BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 6.05

PRODUCTION PROCESS STANDARD

Closure of Fluid Lines and Fluid System Components

Issue 16
- This standard supersedes PPS 6.05, Issue 15.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
- Direct PPS 6.05 related questions to michael.wright@aero.bombardier.com.
- This PPS is effective as of the distribution date.

Approved By:	Ken Quon, for	(Bruce Campbell)	May 27, 2016
	Materials Technology		
	Stephen Pitt	(Stephen Pitt)	May 31, 2016
	Quality		
Prepared By:	Michael Wright	(Michael Wright)	May 19, 2016
	Production Process Standards		

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1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for closing of aircraft fluid lines and fluid system components against contamination.

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 6.10 - Cleaning of Fluid System Components.

3.2.2 PPS 13.26 - General Subcontractor Provisions.

3.2.3 PPS 31.17 - Solvent Usage.

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.

4.2 **Equipment**

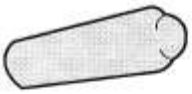
4.2.1 Round vinyl closures (e.g., Sinclair and Rush L-Caps as specified in Table 1).

4.2.2 Tapered non-threaded plastic plugs and caps (e.g., Caplug T Series as specified in Table 2) and/or non-tapered, non-threaded plastic caps (e.g., Caplug SC Series).

4.2.3 Threaded plastic caps and plugs (e.g., Caplug PD Series plugs and CD Series caps as specified in Table 3).

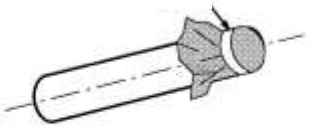
4.2.4 Threaded aluminum plugs and caps (e.g., Clover Industries P Series plugs and C Series caps as specified in Table 3).

4.2.5 Specially designed caps, plugs, plates and gaskets as required or supplied for specific applications.



L-Caps

T series plastic Caplugs



End covered with a polypropylene or polyethylene bag

CD series threaded Caplugs

PD series threaded Caplugs

SC series Caplugs

4.2.6 Polypropylene or polyethylene bags, assorted sizes as required (e.g., 12” x 18”).

4.2.7 Harmful fluid warning labels (e.g., DH5356).

5 **Procedure**

5.1 **General**

5.1.1 Protect pipes, conduits (non-electrical), ducts, fluid lines and fluid system components against the entry of moisture, dust, or other foreign matter, immediately after cleaning or functioning by closing all openings according to this PPS.

5.1.2 Use only clean closures to close pipes, conduits, ducts, fluid lines or fluid system components. It is especially important to ensure that closures that are to be used on lines or components of the oxygen system are **completely** free of oil or grease.

5.1.3 Remove closures only immediately before assembly of the particular line or component or if required for verification. If assembly is delayed, re-apply closures.

5.1.4 Screw in threaded caps and plugs finger tight. Do not over-tighten.

5.1.5 If required, clean purchased or sub-contracted parts received with closures of doubtful sealing ability according to PPS 6.10 and replace the closures with approved caps or plugs according to this PPS.

5.1.6 In general, threaded and non-threaded plastic caps and plugs may be re-used if they are cleaned after use according to section 5.2; however, use only new closures if fluid lines or fluid system components are to be transported to stores or are to be assembled after the final fabrication operation or pressure test.

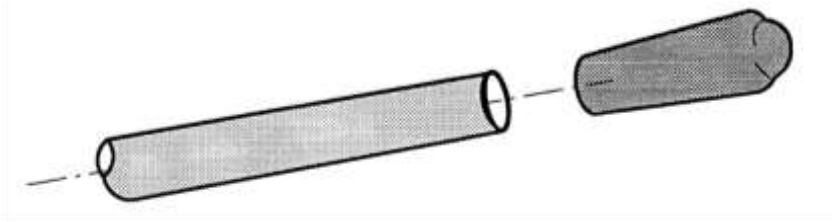
5.2 Cleaning of Closures

5.2.1 Thoroughly solvent clean closures which show evidence of dirt or other contamination according to PPS 31.17. Discard closures which retain evidence of contamination after solvent cleaning. Keep clean closures in covered containers or plastic bags to prevent contamination.

5.3 Application of Closures

5.3.1 Protect the ends of hydraulic tubes which have been prepared for permaswage fittings using a vinyl closure (e.g., L-Cap). Retain vinyl closures on the plain ends of such hydraulic tubes as a mask during priming. Refer to Table 1 for the correct size of L-Cap to be used.

