



INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

MAINTENANCE MANUAL SUPPLEMENT

CONCORDE VALVE REGULATED LEAD-ACID MAIN BATTERY

This document must be used in conjunction with the basic Maintenance Manual for the aircraft when the Concorde Lead-Acid Battery is installed. This Maintenance Manual Supplement modifies/augments the portions of the basic Maintenance Manual.

The data/information contained herein has been reviewed and approved for general release on the basis that this document contains no export-controlled information

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RECORD OF REVISIONS

Rev. No.	Description	Date	Appd
A	1. Delete flooded batteries, 2. Revised inspection interval, 3. Add mandatory removal interval, 4. Deleted flooded battery facility requirement.	2/16/99	JBT
B	1. Revised inspection interval 8, 2. Removed 282 Charger from 8.(b). 10.b ii (1) and 13.C i (a).	4/20/99	JBT
C	1. Revised installation instructions 2. Revised note on experience rating 3. Add note on deeply discharged batteries 4. Revised servicing instructions. 5. Added non scheduled inspections	9/5/00	JBT
D	1. Revised installation and removal notes. 2. Revised torque specifications. 3. Revised battery charger types.	6/18/01	JBT
E	1. Rev cap test to C1 rate. 2. Rev cutoff voltage for conditioning procedure 3. Add warning re conditioning charge.	1/30/02	JBT
F	1. Revised format 2. Assigned Drawing Number 3. Minor text revisions	6/20/02	JBT
G	Delete reference to warranty, para 13	1/16/03	JBT
H	Completely revised	6/12/03	JBT
J	Add limitation specified in TSO-C173 Add full charge voltage to storage limitations. Add export review statement.	2/20/07	JBT

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1. Scope: This Maintenance Manual Supplement provides the additional data required to insure satisfactory operation, maintenance, and repair of the Concorde valve regulated lead-acid battery installation.
2. Purpose: This manual sets forth the instructions for determining continued airworthiness of a Concorde valve regulated lead-acid battery.
3. Application: Concorde valve regulated aircraft batteries - RG series.
4. Definitions:
 - a. Valve regulated battery - A lead-acid battery in which there is no free electrolyte. This battery requires no maintenance of the liquid level and recombines the gases formed on charge within the battery. The battery may be used in any attitude without danger of leakage or spilling of electrolyte.
 - b. Rated capacity C1 - Quantity of electricity in Ampere-hours (Ah) which the cell or battery is capable of delivering in 1 h.
 - c. End Point Voltage (EPV) - Unless otherwise stated, during discharge the battery voltage corresponding to a mean voltage per cell of 1.67 Volts for lead-acid batteries. (10 EPV for 12 volt and 20 EPV for 24 volt batteries).
5. Precautions:
 - a. **CAUTION:** Aircraft batteries are certified to have certain minimum capacity for emergency operations in the event of a electrical generator system failure. Never "jump start" an aircraft that has a discharged or 'dead' battery.
 - b. **WARNING: ELECTRIC SHOCK HAZARD.** Do not touch uninsulated portion of the connector or the battery terminals. A possibility of serious electrical shock exists.
 - c. **WARNING: ELECTRIC SHOCK HAZARD.** Do not lay tools or other metal objects on the battery as arcing or explosion could occur. Remove conductive jewelry before working around battery, charger, or test equipment.
 - d. **CAUTION: ELECTRIC BURN HAZARD.** Do not wear conductive rings, belt buckles, or other jewelry when working with batteries, chargers, or test equipment. Do not lay tools or other metal objects on the battery as arcing and severe burns could occur.
 - e. **WARNING:** Batteries on charge or discharge produce hydrogen gas, which can explode if ignited. Do not smoke, use an open flame, or cause sparking near a battery. Charge, service or test a battery only in a well ventilated area. The use of exhaust fans may reduce the risk of explosion.
 - f. **WARNING:** Batteries contain sulfuric acid which will cause burns. **DO NOT TOUCH EYES AFTER TOUCHING BATTERY.** Do not get acid in your eyes, or on your skin, or clothing. In the event of acid in the eyes, flush thoroughly with clean cool water for several minutes. Get professional medical attention. Refer to battery MSDS for additional information.
 - g. **WARNING:** Wear proper eye, face and hand protection at all times when

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working with batteries. Know the location and use of emergency eyewash and shower nearest the battery charging area.

