BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 13.37

PRODUCTION PROCESS STANDARD

GENERAL AIRCRAFT CLEANING & REMOVAL OF FOREIGN OBJECT DEBRIS/DAMAGE (FOD)

Issue 1
- This is a new Production Process Standard.
- Direct PPS related questions to PPS.Group@aero.bombardier.com or (416) 375-4365.
- This PPS is effective as of the distribution date.

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 procedure and requirements for removal of foreign object debris/damage (FOD) including general aircraft cleaning as contamination such as oil, grease, dirt and soil is considered a form of FOD for the purposes of this PPS.

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction and the procedure specified 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 13.26 - General Subcontractor Provisions.

3.2 PPS 31.17 - Solvent Usage.

3.3 PPS 39.06 - Installation of DASH 8 Airframe De-Icer Boots.

3.4 PPS 39.07 - Installation of DASH 8 Air Intake De-Icer Boots.

3.5 PPS 39.08 - Replacement of Autoclave bonded De-Icer Boots on DASH 8 Composite Leading Edges

4 MATERIALS AND EQUIPMENT

4.1 Materials

4.1.1 Solvent as specified by PPS 31.17.

4.2 Equipment

4.2.1 FOD bucket, plastic (see Figure 1).

4.2.2 Heavy duty electric shop-type vacuum cleaner with rubber tipped crevice-type and dusting brush attachments (e.g., Pullman Holt Model 102 CV).

4.2.3 Paint brushes, synthetic bristle type.

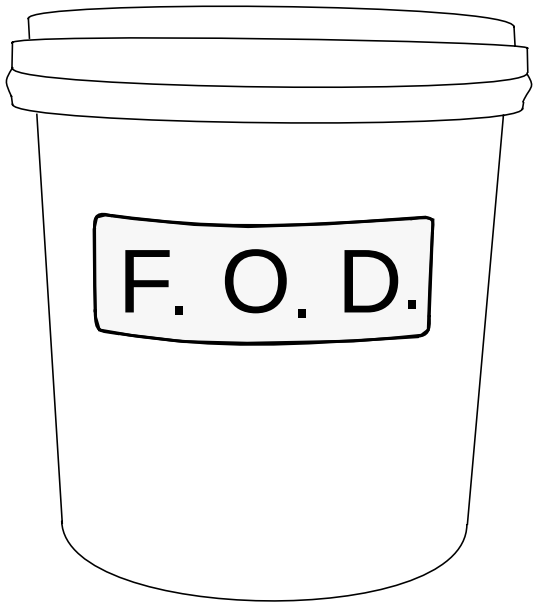

FIGURE 1 - FOD BUCKET

5 PROCEDURE

5.1 General

5.1.1 For the purposes of this PPS, foreign object debris/damage (FOD) includes all manner of foreign objects present on the aircraft. FOD includes, but is not limited to, the following:

- loose, unused aircraft parts and/or fragments of broken aircraft parts or hardware, such as fasteners, o-rings, cable ties, etc.
- tools and clecos
- oil and grease in areas where use of oil or grease is not specified
- residue of cutting fluid (e.g., Boelube)
- inappropriate lubricant (i.e., not authorized by applicable engineering drawings or PPS's)
- debris such as swarf, drill chips, dust, etc. visible without magnification
- dirt or soil on interior furnishings (e.g., upholstery, etc.)

5.1.2 FOD is considered as damage by the simple presence of these unacceptable objects, possibly resulting in damage and/or failure of equipment and/or systems when the aircraft is in use. Refer to Liaison Engineering for disposition where FOD has caused physical damage to components (e.g., stains on upholstery, fabric or carpet, scratches or gouges in parts or coatings, etc.)

