**BOMBARDIER**
Toronto (de Havilland)
**PROPRIETARY INFORMATION**

# PPS 7.02

**PRODUCTION PROCESS STANDARD**

# Charging and Installation of Nickel Cadmium Batteries

Issue 14
- This standard supersedes PPS 7.02, Issue 13.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
- Direct PPS 7.02 related questions to michael.wright@aero.bombardier.com.
- This PPS is effective as of the distribution date.

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|---|---|---|
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## 1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for charging and testing of aircraft nickel-cadmium (Ni-Cd) batteries.

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.

1.2 For charging and installation of the emergency exit lights, refer to PPS 7.03.

## 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 Battery Log Book.

3.2 Battery charger/analyzer manufacturer's operating instructions for each battery charger/analyzer in use.

3.3 Component Maintenance Manual (CMM) and Technical Notes (TN) for each battery to be charged.

3.4 DH Form #4266 - Battery Test Tag (see Figure 1) - *Bombardier Toronto (de Havilland) internal operating form*.

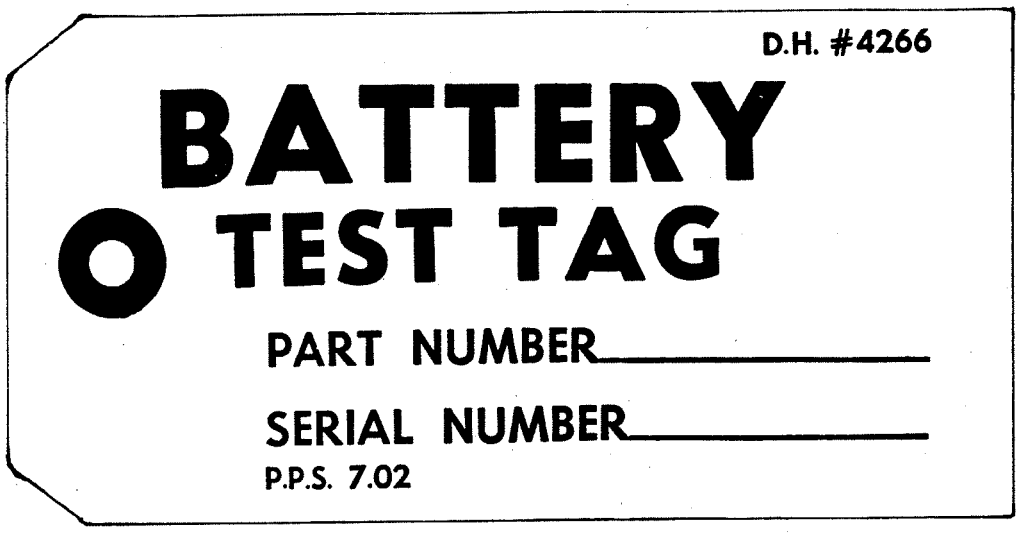
3.5 DH Form #4269 - Nickel Cadmium Battery History Sheet (see Figure 2) - *Bombardier Toronto (de Havilland) internal operating form*.

3.6 EHS-OP-005 - Hazardous Materials Management - *Bombardier Toronto (de Havilland) internal operating procedure*.

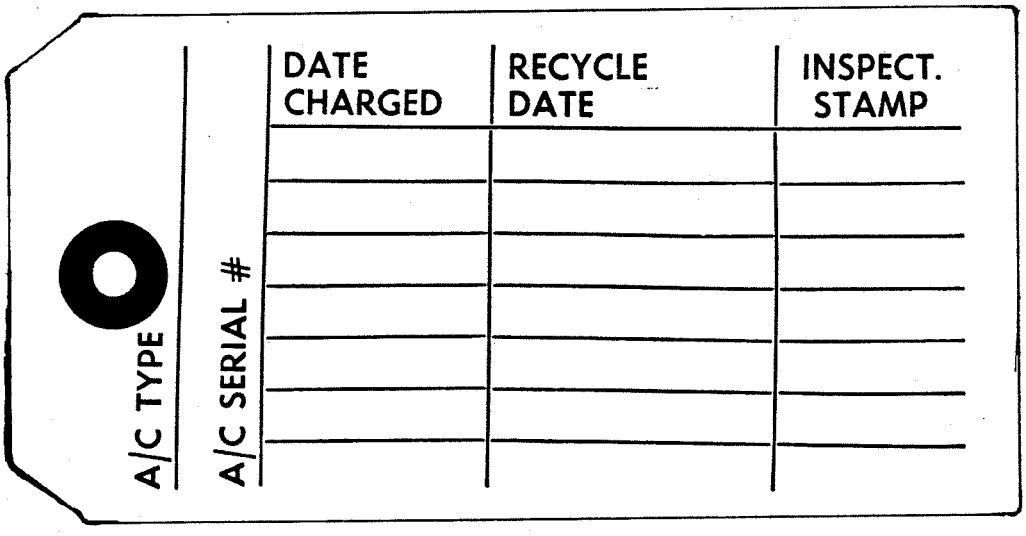
3.7 PPS 7.03 - Charging and Installation of Emergency Exit Light Battery Rack Assemblies.