- h. **CAUTION:** To prevent damage to the connector, arc burns, or explosion, batteries should never be connected or disconnected while being charged or discharged. Batteries must be connected or disconnected only when the circuit is open. Ensure the aircraft battery switch, external power source, or the charger/analyzer is in the "OFF" position before connecting or disconnecting the battery. Battery terminal protectors should be installed whenever the battery is not connected in the aircraft or to the test equipment.
- i. **CAUTION:** Batteries contain hazardous materials. Know the location and proper use of emergency response materials. Refer to battery Material Safety Data Sheet (MSDS) for additional information.
- j. **Caution / Warning:** Only constant potential charging may be done on the aircraft. DO NOT constant current charge a battery on the aircraft. There may be a serious risk of injury to personnel and / or damage to the aircraft or aircraft systems due to high voltage and generation of explosive gases when charging constant current.

6. Airworthiness Limitations:

- a. There are no airworthiness limitations associated with the installation of a Concorde valve-regulated lead-acid battery in an aircraft.
- b. For batteries covered by TSO-C173 the following limitation applies:
Note: The conditions and tests for this TSO approval of this battery are minimum performance standards. Those installing this battery, on or in a specific type or class of aircraft, must determine that the aircraft installation conditions are within the TSO standards. TSO articles must have separate approval for installation in an aircraft. The article may be installed only according to 14CFR part 43 or the applicable airworthiness requirements. Nickel-cadmium and lead-acid battery safety concerns include the possibility of fire and venting violently.

7. Installation and Removal:

NOTE: The following instructions are generic. See airframe manufacturer's maintenance manuals or STC for instructions specific to a particular aircraft model. For removal and replacement of a nickel- cadmium battery, see airframe maintenance manual STC.

- a. Installation procedure:
 - i. Removal:
 - (1) Set Master Switch to the **OFF** position.
 - (2) Disconnect any external power supply.
 - (3) Open battery compartment access panels.
 - (4) Disconnect battery quick disconnect plug or remove terminal bolts and disconnect battery cables from battery terminals. Always disconnect the ground cable first and install the ground cable last.

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- (5) Disconnect battery ventilation tubes, if any.
- (6) Unlock battery hold down clamps or remove battery hold down bars. Disengage battery.
- (7) Carefully remove battery.

WARNING: Batteries are heavy. Use appropriate lifting devices or equipment. Use battery handles where provided.

ii. Installation:

- (1) Inspect the battery for damage. Cracks in metal or plastic containers are not permitted. Dents in metal containers that impinge on the interior plastic container are not acceptable.
- (2) Set Master Switch to the **OFF** position.
- (3) Disconnect any external power supply.
- (4) Open battery compartment access panels.
- (5) Ensure the battery container or tray is clean and dry.
- (6) Install battery in battery container or tray.

WARNING: Batteries are heavy. Use appropriate lifting devices or equipment. Use battery handles where provided.

- (7) Engage battery hold down hardware, torque and safety wire per airframe manufacturer maintenance manual.
- (8) Connect battery vent tubes to aircraft ventilation system, if any.
- (9) Connect battery quick disconnect plug, any auxiliary connector or for ring terminals, install with bolt and bevel lock washer provided with the battery. Torque terminal bolts as noted on the battery label. Always disconnect the ground cable first and install the ground cable last.

CAUTION: Use an open end wrench on the flats of the battery terminal, where available, while torquing the terminal bolts. Failure to do so may result in the rupture of the battery seal at the terminal and premature failure of the battery.

CAUTION: Use only the hardware provided with the battery. Do not use stainless steel or steel washers between the ring terminal and the battery terminal.

- (10) Replace electrical compartment access panel.
- (11) Update aircraft weight and balance data, if necessary.
- (12) Perform an operational test.
- (13) Annotate log book with battery serial number and date of installation.

8. Inspection Requirements and Overhaul Schedule:

a. Scheduled inspections:

NOTE: If the battery is used to satisfy the essential power requirement, it must be capacity tested. If the battery is not used for essential power, there is no requirement for periodic capacity checks.