5.2 FOD Prevention

5.2.1 It is everyone's responsibility to do their part to prevent FOD. Standard practices in day-to day work should include the following, as applicable:

- As practical, shake or roll smaller enclosed assemblies such as aileron flaps, engine cowl, etc. before installation and listen for any entrapped FOD. Take care to avoid damaging the assembly when shaking or rolling.
- If a piece of hardware is dropped, find it and pick it up immediately; don't wait.
- At the completion of each job, clean up all debris resulting from that job (e.g., swarf, lockbolt stems, broken off cable tie tails, etc.).
- Make sure there is a FOD bucket in the area you are working in and use it.
- At the end of each shift, clean up all debris even if some operations have not yet been completed.
- DO NOT use aircraft structure as a receptacle for holding loose aircraft parts (e.g., fasteners, cable ties, o-rings, etc.).
- DO NOT take tools which are not required for the job at hand into areas subject to future closure (e.g., fuel tanks, side wall areas, under floor areas, etc.).
- At the end of each shift, make sure that all tools can be accounted for that you used that day. If any are missing which cannot be found report it immediately to the area inspector and Line Manager.
- If a particular job creates a lot of debris, take a FOD bucket and clean as you go.
- If you see any FOD, even if it is not a result of your work, pick it up and place it in the nearest FOD bucket.
- Follow good FOD prevention procedures at all times. Always keep your work area tidy and free of debris and unnecessary tools or hardware.

5.2.2 O-rings are potential FOD. Some components are received with inlets or outlets capped with metal blanking caps having an internal o-ring; when removing any of these metal blanking caps to make hydraulic connections, always ensure that the o-ring is present and intact inside the removed blanking cap of this type. When removing and replacing any hydraulic components, always ensure all o-rings, or pieces of o-rings if damaged, are accounted for.

5.2.3 Always perform a visual check for signs of FOD inside oxygen, hydraulic, fuel and pneumatic lines before making connections. Ensure only the lubricants specified by the engineering drawing or PPS are used for lubrication. Ensure that all blanking caps and/or dust caps are removed and accounted for.

5.2.4 Ensure that all de-ice lines remain capped at all times except when necessary to remove caps for line testing or for final leading edge installation.

5.2.5 De-icer boot intakes on the leading edge are received capped by the supplier. Ensure that these caps remain in place at all times until final installation. Also, ensure boots are stored upright; not resting on the boot surfaces (see Figure 2). If any leading edge is removed for any reason, ensure that both the supply de-ice line and the air inlet on the leading edge are suitably capped immediately.

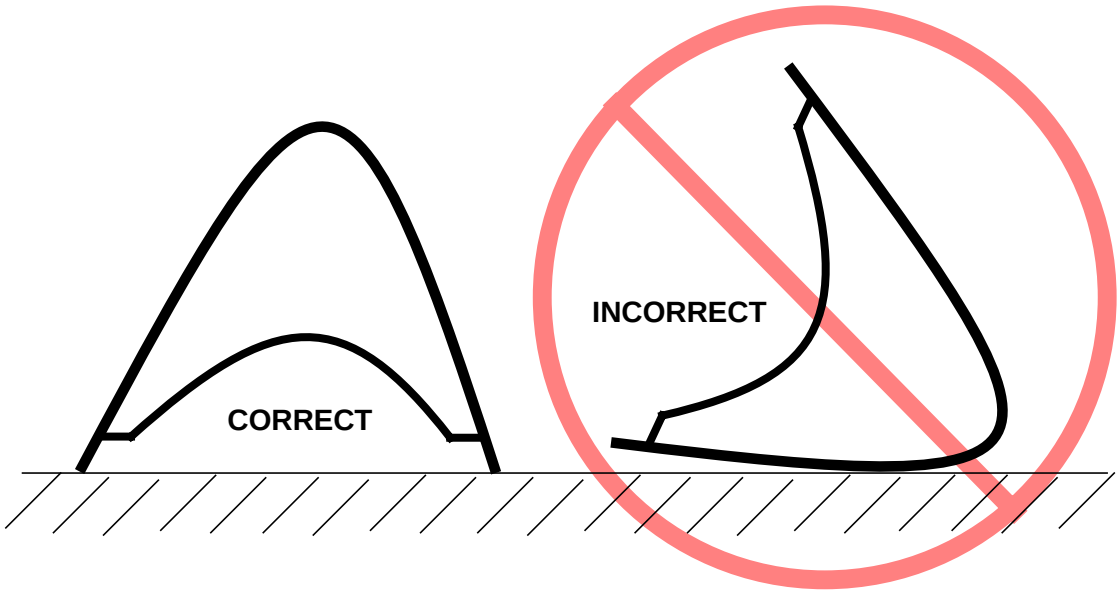

FIGURE 2 - STORAGE OF DE-ICER BOOTS

5.3 Removal of FOD

5.3.1 Refer to Table I for the applicable FOD removal procedure.

TABLE I - FOD REMOVAL PROCEDURES (Notes 3 & 4)

