BOMBARDIER
Toronto Site
PROPRIETARY INFORMATION

PPS 36.09

PRODUCTION PROCESS STANDARD

BONDING OF ALUMINUM PADS TO DASH 8 WING STRUTS

Issue 6
- This standard supersedes PPS 36.09, Issue 5.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
- Direct PPS related questions to christie.chung@aero.bombardier.com or (416) 375-7641.
- This PPS is effective as of the distribution date.

Prepared By:	(Christie Chung)	April 20, 2016
	PPS Group	
Approved By:	(*K. Quon*, for Bruce Campbell)	April 20, 2016
	Materials Technology	
	(Stephen Pitt)	April 21, 2016
	Quality	

TABLE OF CONTENTS

Sections **Page**

Tables

Figures

1 SCOPE

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for bonding of aluminum pads to DASH 8 front and rear wing struts for the purpose of machining the wing struts to final size, after assembly into the fuselage frames.

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction and the procedure specified shall 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, all materials shall be approved and assigned Material Safety Data Sheet (MSDS) numbers by the Bombardier Toronto 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 Environment, Health and Safety Department.

3 REFERENCES

3.1 PPS 13.26 - General Subcontractor Provisions.

3.2 PPS 13.28 - Storage Life of Adhesives, Sealants, Paints and Composite Products.

3.3 PPS 13.39 - Bombardier Toronto Engineering Process Manual.

3.4 PPS 14.01 - Torquing & Tightening.

3.5 PPS 16.24 - Application of DSC 216 Fluorocarbon Dispersion Coating.

3.6 PPS 25.52 - Bonding using DHMS A6.12 Type I Adhesive.

3.7 PPS 31.17 - Solvent Usage.

3.8 PPS 34.08 - Application of Epoxy-Polyamide Primer (F19 & F45).

4 MATERIALS, EQUIPMENT AND FACILITIES

4.1 Materials

4.1.1 Wing Struts: 85320077-9003 - Front
85320338-9005 - Rear
85322595-9001 - Front
85322596-9001 - Rear

4.1.2 Aluminum Pads: 85320078-101 Front
85320339-101 Rear

4.1.3 DHMS A6.12 Type I adhesive.

4.1.4 Release agent, fluorocarbon dispersion coating, to DSC 216-1.

4.1.5 Disposable wax-free paperboard containers (e.g., Melo take-out food containers) or bare aluminum sheet for mixing adhesive.

4.1.6 Abrasive pads (e.g., Scotch-Brite Type A (maroon) fine, 3M Co).

4.1.7 Abrasive paper, aluminum oxide, 240 - 400 grit.

4.1.8 Vinyl tape to DSC 91-1, width as required.

4.1.9 Gloves, clean white lint-free cotton (e.g., DSC 422-1).

4.2 Equipment

4.2.1 Pad bonding hardware (bolts, nuts and washers) as specified in Table I. Nuts and bolts used as assembly/bonding hardware may be used only up to a maximum of 40 times each; discard nuts and bolts after they have been used the maximum number of times.

4.2.2 Shop aid (as shown in Figure 1).

4.2.3 Torque wrench, 0-150 ft/lb range.

4.2.4 Mohair paint roller or spatula.

4.3 Facilities

4.3.1 This PPS has been categorized as a Controlled Critical Process according to PPS 13.39 and as such only facilities specifically approved according to PPS 13.39 are authorized to perform bonding of aluminum pads to DASH 8 front and rear wing struts for the purpose of machining the wing struts to final size, after assembly into the fuselage frames according to this PPS.

4.3.2 Bombardier subcontractors shall direct requests for approval to Bombardier Aerospace Supplier Quality Management. Bombardier Aerospace facilities shall 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 shall 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 shall be detailed in the facility report. Based upon the facility report, Bombardier Toronto Materials Technology may identify additional qualification and/or process control test requirements. During the facility survey, the facility requesting qualification shall 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 For approval of subcontractor facilities to perform bonding of aluminum pads to DASH 8 front and rear wing struts for the purpose of machining the wing struts to final size, after assembly into the fuselage frames according to this PPS, completion of a test program and submission of suitable test samples representative of production parts may be required. Test samples shall meet the requirements specified in by Bombardier Toronto Materials Technology.