Table 1. Application of L-Caps



	L-Cap Dimensions		
Hydraulic Tube O.D.	**Inside Diameter**	**Inside Length**	**L-Cap Colour**
0.250"	0.250"	2.0"	Black
0.375"	0.375"	2.0"	Red

5.3.2 In general, use tapered non-threaded plastic plugs or caps (e.g., Caplug T Series) for closing tubing ends, threaded fittings, and threaded and non-threaded holes (see Figure 1). Insert plugs into the holes or caps onto the fittings to be closed using just enough force to ensure that the closure will remain secure. Refer to Table 2 for the correct sizes of Caplug T Series plugs or caps to be used for particular applications.

5.3.2.1 Alternatively, suitable size non-tapered plastic caps (e.g., Series SC Caplugs), if available, may be used for capping threaded and non-threaded tubing ends.

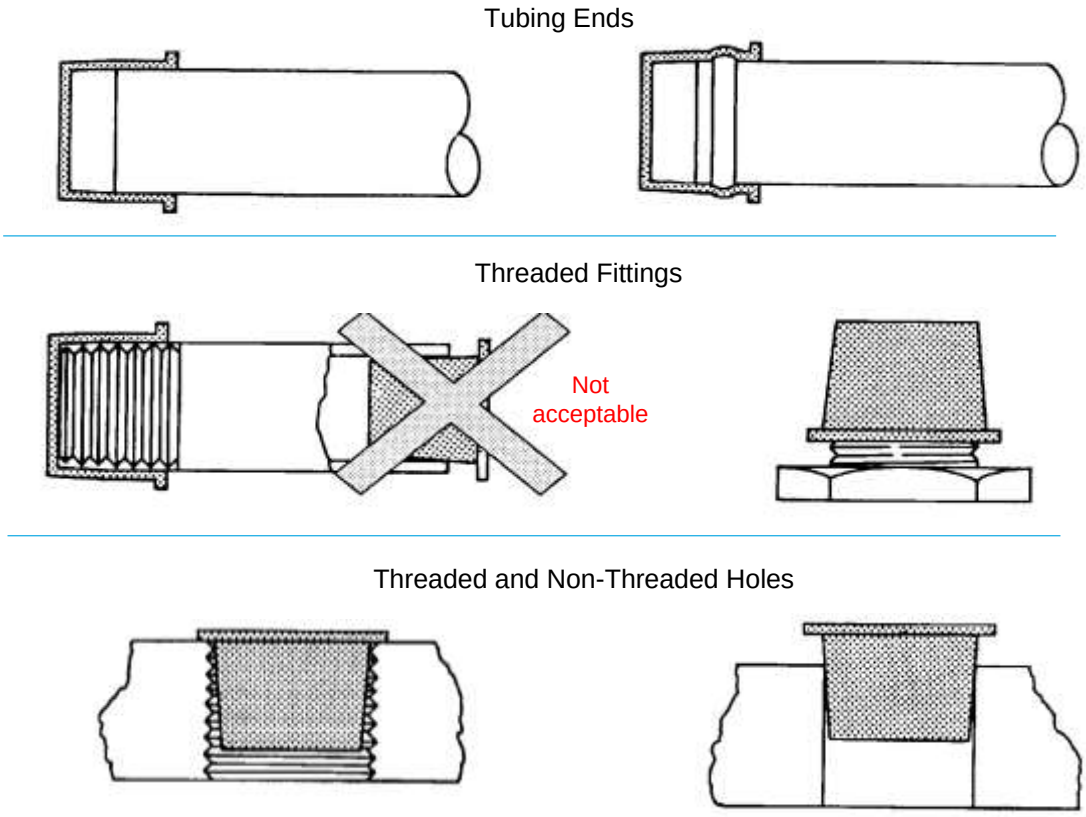


Figure 1. Application of Series T Caplugs

Table 2. Non-Threaded Series T Caplugs

Caplug Number	Caps			Plugs		
	Nominal Tubing Size	Straight Threads	Pipe Threads	Nominal Hole Size	Straight Threads	Pipe Threads
00	0.085"	---	---	0.150"	---	---
0	0.145"	---	---	0.205"	---	---
1	0.205"	---	---	0.270"	5/16-24	---
2	0.270"	5/16-24	---	0.330"	3/8-24	1/8"
3	0.330"	3/8-24	---	0.395"	7/16-20	---
4	0.390"	7/16-20	1/8"	0.455"	1/2-20	1/4"
5	0.450"	1/2-20	---	0.505"	9/16-18	---
6	0.505"	9/16-18	1/4"	0.570"	5/8-18	3/8"
7	0.560"	5/8-18	---	0.625"	---	---
8	0.620"	---	---	0.685"	3/4-16	---
9	0.680"	3/4-16	---	0.740"	---	1/2"

