BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 1.14

PRODUCTION PROCESS STANDARD

USE OF PNEUMATIC RIVET GUNS

Issue 6
- This standard supersedes PPS 1.14, Issue 5.
- Vertical lines in the left hand margin indicate changes over the previous issue.
- Direct PPS related questions to PPS.Group@aero.bombardier.com or (416) 375-4365.
- This PPS is effective as of the distribution date.

Prepared By:	(Michael Wright)	October 9, 2012
	Production Process Standards (PPS)	
Approved By:	(L.K. John)	October 9, 2012
	Materials Technology	
	(B. DeVreede)	October 10, 2012
	Quality	

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1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for the set-up and operation of pneumatic rivet guns.

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction. The procedure specified in this PPS must be followed to ensure compliance with all applicable specifications. In general, if this PPS conflicts with the engineering drawing, follow the engineering drawing. The requirements specified in this PPS are necessary to fulfil the engineering design and reliability objectives.

1.1.2 Refer to PPS 13.26 for the subcontractor provisions applicable to this PPS.

2 Hazardous Materials

2.1 Before receipt at Bombardier Toronto (de Havilland), all materials must be approved and assigned Material Safety Data Sheet (MSDS) numbers by the Bombardier Toronto (de Havilland) Environment, Health and Safety Department. Refer to the manufacturer's MSDS for specific safety data on any of the materials specified in this PPS. If the MSDS is not available, contact the Bombardier Toronto (de Havilland) Environment, Health and Safety Department.

3 References

3.1 PPS 13.26 - General Subcontractor Provisions.

3.2 PPS 21.21 - General Sealing Practices.

4 Materials and Equipment

4.1 Materials

4.1.1 No materials specified.

4.2 Equipment

4.2.1 Pneumatic rivet guns (e.g., as specified in Table 1).

4.2.2 Flush rivet sets (e.g., Schaefer rivet sets as specified in Table 3, Table 4 and Table 5).

4.2.3 Urethane rivet gun covers (e.g., TS.411.03.50).

4.2.4 Bucking bars (e.g., TS.463.10.XXX and TS.463.11.XX as shown in Figure 1). Bucking bars must be of sufficient hardness to prevent marking of the bar during rivet installation.

