BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 33.08

PRODUCTION PROCESS STANDARD

MATTE SILVER PLATING

Issue 4
- This standard supersedes PPS 33.08, Issue 3.
- Extensive changes and/or deletions have been made at this issue and, therefore, detail changes have not been noted.
- Direct PPS related questions to PPS.Group@aero.bombardier.com or (416) 375-7641.
- This PPS is effective as of the distribution date.

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TABLE OF CONTENTS

Sections **Page**

Tables

Flow Charts

1 SCOPE

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for matte silver plating (QQ-S-365 Type I) of aluminum bronze alloys.

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction. The procedure specified in this PPS 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 31.04 - Degreasing Processes.

3.3 PPS 33.02 - Removal of Metallic Coatings.

3.4 QQ-S-365 - Silver Plating, Electrodeposited.

4 MATERIALS AND EQUIPMENT

4.1 All materials and equipment employed in carrying out the processes specified herein, shall be approved by Bombardier Quality as meeting the requirements of this standard and QQ-S-365.

5 PROCEDURE

5.1 Preparation of Parts for Plating

5.1.1 Surface Preparation

5.1.1.1 Surfaces to be plated shall be free of nicks, gouges or other defects that would be detrimental to the appearance or performance of the plating.

5.1.1.2 Areas not to be plated shall be masked off using a suitable masking agent.

5.1.2 Cleaning

5.1.2.1 Degrease parts which have become contaminated with oil or grease according to PPS 31.04.

5.1.2.2 Bright dip parts in a phosphoric acid/nitric acid solution.

5.1.2.3 Immediately before plating, alkaline electrolytically clean parts.

5.2 Plating Procedure

5.2.1 Rack parts so as to obtain a uniform plating thickness over the entire plated surface.

5.2.2 Deposit silver plating directly onto the base metal.

5.2.3 Attain the correct amperage immediately at the beginning of the plating cycle and maintain it constant throughout the operation.

5.2.4 Carry out plating of parts for the time required to achieve the required plate thickness.

5.3 Removal of Plating

5.3.1 If required, strip silver plating according to PPS 33.02.

6 REQUIREMENTS

6.1 Production Parts

6.1.1 From each lot, inspect for visual appearance and non-destructive plating thickness requirements for the number of parts specified in Table I according to section 6.1.3 and section 6.1.4 respectively.

6.1.2 If the non-conforming items in any sample exceeds the acceptance number specified in Table I, disposition the parts of the represented lot according to section 6.3.

6.1.3 Visual Appearance

6.1.3.1 The silver plating shall be smooth, fine grained, adherent, free from visible blister, pits, nodules, porosity, indications of burning, excessive edge build up and other defects.

6.1.3.2 When only a portion of the surface is plated and the surface plated is not bound by grind relief areas, the deposit shall be finished in such a manner that it will blend smoothly with the adjacent unplated areas.

6.1.4 Plating Thickness

6.1.4.1 The thickness of the silver plating shall be as specified on the engineering drawing.

6.1.4.1.1 The plating thickness shall be calculated from measurements taken before and after plating at several locations.

6.1.4.2 No edge build-up is permitted on parts plated to dimension.

6.1.4.3 Item which do not comply with the thickness requirements at one or more points of measurement shall be considered as non-conforming.

TABLE I - SAMPLING SCHEDULE

NUMBER OF ITEMS IN LOT	NUMBER OF ITEMS IN SAMPLE (SELECTED AT RANDOM)	ACCEPTANCE NUMBER (NOTE 1)
1 to 5	All	0
6 to 25	5	0
26 to 50	8	0
51 to 90	13	0
91 to 150	20	1
151 to 280	32	1
281 to 500	50	2
501 to 1200	80	3

Note 1. Any defective items within the permitted number of defectives shall not be accepted with the lot but stripped, re-plated and re-inspected as specified herein.

6.2 Quarterly Adhesion Testing and Metallurgical Examination

6.2.1 Every 3 months, plate four test specimens, 1" x 4" x 0.040" of the same material as the production parts according to the procedure specified herein. Submit the test specimens to either the Bombardier Toronto Materials Laboratory or a Bombardier approved laboratory for plate adhesion testing as follows:

Step 1. Bend each test specimen repeatedly through an angle of 180°, on a diameter of 0.04" until fracture of the basis metal occurs.

Step 2. Using a sharp instrument, attempt to detach an appreciable area of the plating from the substrate metal at the fracture. If it is possible to detach an appreciable area of the plating from the substrate metal at the fracture, suspend plating operations until the cause of the failure is determined and another 4 test specimens have been prepared for adhesion re-testing.

6.2.2 Two of the adhesion test specimens shall be metallographically examined for plating thickness. The thickness of the silver plating shall be as specified on the engineering drawing.

6.2.3 Failure of one or more test specimens shall be cause for action according to section 6.3.

6.3 Disposition

6.3.1 Lots rejected under section 6.1.3 and section 6.1.4 shall be 100% inspected and parts meeting the requirements shall be accepted and parts not meeting the requirements shall be stripped, replated and re-inspected as specified herein.

6.3.2 If specimens fail to meet the requirements specified in section 6.1 or section 6.2, suspend the plating process until the cause of failure has been established and corrective action has been taken prior to commencing processing production parts.

7 SAFETY PRECAUTIONS

7.1 Safety precautions applicable to the materials and procedures specified herein shall be defined by the subcontractor performing the work for Bombardier Toronto.

8 PERSONNEL REQUIREMENTS

8.1 Personnel responsible for matte silver plating (QQ-S-365 Type I) of aluminum bronze alloys shall have a basic understanding of the procedure and requirements as specified herein and shall have exhibited their familiarity to their supervisor.

9 MAINTENANCE OF SOLUTIONS

9.1 Analyse cleaning and plating solutions at regular intervals in order to maintain proper concentrations and operating conditions.

FLOW CHART 1 - SILVER PLATING