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- i. If the battery is being used to start a turbine APU or a reciprocating engine, the battery can be operated for 24 months or 1200 hours of operation whichever occurs first before the initial capacity check. Subsequent capacity checks are due each additional 12 months or 200 hours of operation, whichever occurs first.
- ii. If the battery is used to start a Turbine engine, regardless of whether or not it is also being used to start a turbine APU, the initial capacity check is at 12 months or 600 hours of operation, whichever occurs first. Subsequent capacity checks are due each additional 3 months or 200 hours of operation whichever occurs first.
- iii. Two (2) or more batteries operated in parallel should be replaced together for maximum reliability. Replacing only one battery in a parallel string results in unequal charge acceptance as the resistance of the new battery is much different than the resistance of the older battery.

NOTE: The initial recommended inspection schedule may be adjusted to coincide with the airframe or engine manufacturer's inspection interval so long as the operating time does not exceed the above limits by more than 10% or 60 hours. **The inspection schedule may be adjusted after the useful battery life is established in a particular operation. After the useful life of a battery is established for a particular aircraft or operating mode, the actual useful life period in months or hours may be substituted for the above schedule.**

b. Non-scheduled Inspections:

- i. Capacity check if abnormal slow engine starting performance is noted.
- ii. Capacity check if abnormal high charging current is required to maintain the battery at buss voltage.

c. Inspection Procedure:

i. Charge the battery:

(1) Special tools:

- (a) Advanced Power Products Beta D-50 Aircraft Battery Analyzer, P/N 4126, or equal.
- (b) Advanced Power Products Alpha C-25 Battery Charger, P/N 4142, or equal.
- (c) Advanced Power Products CA15-50 Charger/analyzer P/N 4159, or equal.

Warning: Contact Concorde for determination of equal test equipment. Some brands of battery chargers will destroy the battery.

- (2) Depending on the type of charger available, charge the battery Constant Potential (CP). Charge at 14.1 volts for 12 volt batteries or 28.2 volts for 24 volt batteries until the charge current stabilizes for 1 hour.

Caution / Warning: Only constant potential charging may be done on the aircraft. DO NOT constant current charge a battery on the aircraft. There may be a serious risk of injury to personnel and / or

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damage to the aircraft or aircraft systems.

ii. Capacity test:

- (1) Stabilize the battery at 15°C (59°F) or higher. The battery must be at the temperature for at least 24 hours.
- (2) Discharge the battery at the C1 rate on the label to an end point voltage of 10 volts for 12 volt batteries or 20 volts for 24 volt batteries, or the rate and end point voltage (EPV) specified by the airframe manufacturer for essential power.
- (3) Record the time to EPV.
- (4) The battery is acceptable for continued use if the ampere hour capacity (actual hours of discharge x ampere rate of discharge) is greater than 85% of the nominal rated capacity (C1) shown on the label (i.e. 51 minutes or more). If the battery passes the capacity test return it to service. If the battery fails the capacity test perform a conditioning procedure (13. c.). After the battery has been conditioned perform a second capacity test. If the battery passes return it to service. If the battery fails replace it.

NOTE: Airframe or accessory equipment manufacturers may specify a different capacity requirement.

iii. Return to service: Charge the battery as above. If the battery gets very hot (external case temperature greater than 55°C (130°F)) during charging, it should be replaced.

d. Component Overhaul Schedule: No component overhaul required for this type product.

9. Troubleshooting:

Symptom	Probable Cause	Corrective Action
Low voltage / no voltage	Battery partially or fully discharged	Charge in accordance with Section 8
Battery does not hold charge	Battery beyond serviceable life	Replace battery
Battery gets hot while recharging	Battery beyond serviceable life	Replace battery

10. Servicing discharged batteries:

- a. Recharging dual (parallel) batteries on the aircraft should be done individually.
- b. Recharging a single battery on the aircraft:
 - i. Special tools:
 - (1) Advanced Power Products Activator 282 Battery Charger, P/N 4105, or equal constant potential charger.
 - (2) The Activator 282 is fully automatic. Connect to battery and initiate

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charging. If using a constant potential charger, follow instructions below.