SURFACE	FOD	REMOVAL PROCEDURE
Anywhere on the aircraft	Loose unused aircraft parts or hardware.	If practical, remove by picking up. Take care to avoid damage to surrounding structure, coatings, etc. In cases of limited access, requiring disassembly of applicable structure and/or components, refer to Liaison Engineering for disposition.
	Loose fragments of broken aircraft parts or hardware	
	Misplaced/forgotten tools	
Anodized	Swarf or drill chips	Vacuum and then solvent clean according to PPS 31.17.
	Dirt and/or soil	
	Cutting fluid residue, hydraulic fluid, lubricant, oil or grease	Solvent clean according to PPS 31.17.
C1 or C10 Chemical Conversion Coating	Swarf or drill chips	Vacuum and solvent clean according to PPS 31.17.
	Dirt and/or soil	
	Cutting fluid residue, hydraulic fluid, lubricant, oil or grease	Solvent clean according to PPS 31.17
Decorative Film applied to Composite Parts	Finger prints	Clean using warm water and mild detergent.
	Swarf or drill chips	Vacuum and then clean using warm water and mild detergent.
	Dirt and/or soil	
	Cutting fluid residue, lubricant, oil or grease	Clean using warm water and mild detergent.
De-icer Boot	Suspected FOD inside de-icer boot	Refer to PPS 39.06, PPS 39.07 or PPS 39.08, as applicable, for disposition.
	Dirt and/or soil	Vacuum and then solvent clean according to PPS 31.17.
	Cutting fluid residue, hydraulic fluid, lubricant, oil or grease	Solvent clean according to PPS 31.17.
Dry Film Lubricant (C3, C7 or C8)	Swarf or drill chips	Vacuum and then solvent clean according to PPS 31.17.
	Dirt and/or soil	
	Cutting fluid residue, lubricant, oil or grease	Solvent clean according to PPS 31.17.

Note 1. Cleaning upholstery, fabric or carpet using detergent, water or solvents will adversely affect the flame retardant treatment; and therefore, refer to Liaison Engineering for disposition.
Note 2. Phosphate ester based hydraulic fluid may have a detrimental affect on sealant, and therefore refer to Liaison Engineering for disposition.
Note 3. For instances of FOD other than those specified herein, refer to LIaison Engineering for disposition.
Note 4. If the FOD removal procedure specified herein does not fully remove the FOD, refer to Liaison Engineering for disposition.

TABLE I - FOD REMOVAL PROCEDURES (Notes 3 & 4)

SURFACE	FOD	REMOVAL PROCEDURE
F13 Corrosion Preventive Coating	Loosely embedded swarf, drill chips, etc.	If possible, pick out debris without disturbing the coating. If it is not possible to pick out debris without disturbing the coating, pick out the debris, locally remove the F13 coating by solvent cleaning and re-apply the coating.
	Firmly embedded swarf, drill chips, etc.	Pick out the debris, locally remove the F13 coating by solvent cleaning according to PPS 31.17 and re-apply the coating.
	Dirt and/or soil	Wipe off the dirt and soil as much as possible, locally remove the F13 coating by solvent cleaning and re-apply the coating.
	Cutting fluid residue, hydraulic fluid, lubricant, oil or grease	Locally remove the F13 coating by solvent cleaning according to PPS 31.17 and re-apply the coating.
Bare Metallic & Plated	Swarf or drill chips	Vacuum and then solvent clean according to PPS 31.17.
	Dirt and/or soil	
	Cutting fluid residue, hydraulic fluid, lubricant, oil or grease	Solvent clean according to PPS 31.17.
Bare Plastic or composite (Formica, Arborite, acrylic, polycarbonate, polyester, phenolic, etc.)	Swarf or drill chips	Vacuum and then solvent clean according to PPS 31.17.
	Dirt and/or soil	
	Cutting fluid residue, hydraulic fluid, lubricant, oil or grease	Solvent clean according to PPS 31.17.
Porous (Velcro, balsa, cork, etc.)	Swarf or drill chips	Vacuum. Refer to Liaison Engineering for disposition if vacuuming does not remove all traces.
	Dirt and/or soil	
	Cutting fluid residue, hydraulic fluid, lubricant, oil or grease	Refer to Liaison Engineering for disposition.

