BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 2.42

PRODUCTION PROCESS STANDARD

Installation of B0205023 Hollow End "E-Z Buck" Rivets

Issue 5
- This standard supersedes PPS 2.42, Issue 4.
- 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.

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1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for installation of B0205023 hollow end ("E-Z Buck") rivets in double flush composite applications.

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.

1.1.3 Procedure or requirements specified in a Bombardier BAPS, MPS, LES or P. Spec. **do not** supersede the procedure or requirements specified in this PPS. Similarly, the procedure and requirements specified in this PPS are not applicable when use of a BAPS, MPS, LES or P. Spec. is specified.

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 1.09 - Drilling and Reaming.

3.2 PPS 1.12 - Use of Rivet Squeezers (Portable & Stationary).

3.3 PPS 1.33 - Countersinking for Flush Head Fasteners.

3.4 PPS 1.48 - Set-Up and Operation of Rivet Shavers.

3.5 PPS 10.39 - Machining of Fibre Reinforced Composite Parts.

3.6 PPS 13.26 - General Subcontractor Provisions.

4 Materials and Equipment

4.1 Materials

4.1.1 B0205023 rivets titanium alloy hollow end “E-Z Buck” rivets for composite applications. Refer to Figure 1 for a part number breakdown and Figure 2 for a cross sectional view.

B0205023 -4 - 8

BASIC PART NUMBER

B0205023 - Rivet, flush shear head, hollow end, titanium alloy, composite applications

DIAMETER CODE

-4	1/8"
-5	5/32"
-6	3/16"
-7 (Note 1)	7/32"

FINISH

-	No finish
F	Phosphate fluoride

GRIP LENGTH

-4	0.095" - 0.125"	-18	0.532" - 0.562"
-5	0.126" - 0.156"	-19	0.563" - 0.594"
-6	0.157" - 0.187"	-20	0.595" - 0.625"
-7	0.188" - 0.219"	-21	0.626" - 0.656"
-8	0.220" - 0.250"	-22	0.657" - 0.687"
-9	0.251" - 0.281"	-23	0.688" - 0.719"
-10	0.282" - 0.312"	-24	0.720" - 0.750"
-11	0.313" - 0.343"	-25	0.751" - 0.781"
-12	0.344" - 0.375"	-26	0.782" - 0.812"
-13	0.376" - 0.407"	-27	0.813" - 0.843"
-14	0.408" - 0.438"	-28	0.844" - 0.875"
-15	0.439" - 0.469"	-29	0.876" - 0.907"
-16	0.470" - 0.500"	-30	0.908" - 0.938"
-17	0.501" - 0.531"	-31	0.939" - 0.969"
		-32	0.970" - 1.000"

Note 1. 7/32" diameter fasteners are typically only used for replacement/repair.

Figure 1 - B0205023 Rivet Part Number Breakdown

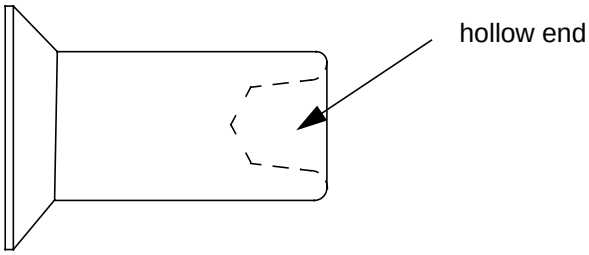


Figure 2 - B0205023 “E-Z Buck” Rivet Cross Section

4.2 Equipment

4.2.1 Flaring snap dies (e.g., Cherry 839B1-() with a 0.187'' tool shank diameter or Cherry 839B10-() with a 0.25'' tool shank diameter). () represents the fastener diameter code for Cherry snap dies

4.2.2 Snap dies (e.g., Cherry 839B3 with a 0.187'' tool shank diameter or Cherry 839B13 with a 0.25'' tool shank diameter).

5 Procedure

5.1 General

5.1.1 Hollow end rivets are specifically designed for double flush applications in composite and non-metallic materials. The rivet design allows low installation loads, uniform structural loading and built in resistance to over squeezing.

5.1.2 When drilling holes maintain the minimum edge distance as specified in PPS 1.09.

5.1.3 Except as noted below, perform all drilling and countersinking using the equipment and procedure specified in PPS 10.39. It is acceptable to use drills equivalent to those specified in PPS 10.39 if the specified hole tolerance requirements are met when verified using gauges or equipment calibrated in inches.

