

SAFETY SUMMARY

- A. **WARNING: LOW CAPACITY HAZARD.** Aircraft batteries are certified to have a certain minimum capacity for emergency operations in the event of a electrical generator system failure. Never use a battery that has less than 80% of rated capacity.
- B. **WARNING: ELECTRIC BURN HAZARD.** Lead-acid batteries are capable of delivering high currents if the terminals are shorted. The resulting heat can cause severe burns and is a potential fire hazard. Take the following precautions:
- Do not place tools or metal objects across battery terminals.
 - Do not wear conductive rings, belt buckles, watches or other jewelry when servicing batteries.
 - Wear insulated gloves and use insulated tools when servicing batteries.
 - Install battery terminal protectors whenever the battery is not connected in the aircraft or to the test equipment.
- C. **WARNING: DANGER OF EXPLODING BATTERIES.** Lead-acid batteries can produce explosive mixtures of hydrogen and oxygen while on charge or discharge, which can explode if ignited. Take the following precautions:
- Never install batteries in an airtight or sealed enclosure and make sure installation is adequately ventilated.
 - Do not smoke, use an open flame, or cause sparking near a battery.
 - Wear proper eye and face protection when servicing batteries.
 - Make sure work area is well ventilated.
 - Do not constant current charge a battery when installed in an aircraft.
 - Connect cables securely to the battery terminals to avoid arcing.
- D. **WARNING: DANGER OF CHEMICAL BURNS.** Lead-acid batteries contain sulfuric acid which can cause severe burns to body tissue. Take the following precautions:
- Never remove or damage vent valves.
 - Avoid contact of the electrolyte with skin, eyes or clothing.
 - Do not touch eyes after touching battery.
 - In the event of acid in the eyes, flush thoroughly with clean cool water for several minutes and get professional medical attention immediately.
 - Refer to battery MSDS for additional information.
- E. **CAUTION: DANGER OF EQUIPMENT DAMAGE.** 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.

What is a parasitic load?

A parasitic load is a small, continuous flow of DC current that takes power from the battery even when the aircraft master switch is turned off. Parasitic loads are present, to a greater or lesser degree, in almost all modern aircraft. Examples of parasitic loads are relays, clocks, radios, and on-board computers. These loads are generally low amperage (e.g., under 50 milliamperes), but since they are continuously present they can deplete the battery's capacity if the aircraft is inactive for an extended time. In some aircraft, the parasitic drain is so high (e.g., over 1 ampere) that the battery becomes depleted within a few days.

What is the effect of a parasitic load?

The parasitic load slowly drains the battery capacity and causes the plates to sulfate. Sulfated plates make the battery harder to recharge and can lead to premature failure of the battery. A long term, low drain rate can deeply discharge the battery, deeper than what can occur with normal aircraft loads. Repeated deep discharges of this nature will shorten the battery life substantially. A battery deeply discharged in this manner may not be recoverable with normal charging methods. If the parasitic drain is high, the battery will become completely discharged in a few days and render the aircraft inoperable (AOG).

Can I eliminate the parasitic load?

The items responsible for the parasitic load are generally integrated in the aircraft electrical system and alteration may affect FAA certification. In some aircraft, modifications can be made to reduce or eliminate the parasitic drain. Contact the aircraft manufacturer for more information on this subject. Another option is to disconnect the battery plug from the battery, which stops all parasitic loads. This procedure is often referenced as part of the aircraft maintenance manual or pilots operating handbook. However, if not specifically referenced, the aircraft manufacturer should be contacted to verify acceptability of this practice.

How do I measure the parasitic load?

The parasitic drain of an aircraft battery can be directly measured with a calibrated digital multimeter (DMM) equipped with an ammeter function. Most DMM's have separate jacks for low current (typically 200 mA maximum) and high current (typically 10A maximum) measurements. The ammeter jacks are fused to prevent damaging of the internal electronics. It's always best to start measurements using the high current jack, and then switch to the low current jack if the measured current does not exceed the low current jack's rating. The low current jack will give a more accurate measurement of typical parasitic currents (generally 1-100 mA).