Caution / Warning: Only constant potential charging may be done on the aircraft. Ensure the charging area is well ventilated. DO NOT constant current charge a battery on the aircraft. There may be a serious risk of injury to personnel and / or damage to the aircraft and aircraft systems.

Warning: Contact Concorde for determination of equal test equipment. Some brands of battery chargers will destroy the battery.

- ii. Set the charger for 2.35 volts per cell (14.1 volts for a 12 volt battery, 28.2 volts for a 24 volt battery).
- iii. Set the current limit to the C1 rate.

NOTE: If current on external power unit is not adjustable, do not charge the battery in the aircraft

- iv. Initiate charging and continue to charge until the charge current stabilizes for 1 hour.

c. Uninstalled recharging:

- i. Remove the battery from the aircraft.

- ii. Special tools:

- (1) Advanced Power Products Alpha C-25 Battery Charger, P/N 4142; Advanced Power Products CA15-50 Charger/analyzer P/N 4159; or equal.

Warning: Contact Concorde for determination of equal test equipment. Some brands of battery chargers will destroy the battery.

- iii. Depending on the type of charger available, charge the battery Constant Potential (CP). Charge at 14.1 volts for 12 volt batteries or 28.2 volts for 24 volt batteries until the charge current stabilizes for 1 hour.

NOTE: Batteries that have been allowed to stand in a deeply discharged state may not accept a CP recharge. See conditioning procedure in paragraph 13.c for handling those batteries.

11. Repair / Replacement:

- a. Repairs should be performed only by a Concorde approved battery shop.
- b. Replacement may be made by removing and installing a new battery in accordance with the instructions in this supplement.
- c. The battery should be replaced after 3 years or 1800 hours of operation or whichever occurs first.

12. Facilities: Valve regulated batteries may be serviced in any battery facility, including nickel-cadmium service facilities. The battery is sealed to prevent cross contamination of the electrolyte.

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13. Storage Limitations:
- a. Batteries are serviced and charged at the factory prior to shipment.
 - i. For maximum battery life, boost charge when open circuit voltage is below 25.0 volts for 24 volt batteries and 12.5 volts for 12 volt batteries. The normal voltage for a fully charged battery is approximately 26 volts for 24 volt batteries and 13 volts for 12 volt batteries.
 - ii. Batteries that have not been recharged when stored for long periods are to be conditioned (13.c) and tested (8.c) before being placed in service.
 - b. Boost charging procedure:
 - i. Special tools:
 - (1) Advanced Power Products Alpha C-25 Battery Charger, P/N 4142; Advanced Power Products Activator 282 Battery Charger, P/N 4105; Advanced Power Products CA15-50 charger/analyzer, P/N 4159; or equal.
 - ii. Depending on the type of charger available, charge the battery Constant Potential (CP). Charge at 14.1 volts for 12 volt batteries or 28.2 volts for 24 volt batteries until the charge current stabilizes for 1 hour.
 - c. Conditioning procedure:

Warning: The battery must be removed from the aircraft prior to performing a conditioning charge.

 - i. Special tools:
 - (1) Advanced Power Products Beta D-50 Aircraft Battery Analyzer P/N 4146 or 4159, or equal.
 - (2) Advanced Power Products Alpha C-25 Battery Charger P/N 4142 or 4159, or equal.

Warning: Contact Concorde for determination of equal test equipment. Some brands of battery chargers will destroy the battery.
 - ii. Procedure:
 - (1) Discharge the battery at the C1 rate to an end point voltage of 9 volts for 12 volt batteries and 18 volts for 24 volt batteries.
 - (2) Constant current charge at the C1 /10 rate for 16 hours.

WARNING: This procedure may damage the battery if performed on a repetitive basis.
 - (3) Allow the battery to cool down for 8 hours.
 - (4) Retest the battery following the inspection procedure (8.c).
14. Disposal:
- a. Batteries contain lead, sulfuric acid, and other hazardous materials. Dispose of all spent batteries in accordance with local laws and regulations. See battery Material Safety Data Sheet (MSDS) for additional information.
 - b. Lead acid batteries are recyclable.

CAUTION: Some aircraft batteries are encased in aluminum containers. These containers must be removed prior to recycling.

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