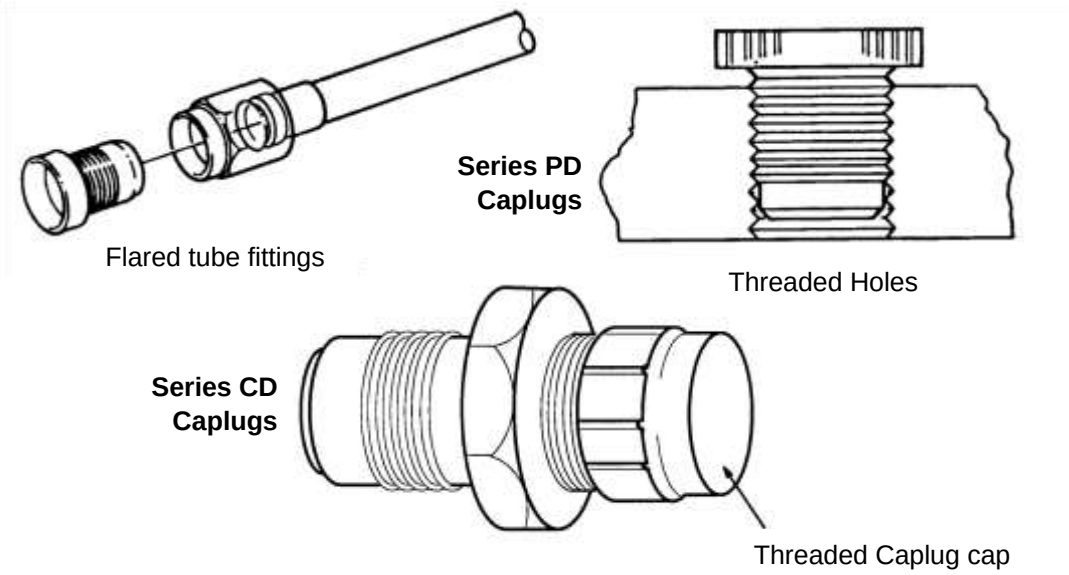
Table 2. Non-Threaded Series T Caplugs

Caplug Number	Caps			Plugs		
	Nominal Tubing Size	Straight Threads	Pipe Threads	Nominal Hole Size	Straight Threads	Pipe Threads
10	0.735"	---	---	0.800"	7/8-14	---
11	0.795"	7/8-14	1/2"	0.855"	---	---
12	0.860"	---	---	0.920"	1 1/16-12	3/4"
13	0.965"	1 1/16-12	3/4"	1.030"	---	---
14	1.900"	---	---	1.155"	1 5/16-12	1"
15	1.225"	1 5/16-12	1"	1.290"	---	---
16	1.325"	---	---	1.390"	---	---
17	1.460"	---	---	1.525"	1 5/8-12	1 1/4"
18	1.560"	1 5/8-12	1 1/4"	1.620"	---	---
19	1.755"	---	---	1.815"	1 7/8-12	---
20	1.800"	1 7/8-12	1 1/2"	1.865"	---	1 1/2"
21	1.925"	---	---	1.990"	---	---
22	2.020"	---	---	2.080"	---	---
24	2.315"	---	2"	2.390"	---	2"
33	2.420"	---	---	2.475"	---	---
43	2.600"	---	---	2.530"	---	---
53	2.980"	---	---	3.040"	---	---
55	3.040"	---	---	3.110"	---	---

5.3.3 Use threaded plastic caps or plugs (e.g., as specified in Table 3) to close aircraft fluid lines and fluid system components if tighter seals than those provided by non-threaded closures are required. Use CD Series Caplugs to close male straight thread fittings and unions.

5.3.4 Except on titanium tubes, if plastic threaded closures are not available (due to thread size, for instance), threaded aluminum caps and plugs (e.g., as specified in Table 3) may be used instead. Discard threaded aluminum closures after one use. Do not use aluminum caps or plugs for closing titanium tubes and fittings.