3.8 PPS 13.26 - General Subcontractor Provisions.

3.9 PPS 14.01 - Torquing and Tightening.




Front View




Back View

**Figure 1 - Battery Test Tag (DH Form #4266)**

NICKEL CADMIUM BATTERY HISTORY SHEET

SHEET SERIAL #

MANUFACTURER _____ SERIAL NO._____ MS OR MODEL # _____

INITIAL INSTALLATION _____
(AIRCRAFT) (DATE)

| DISCHARGED AND SHORTED OUT | CLEANLINESS OF BATTERY AND HARDWARE | TIGHTNESS AND POLARITY OF INTER-CELL LINKS (TORQUED) | SENSORS 140° F - 160° F | CELL CONDITION | | ROUTINE CONSTANT CURRENT CHARGED | POST CHARGE ELECTROLYTE LEVEL CHECKED | CAPACITY TESTED | ROUTINE CONSTANT CURRENT CHARGED | CLEAN, SERVICEABLE FILLER CAP VENT PLUGS INSTALLED | REMARKS<br>• NEW BATTERY<br>• SERVICE FAILURE<br>• PERIODIC INSPECTION<br>WATER ADDITION, ELECTROLYTE CONTAMINATED, ETC.<br>DATE | INSP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | # REPLACED | OK | | | | | | | |
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| | | | | | | | | | | | | |
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BATTERY DISPOSITION:

| DATE | RELEASE FOR INSTALLATION | STORED | REJECTED | QUALITY CONTROL |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Figure 2 - Nickel Cadmium Battery History Sheet (DH Form #4269)**

## 4 Materials and Equipment

### 4.1 Materials

4.1.1 Pure distilled, de-ionized or de-mineralized water. Ensure that containers are clearly marked identifying the contents.

4.1.2 Petroleum jelly or silicone grease (e.g., Dow Corning DC4).

4.1.3 Boric acid and water solution, 3% Boric acid by weight.

### 4.2 Equipment

4.2.1 Constant current battery charger/analyzer. Before use, verify calibration of the charger/analyzer.

4.2.2 Syringe and nozzles as specified by the battery CMM.

4.2.3 Torque wrenches as specified in PPS 14.01. In cases where there is a risk of shorting or shock (e.g., torquing of inter-cell connectors on Ni-Cd batteries), use of a torque wrench with a non-conductive or insulated handle is recommended.

4.2.4 Inspection aids (e.g., mirrors) with non-conductive or insulated handles for use where there is a risk of shorting or shock (e.g., checking torqued inter-cell connectors on Ni-Cd batteries).

## 5 Procedure

### 5.1 General

5.1.1 As electrolyte is extremely susceptible to acid contamination, always observe the following:

- Do not use tools used on lead-acid batteries on Ni-Cd batteries.
- Before performing any maintenance on Ni-Cd batteries, thoroughly wash tools which have been contaminated with acid in a solution of sodium or ammonium bicarbonate, rinse thoroughly with tap water and dry.
- Use appliances (e.g., glass tubes or electrolyte removal syringes) that come into contact with electrolyte exclusively for the maintenance of Ni-Cd batteries and mark appliances as follows:

  **FOR USE WITH Ni-Cd BATTERIES ONLY**
- Rinse appliances that come into contact with electrolyte (e.g., glass tubes or electrolyte removal syringes) thoroughly in tap water before use.

5.1.2 Charging/analyzing equipment must carry a valid calibration sticker.

5.1.3 For any materials with a limited shelf/storage life, before use ensure that such materials have not expired.

### 5.2 Preparation of Batteries for Charging

5.2.1 Carry out the following checks and pre-installation servicing before charging the battery:

- Check the condition of the outer case and the electrical connector.
- Check the cleanliness of the battery and hardware.
- Check that the serviceable filler vent caps are clean and properly installed.
- Loosen, but do not remove the filler vent caps.
- Check the torque of the inter-cell links.
- Check the condition and polarity of all cells.
- If the battery is equipped with a sensor, perform a continuity check according to the battery CMM and Technical Notes.

