BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 1.04

PRODUCTION PROCESS STANDARD

Modified Radius Dimpling Equipment

Issue 17
- This standard supersedes PPS 1.04, Issue 16.
- Vertical lines in the left hand margin indicate technical 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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	Quality	

Signed original on file. Validation of paper prints is the responsibility of the user.

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1 Scope

1.1 This Production Process Standard (PPS) specifies the tools and equipment to be used for modified radius dimpling of aircraft parts and assemblies.

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.

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 1.01 - Dimpling Aluminum Alloys.

3.2 PPS 1.05 - Ram Coin Dimpling Equipment.

3.3 PPS 1.07 - Dimpling Ferrous, Nickel and Titanium Alloys.

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

3.5 PPS 13.26 - General Subcontractor Provisions.

3.6 PPS 13.39 - Bombardier Toronto Engineering Process Manual.

4 Materials, Equipment and Facilities

4.1 Materials

4.1.1 Materials meeting the requirements of PPS 1.01 and PPS 1.07, as applicable

4.2 Equipment

4.2.1 Dimpling dies and punches (e.g., as listed in Table 1). Dimpling tools must be capable of producing dimples in test coupons and production parts meeting the requirements of PPS 1.01 and PPS 1.07, as applicable.

4.2.2 Squeeze yokes and portable pneumatic squeeze guns (e.g., as listed in PPS 1.12).

4.2.3 Abrasive pad, fine (e.g., Scotch-Brite).

4.3 Facilities

4.3.1 This PPS has been categorized as a “Controlled Special Process” according to PPS 13.39 and as such only facilities specifically approved according to PPS 13.39 are authorized to perform modified radius dimpling according to this PPS.

4.3.2 Bombardier subcontractors must direct requests for approval to Bombardier Aerospace Supplier Quality Management. Bombardier Aerospace facilities must direct requests for approval to the appropriate internal Quality Manager.

4.3.3 Facility approval shall be based on a facility report, a facility survey and completion of a qualification test program, if required. The facility report must detail the materials and equipment to be used, the process sequence to be followed and the laboratory facilities used to show compliance with the requirements of this PPS. Any deviation from the procedure or requirements of this PPS must be detailed in the facility report. Based upon the facility report, Bombardier Toronto (de Havilland) Materials Technology may identify additional qualification and/or process control test requirements. During the facility survey, the facility requesting qualification must be prepared to demonstrate their capability. Once approved, no changes to subcontractor facilities may be made without prior written approval from Bombardier Aerospace Supplier Quality Management.

4.3.3.1 Unless otherwise specified by Bombardier Aerospace Supplier Quality Management, for approval of subcontractor facilities to perform modified radius dimpling according to this PPS, completion of a test program and submission of suitable test samples representative of production parts is required. Test samples must meet the requirements specified in section 6.

5 Procedure

5.1 General

5.1.1 Dimpling basically consists of forming an indentation around a fastener hole to receive the head of a countersunk type fastener flush with the surface of the sheet.

5.1.2 Modified radius dimpling is accomplished using portable pneumatic squeeze guns and special dimpling dies which incorporate a ledge at the bottom of the dimple cone. This ledge forms a “flat” area on the bottom of the dimple which acts to prevent radial cracks in the dimple.

5.2 Dimpling Process

5.2.1 Dimple all materials according to PPS 1.01 or PPS 1.07, as applicable.

5.2.2 Perform all modified radius dimpling at room temperature. If hot dimpling of aluminum alloys according to PPS 1.01 or hot dimpling of ferrous, nickel and titanium according to PPS 1.07 is required, employ ram coin dimpling equipment according to PPS 1.05.

5.2.3 Dimpling of tapered material is permissible provided that the degree of taper does not exceed 0.001 inch/inch.

5.2.4 Dimpled holes may be re-dimpled (re-struck) once only, if required to obtain a better dimple configuration. Dimples must not be reversed, flattened or re-dimpled to another size.

5.3 Selection of Tools

5.3.1 Select the correct punch and die set for the particular type and size of fastener to be installed (see Table 1 for a listing of tools used at Bombardier Toronto (de Havilland)). When using a squeeze yoke incorporating integral dies in the top prong, only the dimpling punch is required.