4.2.5 Hearing protectors (e.g., Bombardier Toronto (de Havilland) approved hearing protectors).

4.2.6 Riveting aid tool (e.g., TS.463.12.11).

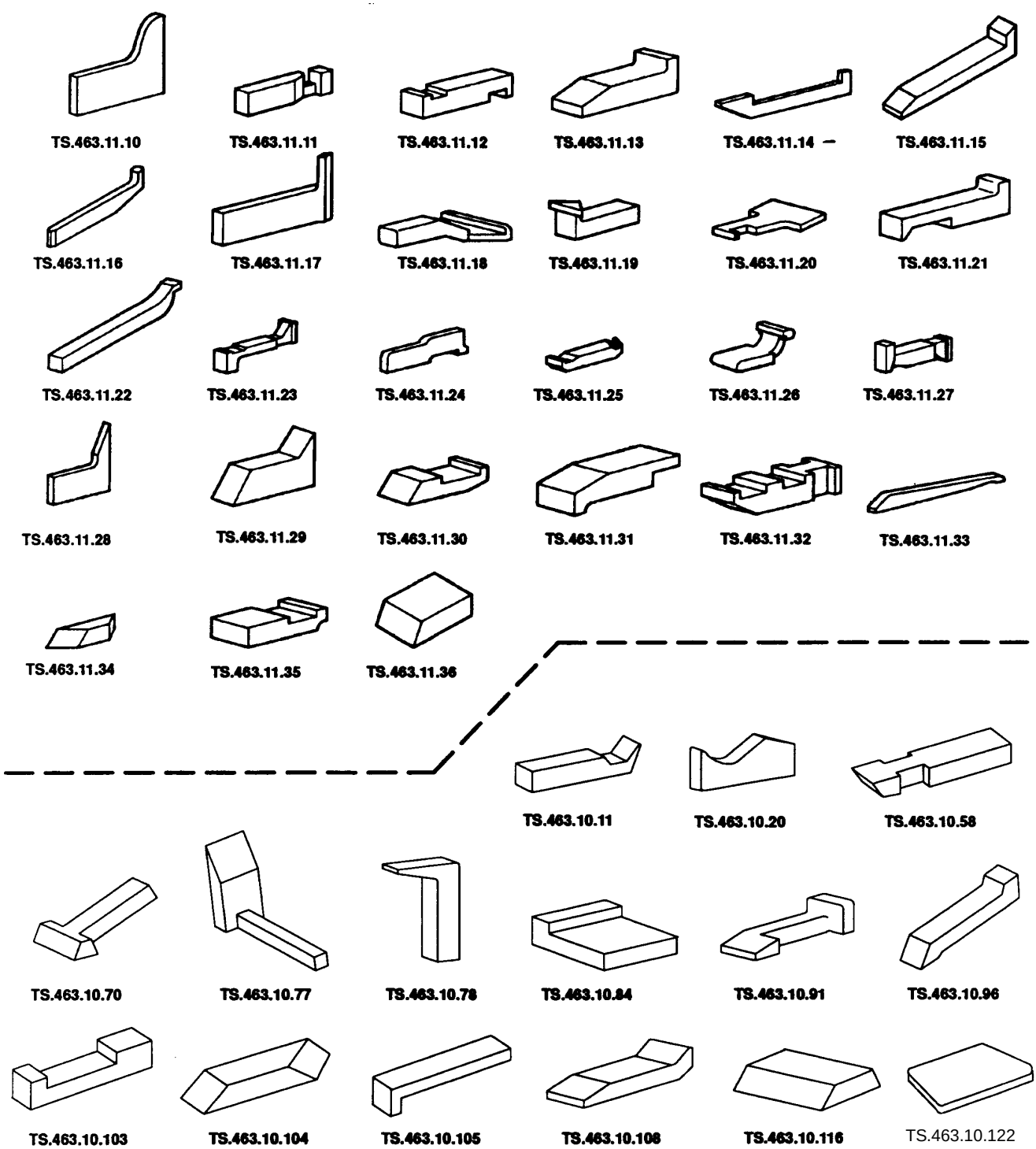


Figure 1 - Typical Bucking Bars

5 Procedure

5.1 General

5.1.1 Pneumatic rivet guns are commonly used to install solid rivets in aircraft structures.

5.1.2 Pneumatic riveting guns are used primarily for reaction riveting but also may be used for percussion riveting. The reaction riveting method is generally employed when installing rivets in aircraft structures. It is carried out by placing the applicable rivet set on the manufactured head and the bucking bar against the end of the shank. Percussion riveting is carried out by placing the bucking bar against the manufactured rivet head and placing the applicable rivet set against the end of the shank. This method is suitable in installations where the manufactured head of the rivet is inaccessible to the gun or in very rigid structures.

5.1.3 When using a pneumatic riveting gun, hold both the rivet set and bucking bar firmly, and square to the work.

5.2 Pneumatic Rivet Guns (see Figure 2)

5.2.1 Chicago Pneumatic CP series rivet guns are of the conventional pneumatic impact type, used with a rivet set held in position by a retaining spring to install rivets in aircraft structures. Control the pressure on the rivet set by turning the air regulator knob. Turn the knob clockwise to decrease the pressure (for thin skins) and counter clockwise to increase the pressure (for more rigid structures).

5.2.2 Atlas Copco RRH series rivet guns are of the recoilless, vibration controlled pneumatic impact type, used with a rivet set held in position by a retaining spring, to install rivets in aircraft structures. Urethane covers may be used on Atlas Copco RRH series rivet guns to protect the operator against vibration during use. Control the pressure on the rivet set by turning the air regulator/trigger knob clockwise to decrease the pressure and counter clockwise to increase the pressure. Recoilless rivet guns cannot be activated unless the rivet set and the trigger are pressed.