5.2.2 If necessary, clean the battery with a clean, dry, cloth and a nylon bristle brush.

### 5.3 Charging

5.3.1 Except as noted below, perform all battery charging operations (including Top-Up charge and Overhaul) according to the battery charger/analyzer manufacturer's instructions.

- For each battery to be charged, refer to the battery CMM and Technical Notes for specific charging instructions/restrictions.
- Check the battery CMM and Technical Notes to ensure that the battery charger/analyzer is suitable for the battery to be charged.

### 5.4 Electrolyte Level Check

#### 5.4.1 Foaming Cells

5.4.1.1 Under certain conditions, the electrolyte in newly made Ni-Cd cells has been known to foam as though it was a soap solution. This usually occurs as the cell approaches full charge. If this condition is observed, follow the procedure specified in the applicable battery CMM and Technical Notes.

#### 5.4.2 Checking and Adjustment of Electrolyte Level

5.4.2.1 Check the electrolyte level as follows:

Step 1. Remove the cell vent plug.

Step 2. Insert a syringe with the appropriate length nozzle as specified by the battery CMM into the cell opening, until the shoulder of the nozzle rests on the valve seat (see Figure 3).

Step 3. Withdraw the plunger and check for any liquid in the syringe.

Step 4. If the level in the cell is too low, the syringe will remain empty, indicating that the end of the syringe nozzle did not reach the liquid in the cell.

5.4.2.2 If the electrolyte is low, carry out the following procedure:

Step 1. Draw approximately 5 cc of distilled, de-ionized or de-mineralized water into the syringe and inject it into the cell.

Step 2. With the syringe resting on the valve seat, withdraw the plunger on the syringe.

Step 3. If the syringe remains empty, repeat Step 1 and Step 2. If some liquid is drawn into the syringe during Step 2, the correct level for the cell has been reached.

Step 4. Record the amount of water added to each cell on the maintenance record.

Step 5. Replace and tighten the vent cap.

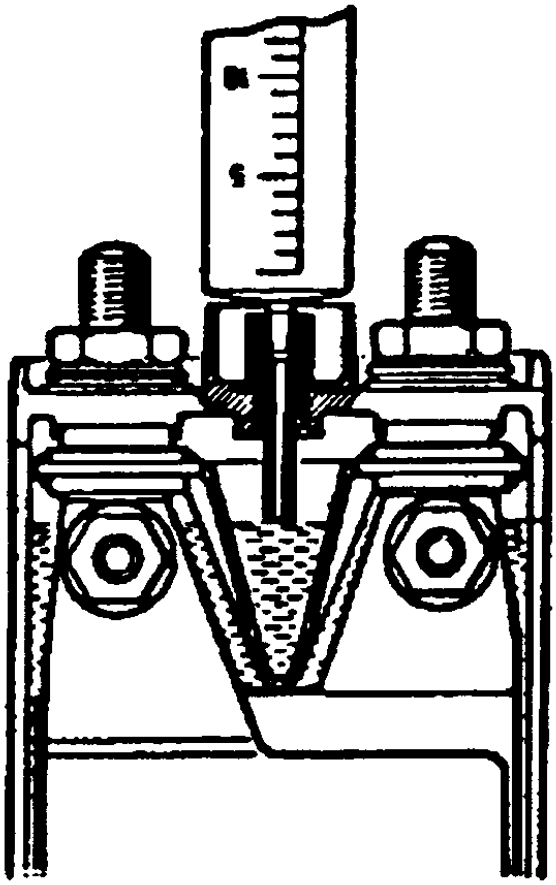

**Figure 3 - checking Cell Electrolyte Levels**

### 5.5 Removal and Replacement of Cells

5.5.1 Remove or replace cells as follows:

Step 1. Totally discharge the battery according to section 5.6.

Step 2. Remove the inter-cell connecting links to the cell to be removed.

Step 3. Remove the cell using a suitable cell puller.

Step 4. Install a discharged and shorted replacement cell. Ensure that the correct polarity is observed in the installed cell.

If a replacement cell is not to be installed immediately, install a cell sized wooden block in the battery until the cell is replaced. Apply petroleum jelly or silicone grease, sparingly, to the side of the cell to ease insertion.

Step 5. Using a torque wrench, tighten the nuts, Allen head or hex head screws that attach the inter-cell connectors to the cell terminals according to PPS 14.01. Refer to the applicable battery CMM and Technical Notes for the required torque value.

### 5.6 Deep Discharge

5.6.1 Except as noted below, perform deep discharge of batteries according to the battery charger/analyzer manufacturer's instructions.

- For each battery to be charged, refer to the battery CMM and Technical Notes for specific discharging instructions/restrictions.
- Check the battery CMM and Technical Notes to ensure that the battery charger/analyzer used is suitable for the battery to be discharged.