Note 1. Cleaning upholstery, fabric or carpet using detergent, water or solvents will adversely affect the flame retardant treatment; and therefore, refer to Liaison Engineering for disposition.
Note 2. Phosphate ester based hydraulic fluid may have a detrimental affect on sealant, and therefore refer to Liaison Engineering for disposition.
Note 3. For instances of FOD other than those specified herein, refer to LIaison Engineering for disposition.
Note 4. If the FOD removal procedure specified herein does not fully remove the FOD, refer to Liaison Engineering for disposition.

TABLE I - FOD REMOVAL PROCEDURES (Notes 3 & 4)

SURFACE	FOD	REMOVAL PROCEDURE
Primed or Painted	Swarf or drill chips	Vacuum and then solvent clean according to PPS 31.17.
	Dirt and/or soil	
	Cutting fluid residue, hydraulic fluid, lubricant, oil or grease	Solvent clean according to PPS 31.17.
Sealant Bead	Swarf or drill chips	Dislodge swarf or drill chips loosely embedded in sealant using a paint brush trimmed to a bristle length of approximately 1/2". Refer to Liaison engineering for disposition of firmly embedded swarf or drill chips.
	Dirt and/or soil	For fully cured sealant, remove loose dirt and/or soil by careful vacuuming (take care to avoid damaging the sealant) followed by solvent cleaning according to PPS 31.17. For sealant which has not fully cured, refer to Liaison Engineering for disposition.
	Cutting fluid residue, lubricant, oil or grease	For fully cured sealant, solvent clean according to PPS 31.17. For sealant which has not fully cured, refer to Liaison Engineering for disposition.
	Phosphate ester based hydraulic fluid (e.g., Skydrol)	For fully cured or partially cured sealant, refer to Liaison Engineering for disposition (Note 2).
Upholstery, Fabric or Carpet	Swarf or drill chips	Pick out large pieces and carefully vacuum.
	Dirt and/or soil	If possible, remove loose dirt and/or soil by careful vacuuming (take care to avoid embedding the dirt and/or soil). Refer to Liaison Engineering for disposition if the dirt and/or soil is embedded such that it is not possible to remove by vacuuming or the dirt and/or soil is contaminated with cutting fluid, hydraulic fluid, oil or grease (Note 1).
	Cutting fluid residue, lubricant, oil or grease	Refer to Liaison Engineering for disposition (Note 1).

Note 1. Cleaning upholstery, fabric or carpet using detergent, water or solvents will adversely affect the flame retardant treatment; and therefore, refer to Liaison Engineering for disposition.
Note 2. Phosphate ester based hydraulic fluid may have a detrimental affect on sealant, and therefore refer to Liaison Engineering for disposition.
Note 3. For instances of FOD other than those specified herein, refer to LIaison Engineering for disposition.
Note 4. If the FOD removal procedure specified herein does not fully remove the FOD, refer to Liaison Engineering for disposition.

5.4 Vacuuming

5.4.1 Use a dusting brush attachment to help dislodge chips and swarf. A crevice-type attachment may be more useful on inside corners, under stringer steps and between rib clips.

5.4.2 Loosen adhering particles in hard-to-reach areas using a clean paint brush and sweep them towards the vacuum nozzle.

5.4.3 Always take care when vacuuming to avoid damaging (e.g., scratching) the surface being cleaned by the vacuum attachments or by the FOD being removed.

6 REQUIREMENTS

6.1 All FOD must be appropriately removed.

7 SAFETY PRECAUTIONS

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

7.2 Refer to PPS 31.17 for the safety precautions for solvent cleaning.

8 PERSONNEL REQUIREMENTS

8.1 Personnel responsible for general aircraft cleaning and FOD removal must have a good working knowledge of the applicable procedure and requirements as specified herein and must have exhibited their familiarity to their supervisor.