5 PROCEDURE

5.1 General

5.1.1 Bonding of aluminum pads to DASH 8 wing struts according to this PPS consists of applying a thin coating of high-strength epoxy adhesive to the bonding surface of the pad and strut, followed by assembling and curing under pressure.

5.1.2 The assembly/cure pressure is achieved by bolting the strut/pad assembly to an aluminum plate shop aid (see Figure 1) as shown in Figure 2.

5.1.3 Torquing of bonding hardware shall be carried out according to PPS 14.01.

MATERIAL: Aluminum alloy plate of sufficient thickness to provide for grip length of bonding slave bolts

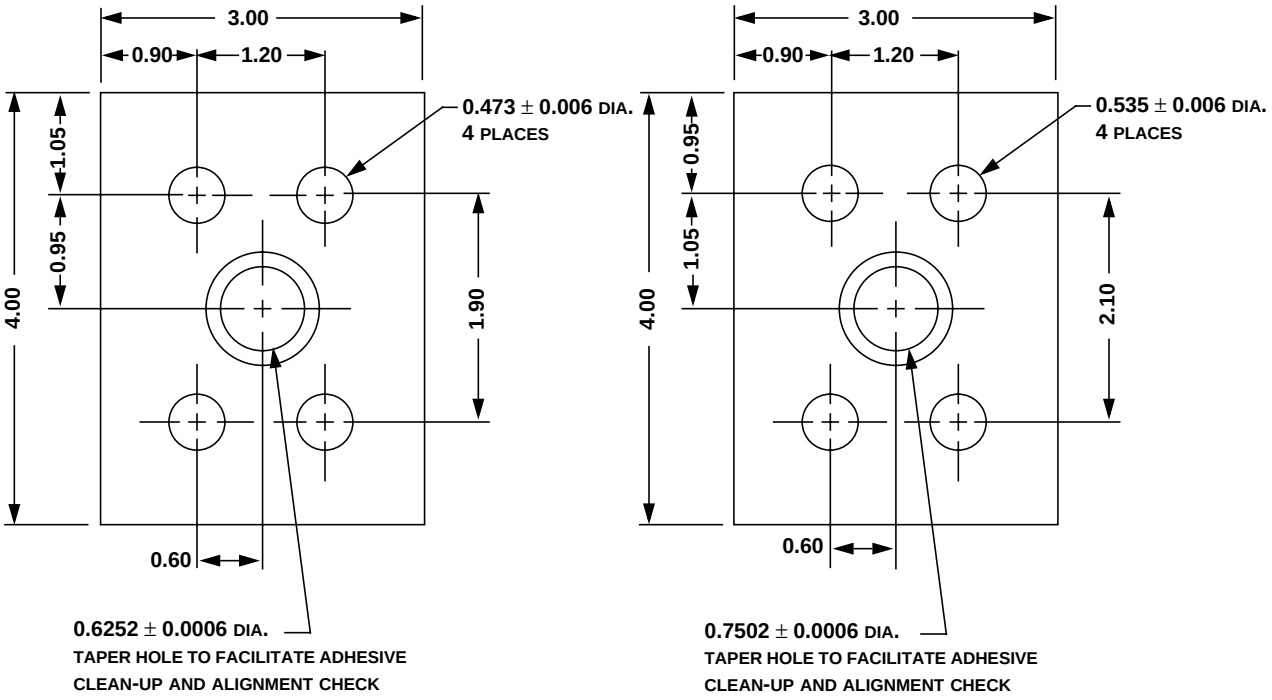

FIGURE 1 - SHOP AID FOR PROVIDING CURE PRESSURE FOR STRUT/PAD ASSEMBLY

5.2 Preparation of Parts

5.2.1 Ensure that the bonding surface of the aluminum pads and wing struts has been F19 primed according to PPS 34.08.

5.2.2 Immediately before the application of adhesive, lightly abrade the bond surfaces with an abrasive pad or 240 - 400 grit aluminum oxide abrasive paper and then solvent clean according to PPS 31.17.