5.1.4 Set-up and adjust countersinks according to PPS 1.33.

5.2 Preparation of Holes and Countersinks

5.2.1 Prepare rivet holes as follows:

Step 1. Correctly position the parts to be drilled and ensure that curved parts mate without excessive gaps.

Step 2. Firmly clamp the components together so there is no gap between the components at the hole locations.

Step 3. Drill all holes to the dimensions specified in Table I according to PPS 10.39. Ensure that the fastener hole is perpendicular within 2° to the surface against which the **shop formed** head will bear (see Figure 4).

Table I - Hole Preparation Data

NOMINAL RIVET DIAMETER	FINAL HOLE SIZE	COUNTERSINK DIAMETER (Note 1)
1/8"	0.128" - 0.132"	0.183" - 0.188"
5/32"	0.159" - 0.163"	0.234" - 0.239"
3/16"	0.190" - 0.195"	0.289" - 0.295"
7/32"	0.222" - 0.227"	0.320" - 0.325"

Note 1. On the manufactured head side, the countersink diameter specified above is for reference only to achieve the flushness requirement specified in Figure 6. On the shop formed head side, the countersink diameter is **not** just for reference and the above limits **must** be met to ensure an acceptable installation.

Step 4. Countersink the first hole to the dimensions specified in Table I. On the manufactured head side use the countersink diameter specified as a guide to meet the flushness requirement specified in Table 6. On the shop formed head side ensure that the countersink diameter prepared falls within the range specified.

Step 5. Insert an E-Z Buck rivet into the hole and check to be sure that the flushness requirements of Figure 6 can be met (after shaving if necessary). The head height of the manufactured head may not be reduced by more than 0.005" by shaving.

Step 6. Adjust the manufactured head side countersink diameter if necessary and countersink the remaining holes.

Step 7. Vacuum up any particles resulting from hole preparation.

5.2.2 On a sample basis, check at random (across the entire pattern) the number of holes specified in Table II for conformance to the hole limit requirements, using a go/no-go gauge or other hole measuring gauge. If any oversize holes are found in the sample, check every hole in the pattern. Refer all oversize holes to Bombardier Toronto (de Havilland) MRB or Bombardier Toronto (de Havilland) delegated MRB for disposition.

5.2.2.1 While checking holes using a GO/NO-GO gauge or other hole measuring gauge, also check visually for hole ovality. For holes with a visually evident oval or out of round shape, check the hole diameter at several positions using suitable hole measurement equipment (e.g., vernier calliper, hole micrometer, etc.) to determine the minor and major diameters of the hole. The minor and major diameters of the hole must be within the minimum and maximum hole diameter tolerances, respectively. If the minor or major diameters of any oval hole in the sample are not within the minimum and maximum hole diameter tolerance, check every hole in the pattern for conformance to the hole limit requirements and visually for ovality as specified herein. Refer all non-conforming holes to Bombardier Toronto (de Havilland) MRB or Bombardier Toronto (de Havilland) delegated MRB for disposition.

Table II - Hole Size Verification Sample Requirements

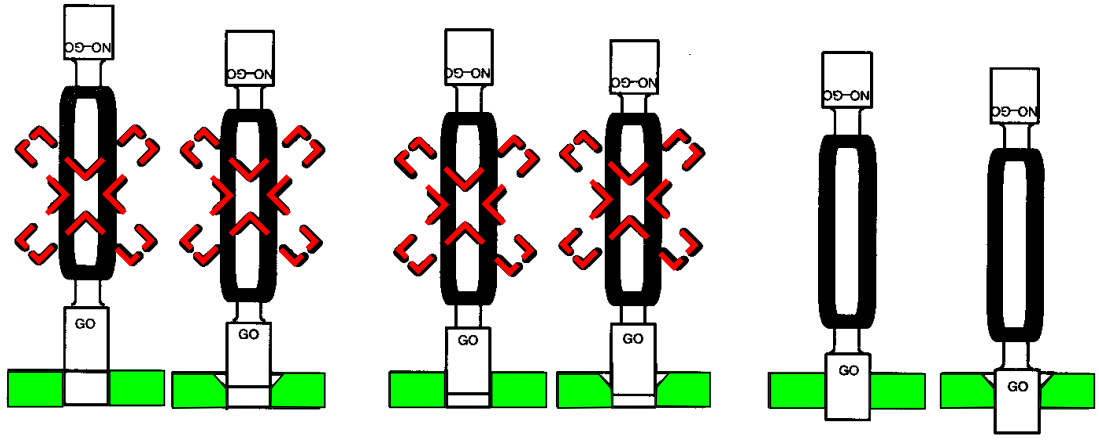
NUMBER OF HOLES IN PATTERN	REQUIRED SAMPLE SIZE
5 or less	all
6 - 50	5
51 - 90	7
91 - 150	11
151 - 280	13
281 - 500	16
more than 500	19