5.3 Assembly of Parts for Riveting

5.3.1 Assemble parts for riveting as follows:

Step 1. Correctly position parts to be riveted, ensuring that curved parts mate without excessive gaps. If a dimpled sheet nests into another dimple or into a countersink, ensure that a small gap or sheet separation of 0.001" to 0.010" exists between sheets (see Figure 3).

Step 2. Clamp the assembly with plunger type fasteners or tack rivets in every fourth to sixth rivet hole.

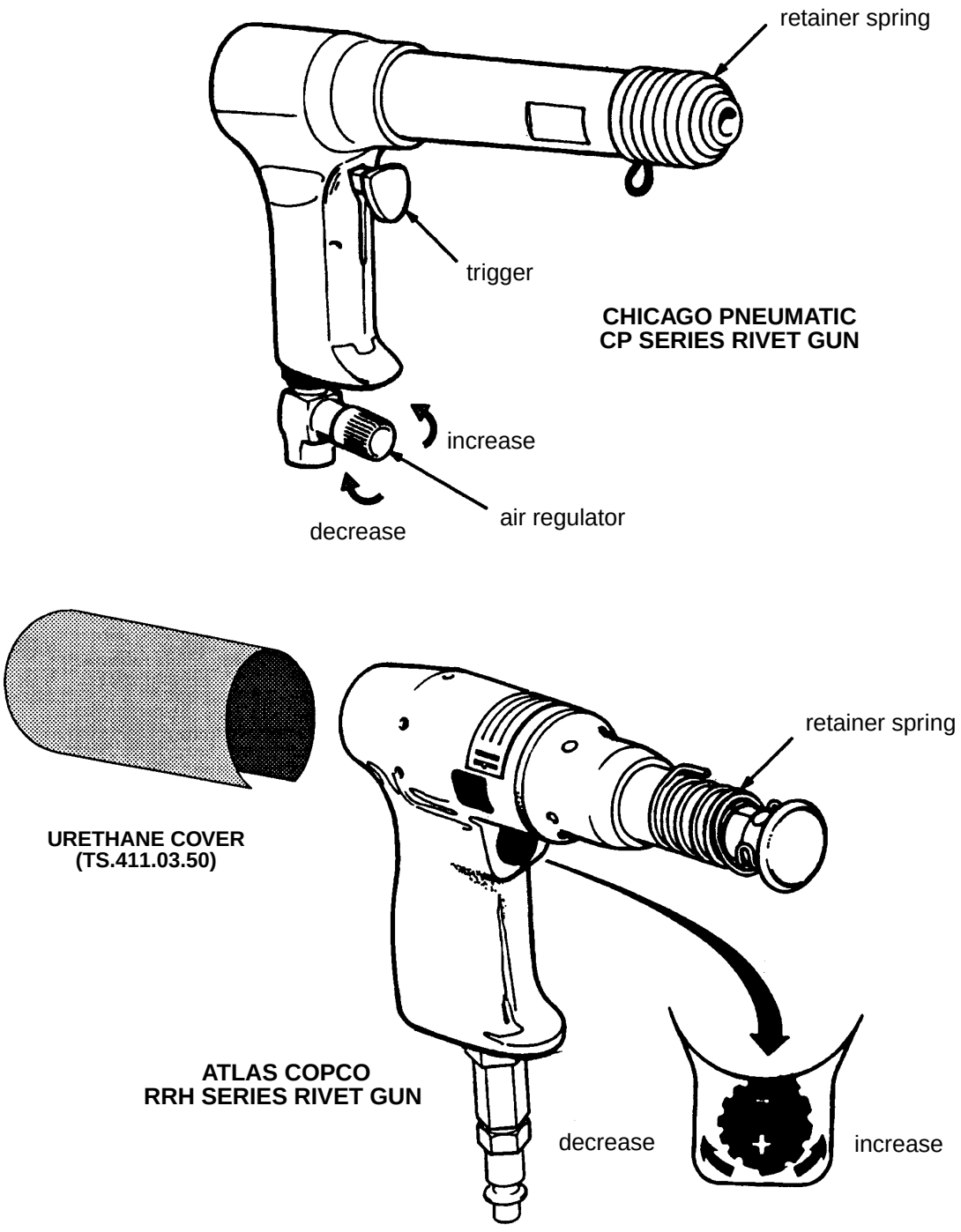


Figure 2 - General Description of Pneumatic Rivet Guns (Typical)

