C/S FLANGE 100°

FIN MOUNTING DETAIL



DRILL HOLES IN DORSAL TO MATCH EXISTING HOLES ON VERTICAL FIN AND ANGLES

MS24693C29 SCREW AND DP1075-12SS WASHER



A6-75 RIVNUT

THIS SEAM IS STATION 157.0

SEE SECTION 1.3 AND 1.4 OF INSTALLATION MANUAL

REAR SEAT AIR INLET (SOME MODELS)

REFERENCE FOR FIN CENTERLINE ROTATION

ON PA-39 AND COUNTER ROTATING PA-30 AIRCRAFT INSTALL THE FIN ON THE FUSELAGE CENTERLINE

— AFT —

CR3242-4-2 RIVETS (TYP)

ON PA-24 AND NORMAL ROTATING PA-30 AIRCRAFT ROTATE FIN CENTERLINE .75 INCHES TO LEFT OF FUSELAGE C/L AT STA 157.0

TOP VIEW OF TAILCONE

SEE INSTALLATION MANUAL NOTE #1 "REFERENCE SKIN SEAM"

FRONT FIN SPAR

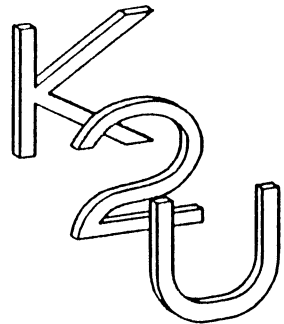
ENLARGED VIEW OF RIVET LOCATIONS

X INDICATES 3 #40 HOLE LOCATIONS THAT ARE USED TO POSITION BASEPLATE. SEE SECTION 1.2

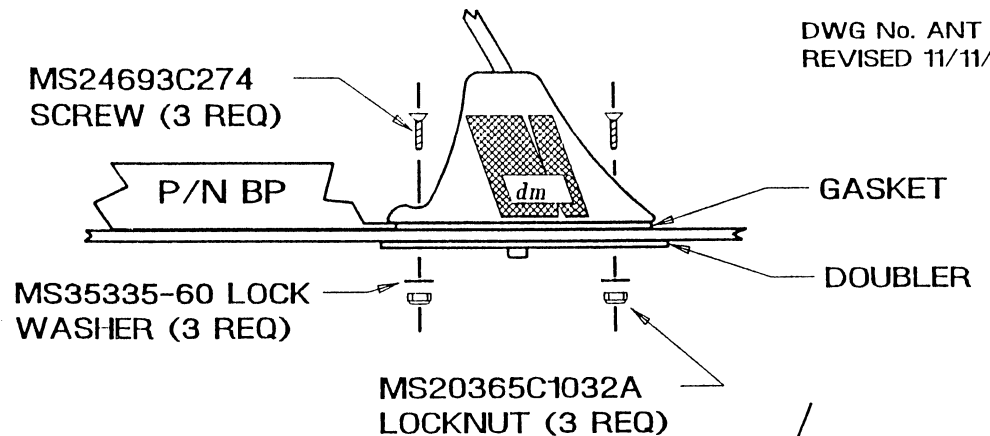
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PA-24, PA-30/39 HIDDEN ANTENNA INSTALLATION DETAIL

