BOMBARDIER Toronto (de Havilland) **Proprietary Information**	**PPS 34.20** **Production Process Standard (PPS)**

Application of F42 Urethane Enamel

Issue 18

- This standard supersedes PPS 34.20, Issue 17.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
- This PPS is effective as of the distribution date.
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Issue 18 - Summary of Changes (over the previous issue)

The following summaries are not detailed and are intended only to assist in alerting PPS users to changes which may affect them; refer to the applicable section(s) of this PPS for detailed procedure and requirements.

- Added provision for masking using masking paper and/or masking tape, as necessary.

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1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for application of urethane enamel decorative finish (Finish Code F42 as per PPS 23.02).

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 Site) 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 General

3.1.1 Unless a specific issue is indicated, the issue of the reference documents specified in this section in effect at the time of manufacture shall form a part of this specification to the extent indicated herein.

3.2 Bombardier Toronto (de Havilland) Process Specifications

3.2.1 PPS 13.13 - Personal Protective Respiratory Equipment.

3.2.2 PPS 13.26 - General Subcontractor Provisions.

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

3.2.4 PPS 17.02 - Abrasive Blast Cleaning.

3.2.5 PPS 23.02 - Protective Treatment and Decorative Surface Finish Code System.

3.2.6 PPS 31.17 - Solvent Usage.

3.2.7 PPS 34.07 – Application of F14 Primer to Thermoplastic Surfaces

3.2.8 PPS 34.08 - Application of Epoxy-Polyamide Primer (F19 and F45).

3.2.9 PPS 34.11 - Priming and Painting of Aircraft Exterior Surfaces.

3.3 Bombardier Toronto (de Havilland) Test Panels

3.3.1 LAB 066 – Paint Test Panel (Untreated).

3.4 Bombardier Toronto (de Havilland) Internal Operating Procedure

3.4.1 EHS-OP-005 - Hazardous Materials Management.

3.5 Bombardier Aerospace Engineering Requirements Documents

3.5.1 BAERD GEN-007 - Quality Control of Heat Treating Equipment and Hot Forming Equipment.

3.5.2 BAERD GEN-023 - Contamination Control for Compressed Air.

3.6 Bombardier Aerospace Process Specifications

3.6.1 BAPS 138-055 - Accelerated Curing of Organic Compounds.

4 Materials and Equipment

4.1 Materials

4.1.1 Unless otherwise specified in this section, use only the materials specified; use of superseding or alternative materials is not allowed.

4.1.2 Urethane enamel, decorative interior system, Finish Code F42, to BMS 10-83 Type II, BMS 10-83 Type III, DHMS C4.22 Type VI or DHMS C4.22 Type VII. Except as follows, where F42 is specified, use the particular enamel specified by the engineering drawing.

- Where use of BMS 10-83 Type II is specified, it acceptable to use DHMS C4.22 Type VI and similarly, where use of DHMS C4.22 Type VI is specified, it is acceptable to use BMS 10-83 Type II.
- Where use of BMS 10-83 Type III is specified, it acceptable to use DHMS C4.22 Type VII and similarly, where use of DHMS C4.22 Type VII is specified, it is acceptable to use BMS 10-83 Type III.
- Use of BMS 10-83 Type II and BMS 10-83 Type III is being phased out; use BMS 10-83 Type II and BMS 10-83 Type III to depletion of existing stock and then use DHMS C4.22 Type VI or DHMS C4.22 Type VII, respectively.

4.1.2.1 If the engineering drawing, or a referencing PPS, does not specify the particular enamel to be used, refer to Liaison Engineering for the enamel to use.

4.1.3 Test samples to Bombardier Toronto (de Havilland) Lab Drawing LAB 066-1.

4.1.4 Wiping cloths (e.g., DSC 378-2).

4.1.5 Tack cloths to (e.g., DSC 375-1).

4.1.6 Aluminum oxide abrasive paper, 180 - 220 grit.

4.1.7 Protective wrapping material (e.g., Brown Kraft paper, Kimpac K41, Air-Cap C120 or D120 plastic bubble film, Poly Foam).

4.1.8 Compressed air for use with spray guns. Compressed air used with spray application equipment must meet the requirements of BAERD GEN-023.

4.2 **Equipment**

4.2.1 Spray booths and rooms must be equipped with suitable exhaust systems such that the air flow will not cause air turbulence or excessive air currents but be adequate to prevent dried overspray from settling on primed surfaces that are still tacky. Adequate lighting must be provided, including in under-surface areas.

4.2.2 Relative humidity recording and/or indicating equipment: sling psychrometer or hygrometer (e.g., Extech RHT20). Relative humidity recording and/or indicating equipment must be calibrated and operated according to the manufacturers' instructions.