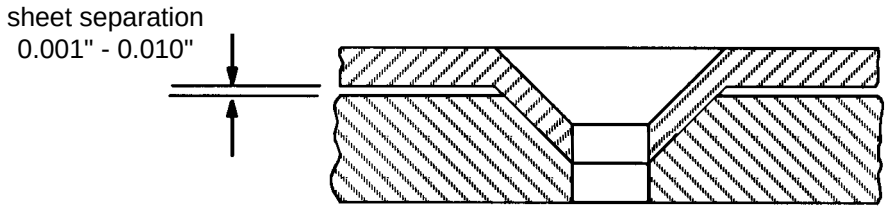


Figure 3 - Sheet Separation

5.4 Rivet Gun Set-Up

5.4.1 Set-up rivet guns as follows:

Step 1. Select the applicable pneumatic rivet gun fromTable 1 for the material and size of rivet to be installed.

Table 1 - Recommended Pneumatic Riveting Gun

RIVET MATERIAL AND SIZE					RECOMMENDED PNEUMATIC RIVET GUN	
ALUMINUM (EXCEPT 7050), COPPER AND STEEL	7050 (KE) ALUMINUM	MONEL	CORROSION RESISTANT STEEL	TITANIUM/ TITANIUM COLUMBIUM (BI-METALLIC)	CHICAGO PNEUMATICS CP	ATLAS COPCO RRH
1/16", 3/32", 1/8" and 5/32"	1/16", 3/32" and 1/8"	- - -	- - -	- - -	2X	04P
3/16"	5/32"	1/16", 3/32", 1/8" and 5/32"	- - -	- - -	3X	04P
7/32" and 1/4"	3/16"	3/16"	1/16", 3/32", 1/8" and 5/32"	5/32" and 3/16"	4X or 5X (Note 1)	04P or 06P
5/16" and 3/8"	1/4", 5/16" and 3/8"	7/32", 1/4", 5/16" and 3/8"	3/16", 7/32", 1/4", 5/16" and 3/8"	1/4"	9X	- - -

Note 1. Use the 4X rivet gun when the shank diameter of the rivet set is 0.401" and the 5X rivet gun when the shank diameter of the rivet set is 0.498".

Step 2. If installing universal head rivets, select an appropriate rivet set from Table 2 for the size and the accessibility of the rivet to be installed. If installing BACR15FT modified universal head rivets, use a universal head rivet set one size smaller than the rivet to be driven. If the cupped rivet set required is not available, flat tools may be used on universal or modified universal heads. Extra long (15" & 22" overall length) rivet sets (TS.411.07.11 & TS.411.06.13) and modified (cut away) rivet sets (TS.411.08.11 & TS411.08.13) for universal head rivets may be used as required. If needed, a TS.411.08.15 special gooseneck rivet set may be used.

If installing flush head rivets, select the applicable rivet set from Table 3 or Table 4. Flush head rivet sets have a slight crown on the face of the rivet set to facilitate driving the rivet without marking the aircraft skin or surrounding work surface. Flush head rivet sets rimmed with urethane (see Table 4) prevent damage to the adjacent structure and give a better grip during riveting operation. If accessibility of the rivet is such that it cannot be driven using a flush rivet set from Table 3 or Table 4, use a swivel end type flush rivet set from Table 5.