DWG No. ANT
REVISED 11/11/95



ANTENNA MOUNTING
DETAIL



SIDE VIEW

OVERALL VIEW OF
ANTENNA
INSTALLATION

4.0 (NOMINAL) FROM
AFT END OF ANTENNA
TO FRONT OF AIRBOX

AFT →

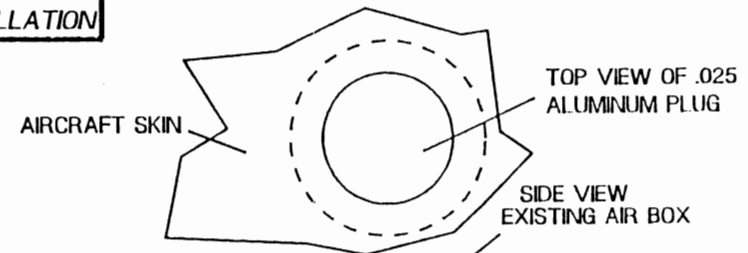
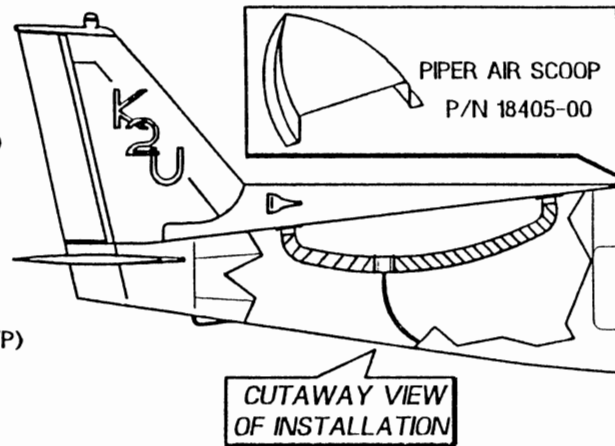
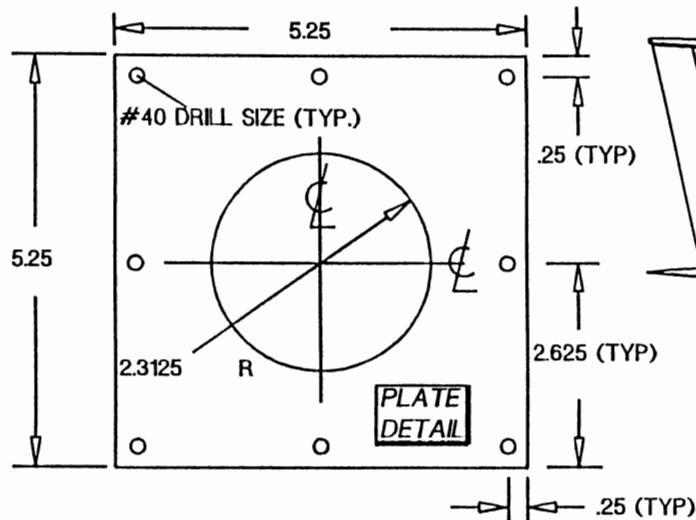
REAR LIP OF AFT ANTENNA OVERLAPS
TRAILING EDGE OF BASEPLATE

TOP VIEW

DETAIL #2
PAGE -7-

PA-24 CABIN AIR INLET INSTALLATION

DWG No. FINAIR
REVISED 11/11/95



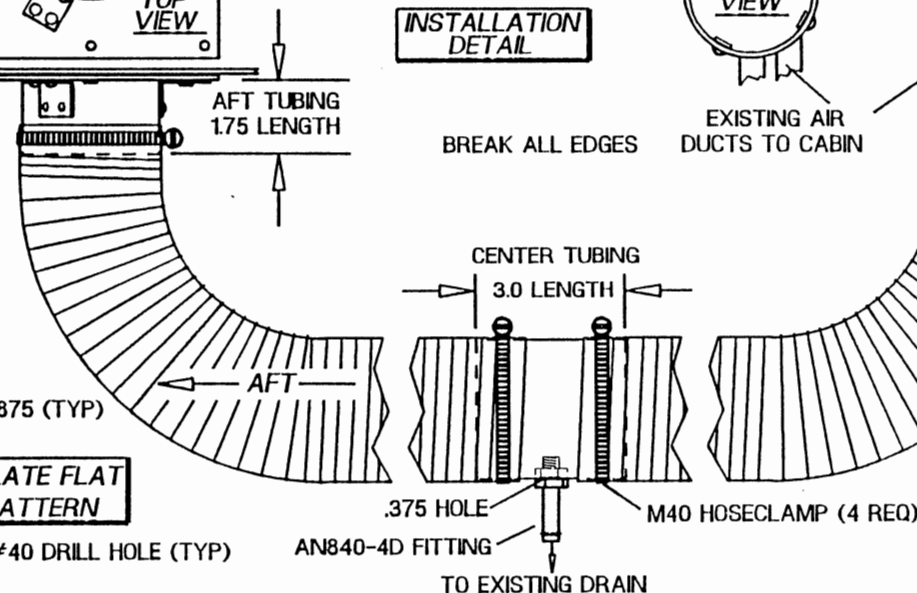
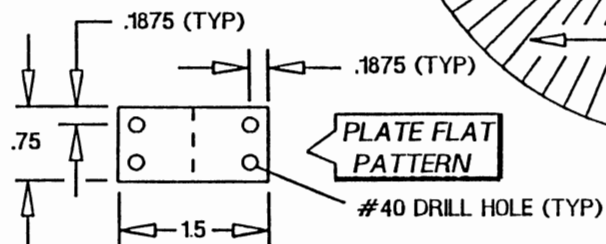
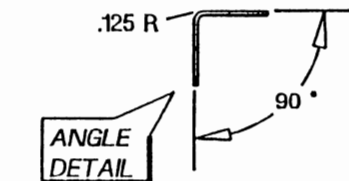
ANGLES ATTACHED TO
PLATE WITH AN426-3-4
RIVETS (6 REQUIRED)

ANGLES ATTACHED TO
TUBE WITH AN426-3-3
RIVETS. (6 REQUIRED)

FLANGE ATTACHED TO
SKIN WITH AN426-3-4
C/S RIVETS (6 REQUIRED)

TUBE ATTACHED TO
EXISTING AIR INLET
WITH CR3243-4-2 CHERRY
RIVETS SPACED AT 90°
(4 REQUIRED)

INSTALLATION
DETAIL



DETAIL #3
PAGE -8-

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