4.2.3 Lint free cheesecloth or filter mesh.

4.2.4 Masking paper, non-adhesive (e.g., 3M #06539, 3M #06736 "Scotchblok" or Kraft paper).

4.2.5 Masking tape utilizing rubber based adhesive (e.g., 3M #218 or 3M #8428).

4.2.6 Electronic thickness gauge (e.g., Elcometer) or micrometer.

4.2.7 Viscometer, "Gardco EZ cup" Zahn #2 cup; do not use other brands of Zahn cups.

4.2.8 Protective rubber gloves (e.g., DSC 422-5 neoprene gloves, DSC 422-2 rubber gloves or DSC 422-8 nitrile gloves).

4.2.9 Mechanical paint shaker, capable of agitation of enamel base component to ensure uniform distribution of solids without adversely affecting the base component.

4.2.10 Spray guns and associated equipment (e.g., HVLP, air electrostatic, high pressure air assist, etc.) capable of applying coatings to the dry film thicknesses specified herein without unacceptable defects as specified in section 6. Operate spray guns and associated equipment according to the equipment manufacturers instructions.

4.2.11 Accelerated cure oven or area (conventional or infrared (IR)), qualified according to BAPS 138-055 (including temperature uniformity survey according to BAERD GEN-007).

5 Procedure

5.1 General

5.1.1 F42 urethane enamel is used to topcoat:

- F14 primed thermoplastic surfaces
- F19 Type 2 primed metallic surfaces
- F19 Type 3 primed fibre reinforced phenolic surfaces
- Bare Ultem and Declar thermoplastic surfaces

5.1.2 F42 catalyst contains isocyanates. All operators must be familiar with the safety precautions listed in section 7 before handling or using this material.

5.1.3 Do not paint when the temperature is less than 60°F (16°C), or when the relative humidity is less than 30% or more than 80%. Use the calibrated indicators provided to monitor and record temperature and humidity conditions.

5.1.4 Wash floors as frequently as required to avoid a build-up of dust and loose overspray.

5.1.5 If the engineering drawing specifies a F42 stipple coat, refer to Liaison Engineering for disposition.

5.1.6 If masking is required, it is acceptable to use masking paper (ref. para. 4.2.4) and/or masking tape (ref. para. 4.2.5), as necessary. Secure masking paper in place using masking tape, as necessary.

5.2 Preparation of Paint

5.2.1 Only use base and catalyst which are within their storage lives (as marked on the containers). Submit base or catalyst which has exceeded its storage life for shelf life extension testing, as applicable and action as specified in PPS 13.28.

5.2.2 Discard enamel base which shows signs of skinning, gelling, lumping, pigment separation or any other deterioration (e.g., according to EHS-OP-005).

5.2.3 If the catalyst shows signs of milkiness, precipitation, darkening in colour, or any other deterioration dispose of it (e.g., according to EHS-OP-005).

5.2.4 Prepare paint according to the manufacturers' instructions, or as follows:

Step 1. Open the can and use a paddle to break up any caked paint at the bottom of the can.

Step 2. Close the can and agitate the base component on a mechanical paint shaker (ref. para. 4.2.9) for a minimum of 1 minute and a maximum of 20 minutes.

Step 3. Hand mix the base and catalyst (or hardener) in the ratio shown in Table 1.

Step 4. For BMS 10-83 Type II and Type III enamel, allow the base/catalyst mixture to stand for the reaction time specified in Table 1. For DHMS C4.22 Type VI and Type VII enamel it is not necessary to allow the base/hardener to stand for a reaction time.

Step 5. Strain the mix through a clean, lint free cheesecloth or filter mesh.

Step 6. Reduce the mixture to the spraying viscosity specified by the manufacturer using the thinner specified in Table 1. Do not reduce enamel to be used for touch-up. Verify the spray viscosity against the specified requirements with a "Gardco EZ cup" Zahn #2 cup. Ensure that the cup is thoroughly cleaned after every use. If there is reason to doubt the accuracy of the cup (e.g., clogging of the orifice) submit the cup for calibration or replace with a new certified cup.

Table 1. Preparation of F42 Enamel

Enamel	Components	Mixing Ratio (By Volume)	Reaction Time	Pot Life	Specification
Mankiewicz Gebr.&Co. Alexit-FST Topcoat	Alexit-FST-346-57 base	4	N/A	3 hours	DHMS C4.22 Type VI (semi-gloss) or Type VII (low gloss)
	Alexit-FST-345-57 hardener	1			
	water	1.5			
Mapaero FR2-55	559X-XXXXB base	4	N/A	1 hour	
	2105 5001D hardener	1			
	water	0.5 – 1.2			
Sherwin-Williams Polane L	F63 Series base	7	Allow the base and catalyst to react for 15 minutes the before reducing	16 hours	BMS 10-83 Type II (semi-gloss) or Type III (low gloss)
	V66VC229 catalyst	1			
	R99KY29 thinner	As required to obtain correct viscosity			

5.3 Preparation of Parts for Application of F42 Enamel

5.3.1 General

5.3.1.1 Mapaero FR2-55 enamel shall only be applied to surfaces primed with Mapaero FR4-45 primer according to PPS 34.07. Do not apply Mapaero FR2-55 enamel to unprimed or F19 primed surfaces.