Table 2 - Rivet Sets for Universal Head Rivets

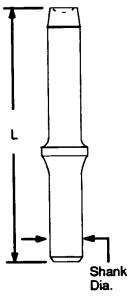
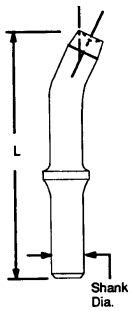
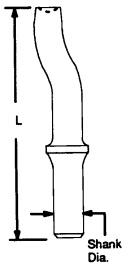
RIVET SETS					
RIVET SIZE	**SHANK DIAMETER**	**LENGTH (L)**	**STRAIGHT**	**OFFSET**	**DOUBLE OFFSET**
1/16"	0.401"	3.5"	SM10-4702	SM20-4702	---
		5.5"	SM11-4702	SM21-4702	SM130-470
		7.5"	SM12-4702	SM22-4702	SM131-470
3/32"	0.401"	3.5"	SM10-4703	SM20-4703	---
		5.5"	SM11-4703	SM21-470333	SM130-470
		7.5"	SM12-4703	SM22-4703	SM131-470
	0.498"	3.5"	SM30-4703	SM40-4703	---
		5.5"	SM31-4703	SM41-4703	---
		7.5"	SM32-4703	SM42-4703	---

Table 2 - Rivet Sets for Universal Head Rivets

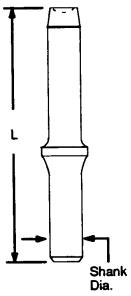
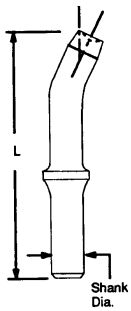
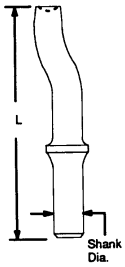
RIVET SETS					
RIVET SIZE	**SHANK DIAMETER**	**LENGTH (L)**	**STRAIGHT**	**OFFSET**	**DOUBLE OFFSET**
1/8"	0.401"	3.5"	SM10-4704	SM20-4704	---
		5.5"	SM11-4704	SM21-4704	SM130-470
		7.5"	SM12-4704	SM22-4704	SM131-470
	0.498"	3.5"	SM30-4704	SM40-4704	---
		5.5"	SM31-4704	SM41-4704	---
		7.5"	SM32-4704	SM42-4704	---
5/32"	0.401"	3.5"	SM10-4705	SM20-4705	---
		5.5"	SM11-4705	SM21-4705	SM130-470
		7.5"	SM12-4705	SM22-4705	SM131-470
	0.498"	3.5"	SM30-4705	SM40-4705	---
		5.5"	SM31-4705	SM41-4705	---
		7.5"	SM32-4705	SM42-4705	---
3/16"	0.401"	3.5"	SM10-4706	SM20-4706	---
		5.5"	SM11-4706	SM21-4706	S130M-470
		7.5"	SM12-4706	SM22-4706	SM131-470
	0.498"	3.5"	SM30-4706	SM40-4706	---
		5.5"	SM31-4706	SM41-4706	---
		7.5"	SM32-4706	SM42-4706	---
1/4"	0.401"	3.5"	SM10-478	SM20-4708	---
		5.5"	SM11-4708	SM21-4708	SM130-470
		7.5"	SM12-4708	SM22-4708	SM131-470
	0.498"	3.5"	SM30-4708	SM40-4708	---
		5.5"	SM31-4708	SM41-4708	---
		7.5"	SM32-4708	SM42-4708	---