Concorde's Parasitic Load Test Adapter (PLTA) makes it easy to measure the parasitic load of aircraft batteries equipped with an MS3509 Style quick disconnect receptacle. The PLTA is designed to connect between the battery receptacle and the aircraft's mating plug, with separate test leads for connection to the DMM. The PLTA is rated for loads up to 10 amperes. The following steps apply to all types of aircraft batteries equipped with this style of receptacle.

NOTE: IF THE BATTERY HAS THREADED TERMINALS, THE PLTA WILL NOT FIT. IN THIS CASE, THE AMMETER SHOULD BE CONNECTED BETWEEN THE BATTERY'S NEGATIVE TERMINAL AND THE NEGATIVE CABLE ON THE AIRCRAFT. THE POSITIVE CABLE SHOULD REMAIN CONNECTED TO THE BATTERY'S POSITIVE TERMINAL.

STEP-BY-STEP INSTRUCTIONS

1. Turn the main aircraft power switch to the off position.
2. Turn off any lights or accessories that remain powered with the main switch turned off and are normally off when the aircraft is inactive.
3. Disconnect the battery quick disconnect plug.
4. Connect the black test lead of the PLTA to the ammeter "COM" jack.

CAUTION: BE SURE TO USE A DMM THAT HAS A FUSED AMMETER IN CASE THE CURRENT TO BE MEASURED EXCEEDS THE AMMETER RATING.

5. Connect the red test lead of the PLTA to the ammeter's high current jack.
6. Plug the PLTA into the battery receptacle.
7. Reconnect the battery quick disconnect plug onto the PLTA.
8. Turn on the ammeter to the high DC range.
9. Gradually decrease the ammeter range and switch the red test lead to the low current jack to obtain the most accurate reading being careful to not exceed the fuse rating.
10. Once the most sensitive scale is reached, allow the current to stabilize for 5-10 seconds and record the reading.

NOTE: THE CURRENT READING SHOULD HAVE A NEGATIVE SIGN INDICATING THE BATTERY IS BEING DISCHARGED.

11. Disconnect the battery quick disconnect plug.
12. Remove the PLTA from the battery receptacle.
13. Reconnect the battery quick disconnect plug onto the battery.
14. Perform any necessary operational checks on the battery.

CAUTION: NEVER TURN ON THE MAIN AIRCRAFT POWER SWITCH OR ATTEMPT TO START ENGINE WHEN THE PLTA IS CONNECTED.

How can I protect my battery from the parasitic load?

To protect the battery from being depleted by the parasitic load, the following procedure is recommended:

1. Measure the parasitic load as described under "How do I measure the parasitic load".
2. Determine how long it will take to deplete 10% of the battery capacity using the following formula:

$$\text{Time (hours)} = 0.10 \times C1 / I_p, \text{ where}$$

C1 is the battery's rated capacity in Ah, and
I_p is the parasitic drain in amperes.

For example, if C1 = 28 Ah and I_p = 0.05 amperes (50 milliamperes), then
Time (hours) = 0.10 x 28/.05 = 56 hours = 2.3 days.

3. If the aircraft is inactive for more than the time calculated in step (2), either:
 - Disconnect the battery plug (preferred), or
 - Connect an approved maintenance charger to the battery (effective, but may reduce the battery life if it is always left on).

NOTE: REPETITIVE CYCLING OF THE BATTERY BY THE PARASITIC LOAD MAY SHORTEN THE BATTERY LIFE EXPECTANCY. THE SOONER THE BATTERY PLUG IS DISCONNECTED OR A MAINTENANCE CHARGER IS CONNECTED, THE LESS IMPACT IT WILL HAVE ON THE BATTERY LIFE.

CAUTION: IF A MAINTENANCE CHARGER IS USED, MAKE SURE THE CHARGER PUTS OUT THE CORRECT FLOAT VOLTAGE (13.2 VOLTS FOR 12 VOLT BATTERIES AND 26.4 VOLTS FOR 24 VOLT BATTERIES, AT 25°C/77°F). EXCESSIVE FLOAT VOLTAGE MAY SHORTEN THE BATTERY LIFE EVEN MORE THAN THE PARASITIC LOAD!