5.3 Use of Go/No-Go Gauges

5.3.1 Check selected fastener holes for conformance to the requirements of Table I using the applicable go/no-go gauge as follows (see Figure 3):

Step 1. Taking care not to force or rotate the go/no-go gauge, lightly insert the go end of the gauge into the fastener hole. If the go end of the gauge goes in only partially or does not go into the hole at all, the hole is **undersize**. Open undersize holes to the final diameter specified in Table I.

Step 2. Lightly insert the no-go end of the plug gauge in the fastener hole. If the gauge goes completely into the hole, the hole is **oversize**; oversize holes are not acceptable and must be referred to Bombardier Toronto (de Havilland) MRB or Bombardier Toronto (de Havilland) delegated MRB for disposition.

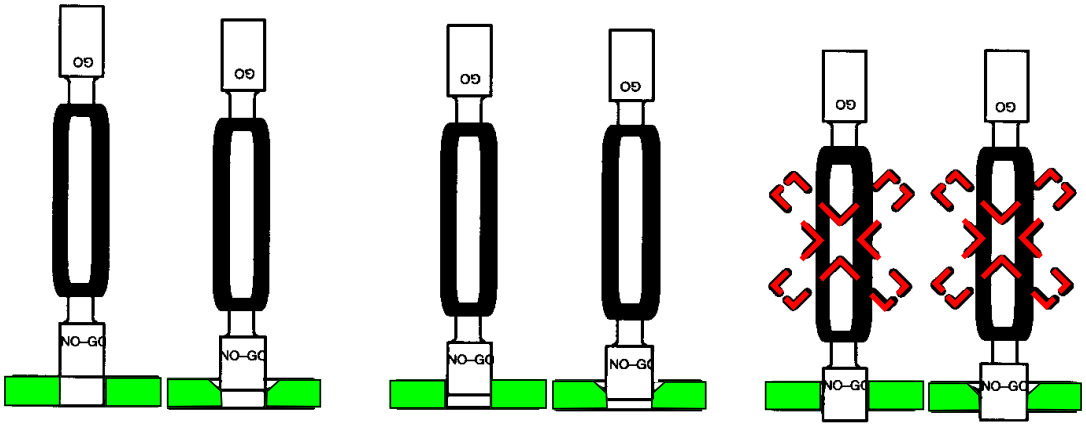


Does not go in.
UNDERSIZE HOLE

Goes only partially in.
UNDERSIZE HOLE

Goes in completely.
ACCEPTABLE

USE OF GO END



Does not go in.
ACCEPTABLE

Goes only partially in.
ACCEPTABLE

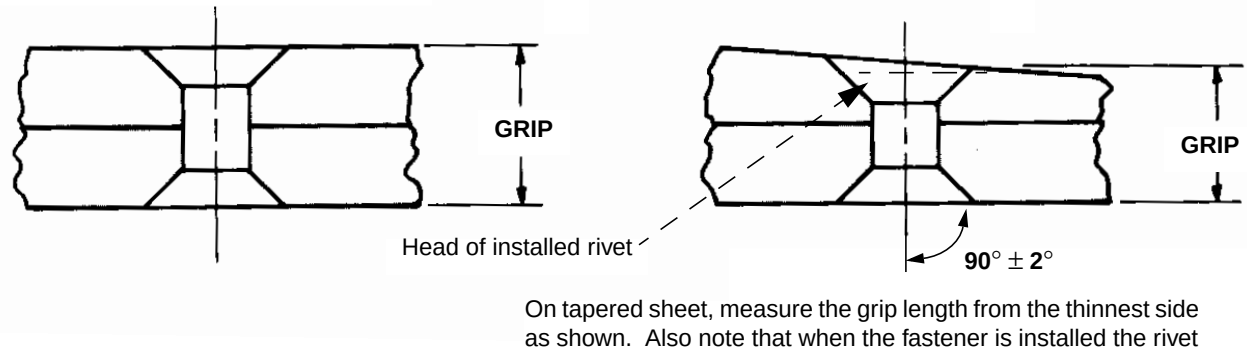
Goes in completely.
OVERSIZE HOLE

USE OF NO-GO END

Figure 3 - Use of Go/No-Go Gauges

5.4 Determination of Required Rivet Length

5.4.1 Measure the material thickness at the hole location, as shown below (see Figure 4) to verify that the grip length specified on the engineering drawing is correct. Refer to Figure 1 for the grip range dimensions. Use a suitable measuring device to determine the grip length as no grip scale is available for these grip lengths.

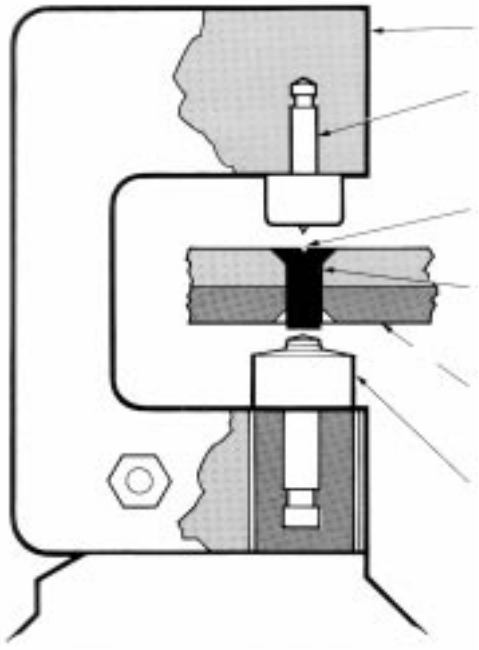


On tapered sheet, measure the grip length from the thinnest side as shown. Also note that when the fastener is installed the rivet head will seat below the sheet surface on the thicker side.

Figure 4 - Determining Suitable Rivet Length

5.5 Tool Selection, Set-up and Operation