Table 2 - Rivet Sets for Universal Head Rivets

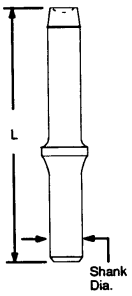
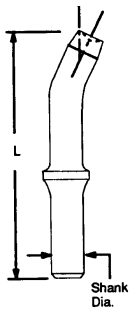
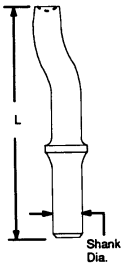
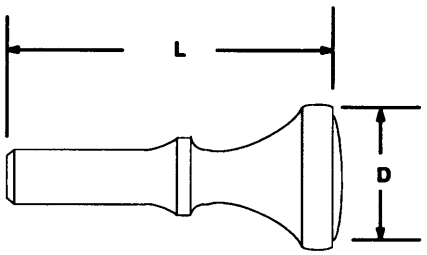
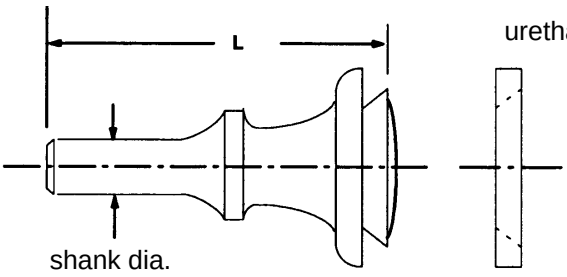
RIVET SETS					
RIVET SIZE	**SHANK DIAMETER**	**LENGTH (L)**	**STRAIGHT**	**OFFSET**	**DOUBLE OFFSET**
5/16"	0.401"	3.5"	SM50-47010	SM60-47010	---
		5.5"	SM51-47010	SM61-47010	---
		7.5"	SM52-47010	SM62-47010	---
		10.5"	SM53-47010	SM63-47010	---
		13.5"	SM54-47010	SM64-47010	---
	0.498"	3.5"	SM70-47010	SM80-47010	---
		5.5"	SM71-47010	SM81-47010	---
		7.5"	SM72-47010	SM82-47010	---
		10.5"	SM73-47010	SM83-47010	---
		13.5"	SM74-47010	SM84-47010	---
3/8"	0.401"	3.5"	SM50-47012	SM60-47012	---
		5.5"	SM51-47012	SM61-47012	---
		7.5"	SM52-47012	SM62-47012	---
		10.5"	SM53-47012	SM63-47012	---
		13.5"	SM54-47012	SM64-47012	---
	0.498"	3.5"	SM70-47012	SM80-47012	---
		5.5"	SM71-47012	SM81-47012	---
		7.5"	SM72-47012	SM82-47012	---
		10.5"	SM73-47012	SM83-47012	---
		13.5"	SM74-47012	SM84-47012	---

Table 3 - Flush Rivet Sets



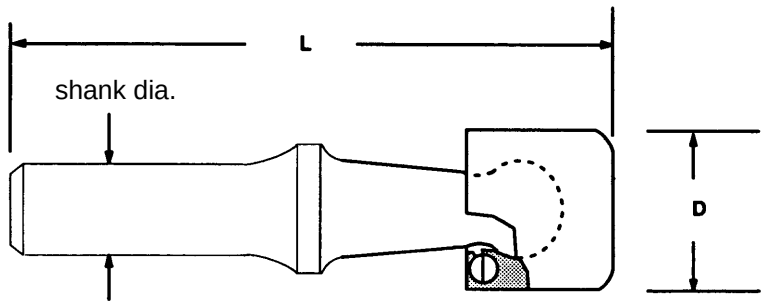
SHANK DIA.	DIA. (D)	LENGTH (L)	PART NO.	SHANK DIA.	DIA (D)	LENGTH (L)	PART NO.
0.401"	1"	2.5"	SM90	0.498"	1.0"	3.0"	SM101
	1"	3.0"	SM91		1.0"	5.5"	SM102
	1"	5.5"	SM92		1.0"	3.0"	SM104
	1.25"	3.0"	SM94		1.25"	5.5"	SM105
	1.25"	5.5"	SM95		—	—	—

Table 4 - Flush Rivet Sets with Urethane Rim



SHANK DIA.	LENGTH (L)	PART NUMBER	URETHANE RIM NO.
0.401"	2.23"	STIIIIB-V40IK-1	STIIIIB-VR-1
	2.27"	STIIIIB-V40IK-2	STIIIIB-VR-2
	2.40"	STIIIIB-V40IK-3	STIIIIB-VR-3
	2.52"	STIIIIB-V40IK-4	STIIIIB-VR-4
	2.58"	STIIIIB-V40IK-5	STIIIIB-VR-5
	2.65"	STIIIIB-V40IK-6	STIIIIB-VR-6

Table 5 - Flush Rivet Set, Swivel End Type



SHANK DIA.	DIAMETER (D)	LENGTH (L)	PART NUMBER
0.401"	0.75"	3.0"	SM180
	1.1875"	3.0"	SM181
0.498"	0.75"	3.0"	SM182
	1.1875"	3.0"	SM183

Step 3. Insert the selected rivet set into the pneumatic rivet gun and secure the rivet set with the retaining spring.