### 5.7 Installation of Battery

5.7.1 Batteries must be in a clean, charged condition (ref. para. 9.3) for installation.

5.7.2 For installation of the sump jar, before placing the felt pad in the sump jar, saturate the felt pad with a 3% solution by weight of boric acid and water. Use only sufficient solution to saturate the felt pad.

5.7.3 Ensure the battery installation area, sump jar, vent system and plumbing are clean before installing the battery.

5.7.4 Install the battery as follows:

Step 1. Turn the BATTERY switch to OFF.

Step 2. Install the battery and secure the hold-down appliance.

Step 3. Connect the battery electrically to the aircraft.

Step 4. Connect the vent plumbing to the vent projections on the battery.

Step 5. Connect the battery temperature connector where fitted.

Step 6. Ensure that the battery test tag is properly filled out and affixed to a suitable part of the battery or battery case.

## 6 Requirements

6.1 Only release batteries which have been successfully charged according to section 5.3 and stored according to section 9 for installation in an aircraft.

6.2 Each new Ni-Cd battery being serviced must have a nickel cadmium battery history sheet and a battery test tag raised and filled out. Affix the battery test tag to a suitable part of the battery or battery case.

6.3 Ensure the following operations are successfully completed before the battery is released from the battery shop.

- Verify that the nickel cadmium battery history sheet and the battery test tag are properly filled out.
- Verify that all cell voltages are within specifications.
- Verify that all cell electrolyte levels are within specifications.
- Verify that all cell connector nuts or screws are torqued to specifications.
- Verify that all cell vent caps are tight.

6.4 If cells are found unacceptable for use, record such on the nickel cadmium battery history sheet.

6.5 Maintain a record of any additional charging operations performed on each battery and any other necessary data (e.g., battery serial number, aircraft serial number, removal and replacement cell numbers, date, etc.).

6.6 Ensure that the appropriate data from the Nickel-Cadmium Battery History Sheet and Battery Test Tag is transferred to the aircraft log sheets which must remain with the aircraft records. A Battery Log Book must be held for each battery processed and included in the aircraft Log Set for delivery.

## 7 Safety Precautions

**7.1 The safety precautions specified herein are specific to Bombardier Toronto 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 The electrolyte used in nickel cadmium batteries is a strong solution of potassium hydroxide that will burn body tissue and clothes on contact. Therefore, operators must wear rubber gloves, a face shield or goggles, and a rubber apron when handling electrolyte. Should electrolyte come into contact with the body, immediately rinse the affected area with large quantities of tap water, neutralize with vinegar or a weak solution of boric acid and report to the Health Center immediately. Soak up spilled electrolyte with sawdust, place in a sealed plastic bag or container sealed with a label stating "Alkaline Potassium Hydroxide" and dispose of according to EHS-OP-005. Rinse a spill area with a weak solution of boric acid and wash with water afterwards.**

**7.4 As a precaution against short circuits which could cause severe burn rings, remove metal watch bands and other metallic jewelry before working on the battery.**

**7.5 Due to the hydrogen and oxygen gases given off by the battery, perform all work under well ventilated conditions and away from fire or other sources of ignition.**

**7.6 If there is any indication of thermal runaway or vicious cycling, stop the battery charging immediately and subject the battery to deep discharge according to section 5.6. Thermal runaway or vicious cycling is indicated by any of the following:**

- **Current increasing during the charging cycle.**
- **Battery voltage decreasing during the charging cycle.**
- **A significant increase in battery temperature.**

**7.7 Use of a torque wrench with a non-conductive or insulated handle is recommended where torquing and there is a risk of shorting or shock (e.g. torquing inter-cell connectors on Ni-Cd batteries). Similarly, when checking torquing where there is a risk of shorting or shock (e.g., torqued inter-cell connectors on Ni-Cd batteries), use of non-conductive or insulated inspection aids (e.g., mirrors) is recommended.**

## 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 Storage

9.1 Store Ni-Cd batteries in a cool dry atmosphere meeting the requirements of the battery CMM and Technical Notes, on racks provided for the purpose.

9.2 Stored batteries must have their covers installed.

9.3 Top-Up charge and/or overhaul stored Ni-Cd batteries according to the battery CMM and Technical Notes. Except as noted below, perform all battery charging operations (including Top-Up charge and Overhaul) according to the battery charger/analyzer manufacturer's instructions.

- For each battery to be charged, refer to the battery CMM and Technical Notes for specific charging instructions/restrictions.
- Check the battery CMM and Technical Notes to ensure that the battery charger/analyzer is suitable for the battery to be charged.