BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 13.04

PRODUCTION PROCESS STANDARD

De-Fuming of Aircraft Fuel Tanks and Fuel Containers

Issue 6
- This standard supersedes PPS 13.04, Issue 5.
- Vertical lines in the left hand margin indicate 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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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 defuelling and de-fuming of aircraft integral fuel tanks, long range fuel tanks and any other containers used for fuel storage, transport or shipment.

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 EHS-OP-017 - Entry into Previously Fuelled Aircraft Tanks - *Bombardier Toronto (de Havilland) internal operating procedure*.

3.2 EHS-OP-028 - Aviation Fuel Transfer System - *Bombardier Toronto (de Havilland) internal operating procedure*.

3.3 PPS 13.13 - Personal Protective Respiratory Equipment.

3.4 PPS 13.26 - General Subcontractor Provisions.

4 Equipment

4.1 Explosion proof lights.

4.2 Combustible gas indicator (e.g., M.S.A. Explosimeter).

4.3 Fresh air ventilating unit.

4.4 Suitable Class B Fire Extinguisher Equipment.

4.5 Pressure Refuel/Defuel Truck.

5 Procedure

5.1 General

5.1.1 Carry out de-fuming of fuel containers whenever a container is to be stored indefinitely or is to be repaired or reworked.

5.1.2 Carry out defuelling and de-fuming of aircraft fuel tanks if the fuel tanks or fuel system is to be repaired or reworked.

5.1.3 The basic principles specified herein to ensure safe handling of fuel and fuel containers may be summarized as follows:

- Eliminate sources of ignition such as open flames or cigarettes from the area where defuelling, draining or de-fuming operations are being done.
- Eliminate static electric potential from all equipment, containers, aircraft, fuel trucks, etc. by common connection to earth ground.
- Reduce the amount of combustible vapour within a fuel tank or container to a level below the lower explosive limit by purging the container with warm fresh air.

5.2 Defuelling and Draining Aircraft

5.2.1 Defuel and drain aircraft as follows:

Step 1. Electrically ground the aircraft and fuel tender to a common ground point.

Step 2. Apply external electrical power to AC and DC bus systems.

Step 3. Open the access door to the aircraft Refuel/Defuel control panel and observe that the panel lights and MASTER VALVE CLOSED light come on.

Step 4. Remove the cap from the hose on the fuel tender and connect the grounding pin (on the hose) to the grounding receptacle on the aircraft.

Step 5. Remove the cap from the aircraft refuel/defuel adapter and connect the fuel tender hose to the adapter.

Step 6. Set the load limit controls to 50 lbs on the tanks to be drained. A fuel quantity of 50 lbs is necessary to prevent pump dry run operation; if this is not done it could create an unsafe condition enabling an ignition source inside the fuel tank.

Step 7. Select DEFUEL on the rotary selector switch on the Refuel/Defuel control panel and observe the following:

- The POWER ON light at the Refuel/Defuel control panel comes on.
- The FUELING ON caution light at the caution lights panel in the flight compartment comes on.
- The AUX PUMP advisory lights on the fuel control panel come on. Depending on the fuel level, the transfer shut-off valve advisory light will come on also
- The MASTER VALVE CLOSED light on the Refuel/Defuel control panel goes off.

Step 8. When the auxiliary pump advisory lights go off to indicate that the initial part of the defuelling operation is complete, turn the rotary selector switch OFF. There will still be about 50 lbs of fuel in the fuel tank. Observe that the POWER ON light and the FUELING ON caution light are off and the MASTER VALVE CLOSED light comes on.

Step 9. Disconnect the fuel tender hose from the defueling adapter and install the caps.

Step 10. Close and secure the Refuel/Defuel control panel access door.

Step 11. Remove external power from the AC and DC bus systems.

Step 12. After suction defuelling, drain remaining fuel in the tanks (50 lbs) and lines by opening the drain valves located in wing lower skin and allow all residual fuel to drain into a suitable clean 10 gal pail. Return drained fuel to the fuel tender or pour into a waste fuel drum for disposal, as considered appropriate for the quantity and known condition of such fuel.