5.5.1 Install rivets using a rivet squeezer equipped with a flaring snap die as specified in paragraph 4.2.1 and a snap die as specified in paragraph 4.2.2 (see Figure 5). Except as noted above, set-up and operate the rivet squeezer according to PPS 1.12.



Squeezer yoke or riveting machine

Snap Die
(Cherry 839B3, 0.187" shank size)
(Cherry 839B13, 0.25" shank size)

Head Dimple

Hollow End E-Z Buck Rivet

Composite Material

Cherry Flaring Snap Die

RIVET DIAMETER	0.187" DIA. MOUNT	0.25" DIA. MOUNT
1/8"	839B1-4	839B10-4
5/32"	839B1-5	839B10-5
3/16"	839B1-6	839B10-6
7/32"	839B1-7	839B10-7

Figure 5 - Set Up of Rivet Squeezers

5.6 Rivet Installation

5.6.1 Install rivets as follows:

Step 1. Install cleco temporary fasteners in every fourth to sixth rivet hole to clamp the assembly.

Step 2. Install the first rivet.

Step 3. Check the rivet installation to be sure the flushness requirements of Figure 6 can be met after shaving (note: the head height of the manufactured head may not be reduced by more than 0.005" by shaving).

Step 4. Install rivets in the remaining holes.

Step 5. Remove the cleco temporary fasteners and install rivets in those holes.

Step 6. Except as noted below, shave the manufactured and shop formed heads as necessary to meet the flushness requirements specified in Figure 6. The head height of the manufactured head may not be reduced by more than 0.005" by shaving. When shaving rivet heads, take care to avoid marking or damaging the surrounding structure. Set-up and operate rivet shavers as specified in PPS 1.48.

5.7 Oversize Holes and Countersinks

5.7.1 Refer all oversize holes and countersinks to Bombardier Toronto (de Havilland) MRB or Bombardier Toronto (de Havilland) delegated MRB for written authorization to repair.

5.8 Removal of Rivets

5.8.1 If necessary, remove rivets as follows:

Step 1. Using a drill of the same diameter as the rivet shank, drill through the head, on the manufactured head side if possible, for a distance equal to the rivet head height.