5.3.2 CP214PC squeeze guns can generally be used to dimple light gauge aluminum alloy sheet up to 0.040" thick for fastener diameters up to 5/32" and for 3/16" diameter fasteners a CP351C squeeze gun shall be used. Select the applicable yoke which will provide access to the particular dimpling application. At Bombardier Toronto (de Havilland), dimpling yokes are normally provided pre-assembled to the appropriate portable pneumatic squeeze gun as listed in PPS 1.12.

5.4 Set-Up of Tools

5.4.1 Disconnect the squeeze gun air supply before assembling the dimpling punch and die into the tool. Generally, when dimpling with a squeeze gun, the dimpling die is used in the yoke and the punch in the squeeze gun piston rod, however, if necessary these positions may be reversed.

5.4.2 The punch and/or die may be shimmed according to PPS 1.12 to provide sufficient pressure to produce the required dimple configuration according to PPS 1.01 or PPS 1.07.

5.4.3 Operate squeeze guns according to PPS 1.12.

5.5 Care of Tools

5.5.1 Use only tools in good condition. Frequently check the dimple punches and dies for evidence of wear, damage, pick-up and oxidation.

5.5.2 Do not operate squeeze guns without a test strip or work piece between the punch and die.

6 Requirements

6.1 Dimpling tools must be capable of producing dimples in test coupons and production parts meeting the requirements of PPS 1.01 and PPS 1.07, as applicable.

7 Safety Precautions

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

7.2 Disconnect the air line from the squeeze gun or portable dimpler while installing or changing punches and dies.

8 Personnel Requirements

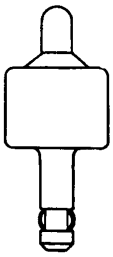
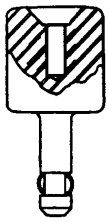
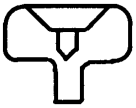
8.1 This PPS has been categorized as a “Controlled Special Process” by PPS 13.39. Refer to PPS 13.39 for personnel requirements.

9 Maintenance of Equipment

9.1 Do not use dimpling tools exhibiting signs of wear or damage. At Bombardier Toronto (de Havilland), return dimpling tools exhibiting signs of wear or damage for salvage rework. Discard excessively worn or damaged tools.

9.2 Punch and die faces may be buffed using a fine grade abrasive pad to remove pick-up and oxide; do not use emery cloth or crocus paper.

Table 1 - Modified Radius Dimpling Tooling (Note 4)

FASTENER		PUNCH PILOT DIA.			
TYPE	**DIA.**		**STANDARD PUNCH**	**STANDARD DIE**	**MIDGET DIE** (Note 3)
Flush head (426 type) solid rivets (Note 1)	3/32"	#40	ZT2895-3/32	ZT1841-3/32-12M	SD2861 MK 1
	1/8"	#30	ZT2895-1/8	ZT1841-1/8M	SD2861 MK 2
	5/32"	#20	ZT2895-5/32	ZT1841-5/32M	—
	3/16"	#11	ZT2895-3/16	ZT1841-3/16M	
Reduced flush head solid rivets (Note 1)	1/8"	#30	ZT1743-1/8M	ZT1843-1/8-12M	SD2861 MK 5
	5/32"	#20	ZT1743-5/32M	ZT1843-5/32-12M	—
Cherry lock-spindle & CherryMax blind rivets (Note 2)	1/8"	#40	ZT1714-1/8M	ZT1713-1/8-12	SD2861 MK 3
	5/32"	#30	ZT1714-5/32M	ZT1713-5/32-12	SD2861 MK 4
	3/16"	#20	ZT1714-3/16M	ZT1713-3/16-12	—
AN & NAS 100° flush head screws (Note 2)	#10	#24	ZT1742-#10	ZT1842-#10	—

NOTES:
1. Ensure fastener hole has been drilled to full size before dimpling.
2. Dimple when the fastener hole is undersize and then drill to final size on assembly.
3. Made from a standard die for minimum clearance applications.
4. For fasteners and/or fastener diameters which are not listed in this table, use tools capable of producing dimples in test coupons and production parts meeting the requirements of PPS 1.01 or PPS 1.07, as applicable.