5.2.3 Do not touch prepared surfaces with bare hands or subject to contamination. Wear clean cotton gloves at all times when handling prepared bonding surfaces.

5.3 Preparation of Bonding Kit Hardware

5.3.1 Before use, apply a coating of DSC 216-1 release agent to the threads and plastic sleeve (or vinyl tape) on the shanks of all slave bolts used to apply pressure during assembly and curing. Apply DSC 216-1 release agent according to PPS 16.24.

5.4 Preparation of DHMS A6.12 Type I Adhesive

5.4.1 Prepare and apply DHMS A6.12 Type I adhesive according to the requirements of PPS 25.52. Prepare only enough adhesive mix to be used up within 1 hour of mixing, to prevent the application of partially cured adhesive to parts.

5.5 Bonding

5.5.1 Bond as follows:

Step 1. Apply a thin uniform coating of DHMS A6.12 Type I adhesive mix to the bonding surface of the aluminum pad and wing strut, using a mohair roller or spatula.

Step 2. Immediately after applying the adhesive, place the aluminum pads (bonding surface to bonding surface) in correct alignment onto the wing strut mounting pads and assemble the strut/pad assembly and shop aid together as shown in Figure 2. Refer to Table I for a listing of the appropriate bonding hardware.

Step 3. Assemble bolts into the strut/pad mounting holes and pre-torque the bolts in holes 1 and 2 (see Figure 2-A) to the appropriate pre-torque values specified in Table I, using a suitable torque wrench.

Step 4. Pre-torque the bolts in holes 3 and 4 (see Figure 2-B) to the appropriate pre- torque value specified in Table I.

Step 5. Approximately 5 minutes after pre-torquing, torque each of the 4 nuts to the final torque values shown in Table I, in a criss-cross pattern (see Figure 2-C). Final torquing shall be accomplished within 1 hour of mixing the adhesive. Final torquing shall be monitored by Inspection to verify that final torque values as specified in Table I are achieved. The more often the bonding hardware is used, the easier it becomes to torque the bolts; however, do not exceed the torque values specified in Table I to seat the bolts.

Step 6. Immediately after final torquing, wipe off excess adhesive squeezed out of the bond line using a clean cloth dampened with the solvent specified in PPS 31.17.