5.3.1.2 Alexit-FST and Polane L enamel shall only be applied to unprimed or F19 primed surfaces. Do not apply Alexit-FST Topcoat or Polane L enamel to F14 primed surfaces.

5.3.2 **Preparation of F14 Primed Surfaces for Application of Mapaero FR2-55 Enamel**

5.3.2.1 For F14 primed surfaces, solvent clean according to PPS 31.17 and then wipe surfaces with a tack cloth immediately before painting.

5.3.3 **Preparation of F19 Primed Surfaces for Application of Alexit-FST Topcoat or Polane L Enamel**

5.3.3.1 For F19 primed surfaces which have been room temperature cured for less than 12 hours use a tack cloth to remove loose particles (i.e., dust, etc.) immediately before painting.

5.3.3.2 For F19 primed surfaces which have been room temperature cured for 12 to 48 hours solvent clean according to PPS 31.17 and then wipe surfaces with a tack cloth immediately before painting.

5.3.3.3 For F19 primed surfaces which have been either heat cured or room temperature cured for more than 48 hours, to obtain proper topcoat adhesion reactivate as follows:

Step 1. Scuff the surface using aluminum oxide abrasive paper (180 grit for vibrating sanders, 200 grit for hand abrading).

Step 2. Dust off scuffed areas with a clean wiper.

Step 3. Reactivate the primer according to PPS 31.17.

Step 4. Use a tack cloth to remove loose particles (i.e., dust, etc.) immediately before painting.

5.3.4 **Preparation of Unprimed Ultem and Declar Surfaces for Application of Alexit-FST Topcoat or Polane L Enamel**

5.3.4.1 Prepare unprimed Ultem and Declar surfaces as follows immediately before applying Alexit-FST Topcoat or Polane L enamel:

Step 1. Scuff the surface using aluminum oxide abrasive paper (180 grit for vibrating sanders, 200 grit for hand abrading).

Step 2. Either wash parts with soap and water or solvent clean as specified in PPS 31.17.

Step 3. Tack rag the surfaces.

5.4 **Application of F42 Enamel**

5.4.1 Begin painting immediately after the surface has been prepared.

5.4.2 Include an untreated, unprimed LAB 066-1 test panel with each batch of parts to be F42 coated.

5.4.3 Apply F42 as follows:

Step 1. Apply a thin even, cover coating of F42.

Step 2. Allow the cover coat to air dry for 5 to 10 minutes.

Step 3. Apply a final full coating of F42 to obtain a total dry film thickness of 0.002" - 0.003".

5.5 Curing of F42 Enamel

5.5.1 Allow F42 enamel to cure according to Table 2. Ovens or areas (conventional or infrared (IR)) used for accelerated cure must be qualified according to BAPS 138-055 (including temperature uniformity survey according to BAERD GEN-007).

Table 2. Cure Schedule for F42 Enamel

Enamel	Minimum Cure Time & Temperature		Specification
	Cure to Handle	Full Cure	
Mankiewicz Gebr. & Co. Alexit-FST Topcoat	60 minutes at 60°F (16°C)	30 minutes flash off at 60°F (16°C) followed by 60 minutes at 110°F (43°C)	DHMS C4.22 Type VI (semi-gloss) or Type VII (low gloss)
		30 minutes flash off at 60°F (16°C) followed by 30 minutes at 140°F (60°C)	
Mapaero FR2-55	8 hours at 73°F (23°C)	7 days at 73°F (23°C)	
	3 hours at 104°F (40°C)	30 minutes flash off at 60°F (16°C) followed by 3 days at 104°F (40°C)	
	60 minutes at 140°F (60°C)	30 minutes flash off at 60°F (16°C) followed by 12 hours at 140°F (60°C)	
Sherwin-Williams Polane L	12 hours at 60°F (16°C)	7 days at 60°F (16°C)	BMS 10-83 Type II (semi-gloss) or Type III (low gloss)

5.6 Clean-Up and Disposal

5.6.1 Promptly remove un-cured urethane enamel from tools and other areas using the solvent specified in PPS 31.17. Clean equipment promptly to avoid dried paint.

5.6.2 Dispose of the following items according to the appropriate plant procedure (e.g., according to EHS-OP-005):

- Excess mixed F42 enamel
- Unacceptable base or catalyst
- Empty cans, containers, rags, wipers or paper contaminated with mixed F42 enamel or raw catalyst

5.6.3 In the event of spillage of mixed F42 or raw catalyst, clear the immediate area of personnel and clean up the spill (e.g., according to EHS-OP-005).