Step 13. Remove the over-wing fuel tank access panels, as required, and soak up any remaining small puddles of fuel with suitable non-synthetic absorbent material. Do not enter the container or tank to remove fuel; carry out fuel removal from the outside of the container. Personnel carrying out this operation must wear fresh air respirators according to PPS 13.13.

5.3 Draining Individual Fuel Tanks and Fuel Containers

5.3.1 Drain residual fuel in tanks and fuel containers as follows.

Step 1. Position the tank or container so as to provide complete drainage of fuel through the drain or fill openings into a suitable clean 5 gal. pail.

Step 2. Return drained fuel to the fuel tender or pour into a waste fuel drum for disposal as considered appropriate for the quantity and known condition of such fuel.

5.4 De-Fuming (Purging)

5.4.1 Carry out purging of the fuel container of vapour immediately after removal of excess fuel in an open, well-ventilated, area outside of buildings or hangers.

5.4.2 If possible, purge using fresh warm air (60°F minimum) supplied through a blower fitted with a 5 inch diameter flexible hose. For fuel containers such as 45 gallon drums, which have access holes too small to permit purging with a 5 inch diameter hose, purge with a steam hose for 15 minutes and then blow out with clean dry air until dry. Remove access plates from long range fuel tanks, if required to permit the purging hose to be inserted. Ground the blower unit and electrically bond the flexible hose to the container opening before inserting the hose into the fuel container. Open all drains in the container and start the air blower.

- The direction of flow and circulation of air shall be as illustrated in Figure 1.
- The rate of flow shall not be such as to cause air to whistle through the drain, as this may cause a spark.
- Except for integral fuel tanks, purge fuel containers for a minimum of 4 hours. For integral fuel tanks purge each rib compartment, including the fuel collection compartment, for a minimum of 1 hour each.

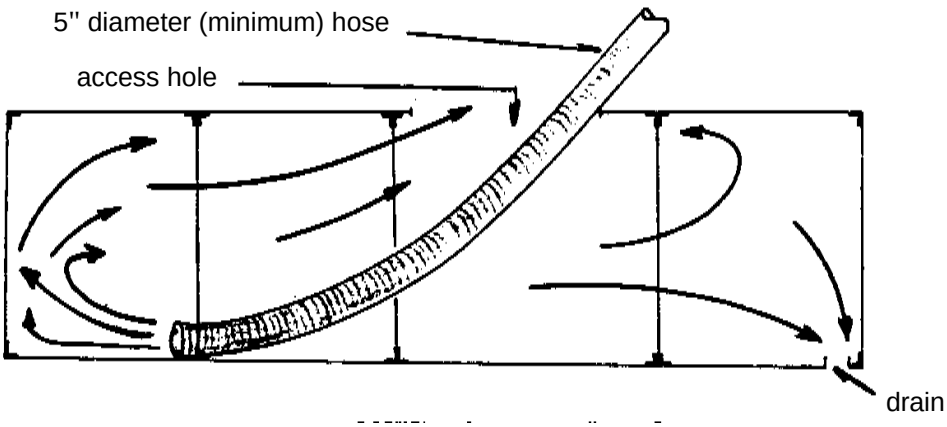

Figure 1 - Placement of Purging Hose

5.4.3 If the ambient temperature is less than 60°F, move the aircraft, tanks or containers inside a hangar after purging and allow to warm to room temperature (minimum 60°F) before checking for explosiveness.

5.4.4 Ensure that all fuel has been removed from the container before checking for explosiveness according to section 5.5.

5.5 Checking Explosiveness

5.5.1 Except for fuel containers such as 45 gallon drums, which had access holes too small to permit purging with a 5 inch diameter hose, check purged containers for explosiveness approximately 10 minutes after completion of purging. For fuel containers such as 45 gallon drums, which had access holes too small to permit purging with a 5 inch diameter hose, check for explosiveness approximately 1 hour after purging.

5.5.2 Check tanks and containers for explosiveness at room temperature (minimum 60°F).

5.5.3 Examine the explosimeter before use to ensure that its due date for re-calibration has not been exceeded. Ensure that the temperature of the explosimeter does not vary significantly from that of the tank to be checked.