Step 4. Connect the main air supply to the inlet valve of the rivet gun.

5.5 Riveting Operation

5.5.1 Rivet assemblies as follows:

Step 1. If dissimilar materials come into contact (e.g., stainless steel and aluminum, titanium and aluminum, etc.), wet assemble rivets with PR1431G Type 2 sealant, mixed and applied in accordance with PPS 21.21.

Step 2. Drawing-up before forming the shop head is necessary if the faying surfaces of the work in the area surrounding the rivet are not in close contact with each other. When using a rivet gun for drawing-up, apply a few moderate strokes in order to prevent stretching of the parts.

Step 3. Select the appropriate bucking bar that can be used for bucking as many rivets as possible in the group of rivets to be driven. Bucking bars are available in various shapes, sizes and weight. The weight and the shape of the bucking bar has an important bearing on the quality of the driven rivets. Hold the bucking bar so that it rests squarely against the end of the rivet shank and its corners will not touch the aircraft structure (see Figure 4). Ensure that the bucking bar selected is clean and polished free of any marks, scratches or other defects which could cause damage to the rivet or skin surfaces.

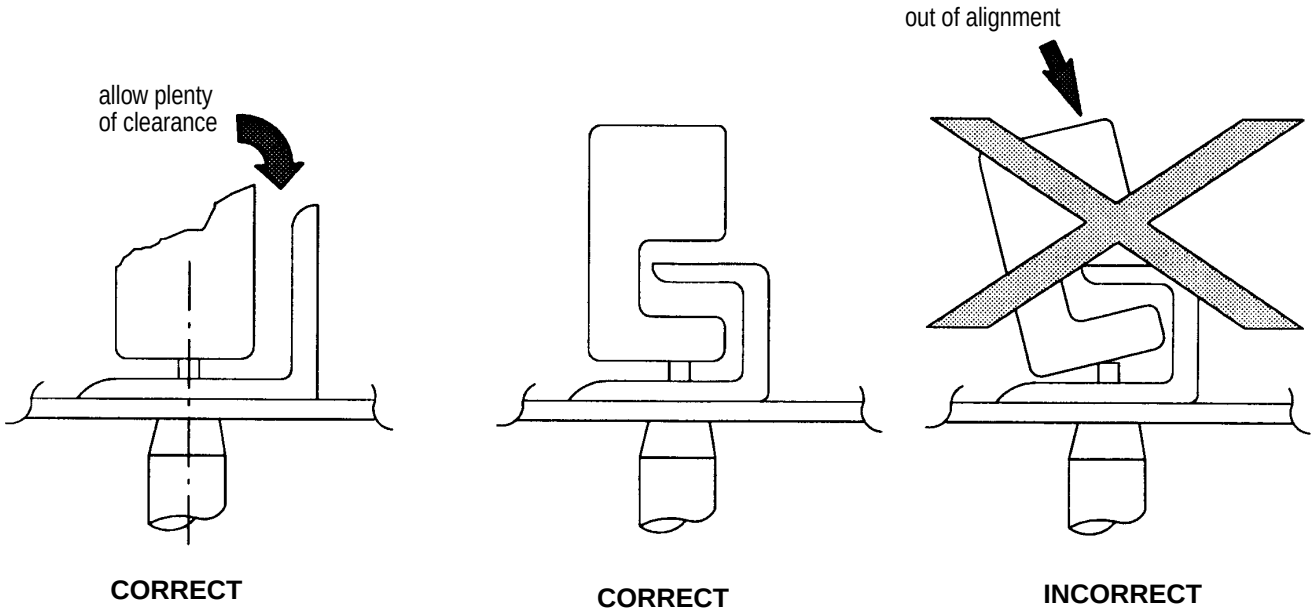


Figure 4 - Using the Bucking Bar

Step 4. Place the rivet gun on the rivet head and square to the work surface.