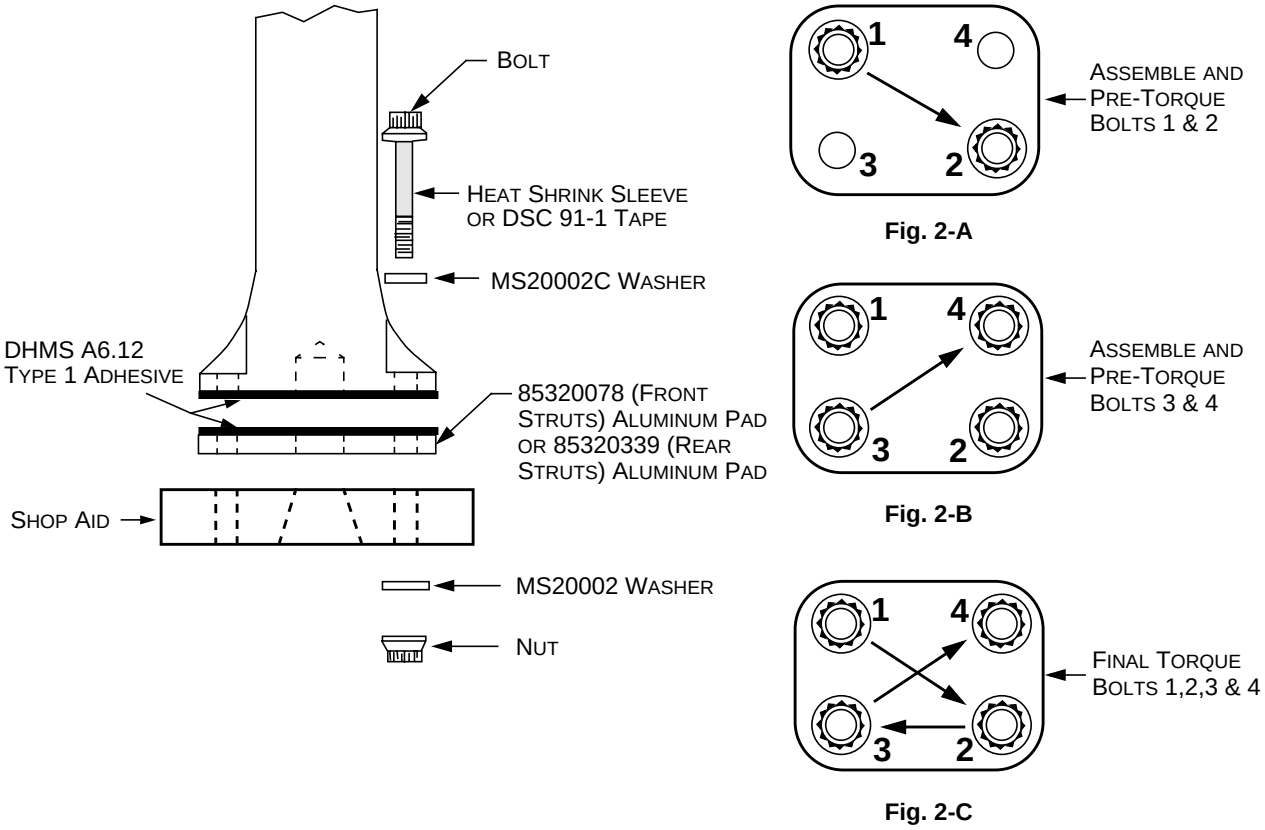

FIGURE 2 - ASSEMBLY/BONDING PROCEDURE

TABLE I - ASSEMBLY/BONDING HARDWARE AND TORQUE VALUES

STRUT ASSEMBLY	BONDING HARDWARE			TORQUE VALUES	
	BOLT	NUT	WASHERS	PRE-TORQUE	FINAL TORQUE
Front 85320077 85322595	MS21250-07022 (Note 1)	DSC97-7	MS20002-7 MS20002C7 (Note 3)	30 ft/lbs	50 ft/lbs
Rear 85320338 85322596	MS21250-08028 (Note 2)	DSC97-8	MS20002-8 MS20002C8 (Note 3)	40 ft/lbs	60 ft/lbs

Notes:
1. Bolt shank sleeved with M23053/5-108-9 heat shrinkable sleeve or DSC 91-1 vinyl tape to provide a close slide fit to the bolt holes.
2. Bolt shank sleeved with M23523/5-109-9 heat shrinkable sleeve or DSC 91-1 vinyl tape to provide a close slide fit to the bolt holes.
3. Use MS20002C washers under the head of the bolt to clear the fillet radius.

5.6 Curing

5.6.1 Allow bonded pad/strut assemblies to cure under pressure for a minimum of 8 hours at room temperature before removal of bonding hardware.

5.6.2 Allow bonded assemblies to full cure for a minimum of 72 hours at room temperature, before further working or machining the assembly.

5.7 Clean-up

5.7.1 Remove uncured adhesive from tools and equipment by solvent cleaning according to PPS 31.17.

6 REQUIREMENTS

6.1 Inspection shall monitor the final torquing operation to verify torque values per Table I.

6.2 Bonding aluminum pads to the wing struts according to this PPS will result in a nominal glue line thickness of 0.0005". Evidence of excessive glue line thickness shall be cause to reject the bonded assembly.

7 SAFETY PRECAUTIONS

7.1 Observe standard plant safety precautions when performing the procedure specified herein.

7.2 Refer to PPS 31.17 for the safety precautions for handling, storage and use of solvents.

7.3 Refer to PPS 25.52 for the safety precautions for handling and use of DHMS A6.12 Type I adhesive.

8 PERSONNEL REQUIREMENTS

8.1 This PPS has been categorized as a Controlled Critical Process according to PPS 13.39. Refer to PPS 13.39 for personnel requirements.

9 STORAGE

9.1 Storage DHMS A6.12 Type I adhesive components according to PPS 25.52.

9.2 The storage life of the adhesive components shall be as specified in PPS 13.28.