5.5.4 Check for explosiveness as follows:

Step 1. Connect the sampling hose and aspirator bulb to the explosimeter, squeeze bulb several times to clear the instrument of residual air and vapour.

Step 2. Lift the locking lever and turn the switch on; rotate the switch knob clockwise to zero the meter needle.

Step 3. Insert the sampling tube into the container to be tested and squeeze the aspirator bulb repeatedly. Watch the meter at all times during testing and record the highest reading obtained. For integral fuel tanks test each rib compartment individually. If there is any indication on the meter of combustible vapour being present in the container re-purge according to section 5.4.

Step 4. Withdraw the sampling tube from the container and clear the instrument by squeezing the aspirator bulb several times.

Step 5. Re-check the container using the same technique as specified in Step 3.

Step 6. If the container checks safe (i.e., no indication on the explosimeter scale) tag it as such according to section 5.6. and it may be worked on or placed in storage as required. If the container does not check safe, re-purge according to section 5.4 and repeat the explosiveness check; continue to repeat purging and explosiveness checks until a safe condition is obtained.

5.5.5 Clear the explosimeter with fresh air when testing is finished. Ensure that the instrument is switched off before returning it to its box.

5.6 Tagging

5.6.1 Mark containers which have been de-fumed and checked safe with suitable tags, wired to the container, showing the date of purging. Do not remove tags from purged containers until such time as they are to be re-used or as required for production.

6 Requirements

6.1 Tanks and containers must not be worked on until they have been checked 'safe' according to section 5.5.

7 Safety Precautions

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

7.2 Smoking or any other kind of open flame is prohibited within 100 feet of fueled aircraft or a fuel container or tank being worked on according to this PPS.

7.3 Ensure that adequate fire extinguishing equipment, and personnel familiar with its use are immediately available and standing by at all times.

7.4 Before defueling, ensure aircraft are correctly grounded and, if a suction defueling operation is in progress, the fuel tender grounded to the same ground point as the aircraft.

7.5 In all cases where fuel is being drained into pails or drums, such containers must be electrically grounded.

7.6 Ensure that all electrical power is off except when suction defueling is in progress. During suction defueling, all electrical services must be off, except those required for monitoring the operation.

7.7 No other work must be carried out on an aircraft being defumed until the fuel tank(s) is completely drained, purged of fuel vapours and checked safe.

7.8 Do not move aircraft or fuel containers which are to be de-fumed, inside a hanger or other building until the purging operation has been completed.

7.9 Avoid fuel spillage as this will greatly increase the fire hazard. If fuel is spilled, all operations must cease in the vicinity until the spill is cleaned up and the area checked safe by fire personnel.

7.10 Only vapour/explosion proof lamps, with good electrical connections and serviceable extension cords, may be used inside or in the vicinity of open fuel tanks or containers.

7.11 Personnel must take suitable precautions to avoid fuel contacting eyes and skins, inhalation of fuel vapours or ingestion of fuel. Anyone exposed to these conditions must wash contacted areas thoroughly with water and seek medical attention promptly.

7.12 When working in over-wing fuel tank access panels to soak up any remaining small puddles of fuel wear splash goggles and protective respiratory equipment according to PPS 13.13.

7.13 Fuel tanks must not be entered or worked on until completely drained, purged of fuel vapours, and checked safe. All access panels must be open or removed before entering.

7.14 Protective clothing of cotton material should be worn when carrying out work inside a fuel tank. Do not use any article made from nylon due to static electricity build-up.

7.15 A continuous flow of ventilating air must be maintained through a fuel tank when work is being carried out inside.

7.16 Comply with the applicable requirements and safety precautions of EHS-OP-017, and EHS-OP-028 at all times when defuelling and de-fuming aircraft integral fuel tanks, long range fuel tanks and any other containers used for fuel storage, transport or shipment.

8 Personnel Requirements

8.1 Personnel responsible for defuelling and de-fuming of aircraft integral fuel tanks, long range fuel tanks and any other containers used for fuel storage, transport or shipment must have a good working knowledge of the applicable procedure and requirements as specified herein and must have exhibited their competency to their supervisor.