Step 5. Start riveting at the center of the skin and work outward in all directions so that the tendency of the skin to stretch does not result in warping or oil-canning. Squeeze the trigger on the rivet gun slowly to begin riveting to avoid damaging the skin or surrounding structure. If riveting extra long joints, start from the center of the joint and rivet approximately every fourth rivet, working toward the end of the joint, and then install the remaining rivets. A TS.463.12.11 riveting aid tool may be used to hold the parts firmly together when riveting thin material to thick material and to prevent any gapping condition between sheets during forming of the shop head (see Figure 5). The maximum nominal diameter of the rivet that can be installed using the riveting aid tool is 5/32". Control the pressure on the rivet set as required by turning the rivet gun's air regulator/trigger knob.

6 Requirements

6.1 Refer to the applicable fastener PPS for the height and diameter requirements for shop formed heads.

6.2 Refer to the applicable fastener PPS for the requirements for installed rivets.

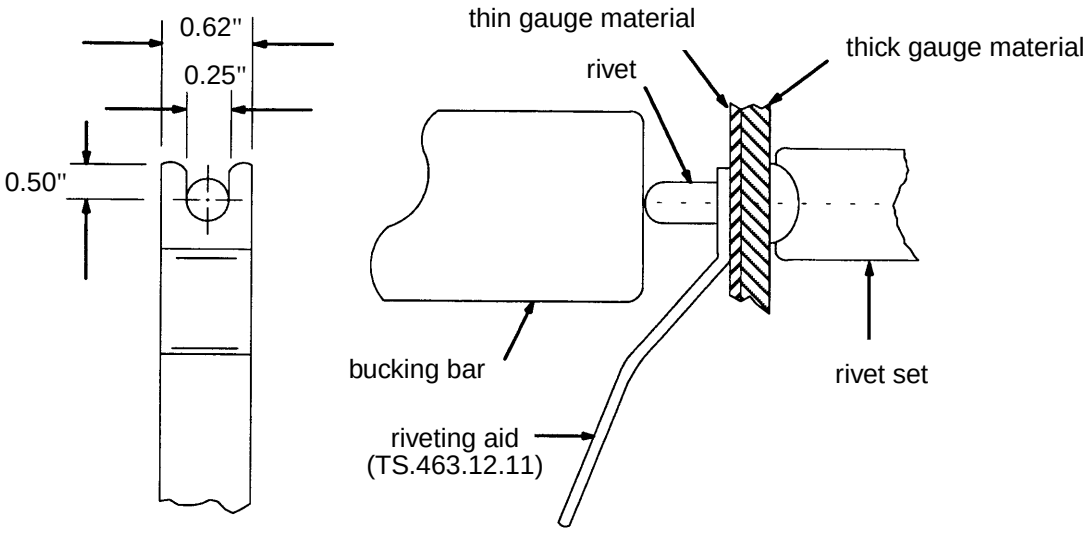


Figure 5 - Riveting Aid Tool

7 Safety Precautions

7.1 Observe general shop safety precautions when performing the procedure specified herein.

7.2 Pneumatic riveting guns shall not be used without a rivet set retaining spring in position.

7.3 Disconnect the shop air supply line from pneumatic riveting guns when changing rivet sets.

7.4 Wear approved safety glasses and hearing protectors at all times while operating rivet guns.

8 Personnel Requirements

8.1 Personnel using pneumatic rivet guns according to this PPS must have a good working knowledge of the procedure and requirements as specified herein and have exhibited their competency to their supervisor.

9 Recommended Maintenance of Equipment

9.1 Keep riveting guns clean and oil or grease moving parts.

9.2 Approximately once a day, insert a few drops of light machine oil into the air inlet.

9.3 Check riveting guns regularly. Replace damaged or badly worn parts independently from the periodic check-up.

9.4 Any rework or alteration of riveting tools is prohibited unless appropriately authorized.