Table 3. Threaded Caps and Plugs



Nominal Tube Diameter	Plugs			Caps		
	Thread Size	**Caplug Part Number**	**Clover Industries Aluminum Plug** (Note 1)	**Thread Size**	**Caplug Part No.**	**Clover Industries Aluminum Cap** (Note 1)
1/8"	5/16-24	PD-20	P2	3/8-24	CD-3	C3
3/16"	3/8-24	PD-30	P3	7/16-20	CD-4	C4
1/4"	7/16-20	PD-40	P4	1/2-20	CD-5	C5
5/16"	1/2-20	PD-50	P5	9/16-18	CD-6	C6
3/8"	9/16-18	PD-60	P6	5/8-18	CD-6A	---
1/2"	3/4-16	PD-80	P8	3/4-16	CD-8	C8
5/8"	7/8-14	PD-100	P10	7/8-14	CD-10	C10
3/4"	1 1/16-12	PD-120	P12	1 1/16-12	CD-12	C12
1"	1 5/16-12	PD-160	P16	1 5/16-12	CD-16	C16
1 1/4"	1 5/8-12	PD-200	P20	1 5/8-12	CD-20	C20
1 1/2"	1 7/8-12	PD-240	P24	1 7/8-12	CD-24	C24

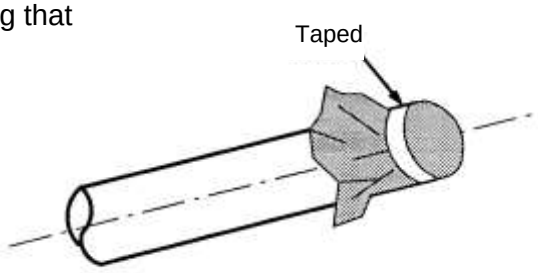
Note 1. Use aluminum plugs or caps only if Caplugs are not available. Do not use aluminum caps or plugs on titanium tubing or fittings.

5.3.5 If the correct size of cap or plug is not available for larger diameter pipes, conduits and ducts, cover the open ends using polypropylene or polyethylene bags as follows:

Step 1. Select a polypropylene or polyethylene bag that will cover the open end of the pipe, conduit or duct.

Step 2. Place the bag over the open end of the pipe, conduit or duct.

Step 3. Using masking tape, firmly secure the bag onto the pipe, conduit or duct as shown.



5.3.6 Other types of closures, such as those received with purchased or sub- contracted parts, may be used, provided that they have at least equal sealing ability as those specified in this PPS. Special polypropylene or metal plates may be required if satisfactory sealing is not possible with closures specified in this PPS due to the design of the fluid system components.

5.4 Handling and Storage of Fluid Lines

5.4.1 Do not support fluid line assemblies by their fittings.

5.4.2 Take care to ensure that protective caps are not loosened or removed unless that end is being fitted to an assembly.

5.4.3 Handle and store tubes in such a manner as to preserve their designed shape (i.e., to prevent bending). Keep similar shapes together.

5.5 Handling of Fluid System Components Removed from the Aircraft

5.5.1 Handle any unacceptable fluid system component which has been removed from the aircraft (e.g., for RNC action) containing fuel, hydraulic fluid or other potentially hazardous fluid as follows:

Step 1. Drain hydraulic fluid, fuel or other potentially harmful fluids from the fluid system component ports as much as possible.

Step 2. Cap each port of the component with suitable caps according to the applicable procedure specified herein. Polypropylene or polyethylene bags, held in place with masking tape or plastic cable ties, may be used according to the procedure specified herein to cover ports when caps are not suitable or not available.

Step 3. Bag the component in a suitable sized polypropylene or polyethylene bag.

Step 4. Secure/seal the bag with a plastic cable tie.

Step 5. Apply a harmful fluid warning label to the bag (e.g., DH5356)

6 Requirements

6.1 The correct size of closure for the particular application shall be used to ensure adequate sealing of the line or component.

6.2 Ensure that threaded closures are applied carefully, so that the threads are not crossed or stripped from the closure. Titanium tubes and fittings shall be closed using plastic closures only.

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 **Handle any unacceptable fluid system component which has been removed from the aircraft (e.g., for RNC action) containing fuel, hydraulic fluid or other potentially hazardous fluid according to section 5.5.**

8 Personnel Requirements

8.1 Personnel responsible for closure of fluid lines and fluid system components must have a good working knowledge of the procedure and requirements as specified herein and must have exhibited their competency to their supervisor.

9 Special Points to Note

9.1 Just before assembly of lines or fittings, when removing the closure ensure that there are no abraded particles of the closure remaining on or in the particular line or component.

10 Caution

10.1 Take care to ensure that hydraulic fluid lines and hydraulic system components used with MIL-H-5606 hydraulic fluid do not come into contact with solvent blends containing isopropyl alcohol, also known as isopropanol and 2-propanol. Hydraulic fluid lines and hydraulic system components used with MIL-H-5606 hydraulic fluid which have been contaminated with solvent blends containing isopropyl alcohol must be cleaned according to PPS 6.10.