5.7 **Rework of Damaged or Defective Coatings**

5.7.1 Use a brush to touch up small pits and scratches. Repair coatings with other minor defects as follows:

Step 1. Use 180 - 220 grit abrasive paper to locally abrade the area of the defect as required.

Step 2. Feather edge the existing finish adjacent to the stripped area by sanding with abrasive paper.

Step 3. Wipe the abraded area with a tack rag.

Step 4. Re-paint the area according to the procedure specified herein.

5.7.2 Repair coatings with major defects as follows:

Step 1. Use 180 - 220 grit abrasive paper to abrade the coating as required to remove the defects.

Step 2. Reprocess the parts according to the original painting sequence.

5.7.3 Process F42 coated surfaces which are unacceptable due to excessive coating thickness as follows:

Step 1. Abrade the surface with 180 - 220 grit abrasive paper to remove the F42 coating and applicable primer. Take care not to damage the surface of composite or thermoplastic parts. For metallic substrates only, it is acceptable to remove the primer coat by abrasive blasting according to PPS 17.02.

Step 2. Re-prime composite and metallic parts with the applicable type of F19 primer according to PPS 34.08.

Step 3. Re-paint the parts according to the procedure specified herein.

5.8 **Protection for Transport or Storage**

5.8.1 Wrap painted parts to be transported or stored in protective wrapping material (ref. para. 4.1.7) and place in cardboard boxes to provide protection against damage.

6 Requirements

6.1 Examine painted surfaces for damage (such as scratches), defects (such as blemishes, runs, sags, pits, streaks, excessive orange peel, dried overspray, blisters, peeling, etc.) or other irregularities that impair appearance or protective qualities. Coatings with damage, defects or irregularities are not acceptable and must be reworked according to section 5.7.

6.2 Check parts which have been stippled for stipple size and consistency of appearance by comparing the stippled part with the F42 Stipple Surface Finish Sample. Parts which fail to meet the stipple size and consistency of appearance are not acceptable and must be reworked according to section 5.7.

6.3 Determine the dry film thickness of the F42 by measuring the F42 on the test sample that was included with the parts when they were painted. Check the dry film thickness at specified locations. The dry film thickness of the F42 without stipple, measured using a micrometer or electronic coating thickness gauge, must be 0.002" - 0.003". For test samples which fail to meet the coating thickness requirements, rework the represented parts according to para. 5.7.3, including another set of test samples.

6.4 Except as noted in para. 6.4.1, the dry film thickness of F42 with stipple, measured using a micrometer or electronic coating thickness gauge, must be 0.002" - 0.004". Measure the F42 stipple at several different locations in order to determine the maximum thickness.

6.4.1 In small repair areas touched up by brush according to section 5.7, it is acceptable to vary from the dry film thickness limitations provided that complete coverage is visually verified. Take care to avoid application of an excessively thick or thin coating beyond the dry film thickness limitations specified.

7 Safety Precautions

7.1 The safety precautions specified herein are specific to Bombardier Toronto (de Havilland) to meet Canadian Federal and Provincial government environmental, health and safety regulations. It is recommended that other facilities consider these safety precautions; however, suppliers, subcontractors and partners are responsible for ensuring that their own environmental, health and safety precautions satisfy the appropriate local government regulations.

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

7.3 Ensure the spray booths and rooms are equipped with suitable exhaust systems. Paint spray rooms must be equipped with forced or induced ventilation systems capable of maintaining sufficient ventilation to meet Occupational Health and Safety Act requirements.

7.4 Do not smoke or eat in paint spraying areas.

7.5 Always wear protective respiratory equipment according to PPS 13.13 when applying F42 enamel.

7.6 Do not have open flames or unprotected lights in areas where painting operations are carried out. Do not use infrared or other heat lamps in the paint booths (i.e., in any area where paint is being applied).

7.7 Clean-up and dispose of empty cans or containers, rags, wipers or paper contaminated with mixed F42 or raw catalyst according to EHS-OP-005. In the event of spillage of mixed F42 or raw catalyst, clear the immediate area of all personnel and clean up the spill (e.g., according to EHS-OP-005).

7.8 Always wear protective coveralls, rubber gloves and Bombardier Toronto (de Havilland) approved splash goggles when handling mixed F42 enamel or components.

7.9 Refer to PPS 31.17 for safety precautions relating to solvents.

8 Personnel Requirements

8.1 Personnel must have a good working knowledge of the applicable procedure and requirements as specified herein and must have exhibited their competency to their supervisor.

9 Additional Information

9.1 Store F42 enamel components in a dry area at a temperature of 40°F - 100°F (4°C - 38°C); for optimum storage life, a temperature of 60°F - 80°F (16°C - 27°C) is recommended. Store F42 enamel components according to PPS 13.28.