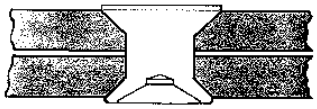
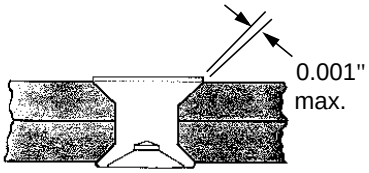
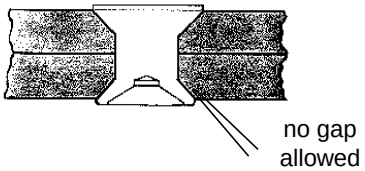
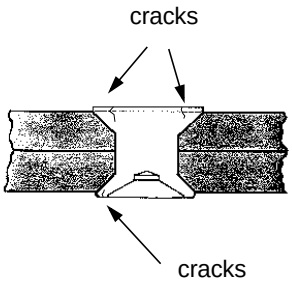
Step 2. Pry off the rivet head using a straight punch.

Step 3. While supporting the part on the opposite side, drive out the rivet shank using a small punch.

6 Requirements

6.1 Visually examine all installed rivets for defects as specified in Table III.

Table III - Visual Examination of Installed Rivets

VISUAL APPEARANCE	DEFECT DESCRIPTION	CORRECTIVE ACTION
	Parts not drawn up tightly.	If the parts have not been drawn up tightly, remove the rivet and re-check the grip length required. Use of a drawing aid is recommended.
	Gap under manufactured rivet head greater than 0.001".	If there is a gap greater than 0.001" under the manufactured head, replace the rivet and check the countersink diameter.
	Gap under shop formed head.	If there is any gap under the shop formed head, replace the rivet, check the countersink diameter and, if necessary, increase the pressure adjustment on the squeeze riveter.
	Cracks in manufactured or shop formed heads.	If there are any cracks in the rivet head replace the rivet.
Marring of surrounding structure.		Refer the assembly to MRB (or DHI approved MRB) for disposition.
Signs of damage around the shop formed head of the fastener.		Refer the assembly to Bombardier Toronto (de Havilland) MRB or Bombardier Toronto (de Havilland) delegated MRB for disposition.

6.2 Installed rivets must meet the flushness requirements specified in Figure 6, after shaving according to PPS 1.48, if necessary. The head height of the manufactured head may not be reduced by more than 0.005" by shaving.

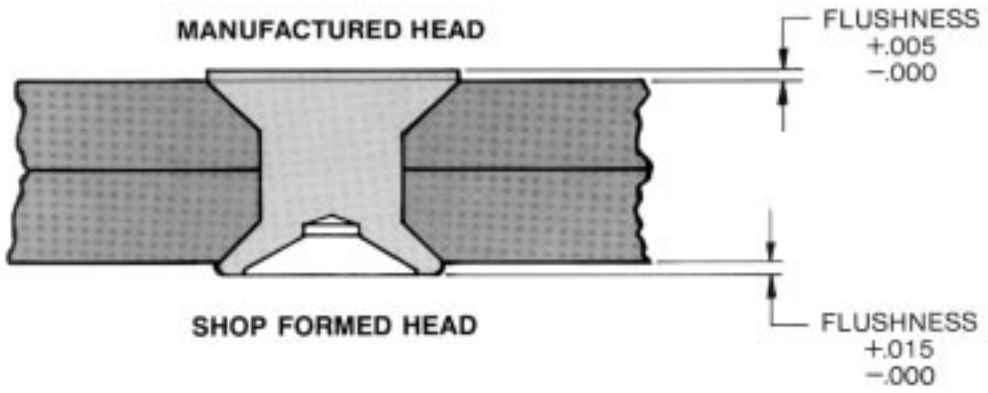


Figure 6 - Flushness Requirements

7 Safety Precautions

7.1 Observe general shop floor safety precautions.

8 Personnel Requirements

8.1 Personnel responsible for the installation of B0205023 hollow end “E-Z Buck” rivets must have a good working knowledge of the procedure and requirements as specified herein and shall have exhibited their familiarity to their supervisor.

9 Maintenance of Equipment

9.1 It is recommended that riveting squeezers and accessories be checked at suitable intervals and damaged or badly worn parts repaired or replaced.

9.2 Do not rework or alter riveting tools unless appropriately authorized.