

**Memorandum To: Squadron Operations and Maintenance Officers**  
**From: Wing Director of Operations and Maintenance**  
**Subject: CAP Aircraft (AC) Cold Temperature Starts**  
**Date: February 09, 2007**

**The battery condition is one thing you want to monitor in the cold season.**

You need a good battery not only to start an engine, but also to maintain a reliable electrical system during flight especially after sunset. The Alaskan cold season takes a heavy toll on aircraft batteries, a weak battery will freeze and have been known to explode during heavy battery drain (such as cranking), If the battery case isn't cracked or bulging (looks like a ball) the battery may or may not be able to be recharged. Batteries that are neglected (never visually looked at by the PIC or maintenance officer) or never receive any servicing (e.g. check electrolyte level, battery cable connections, cleanliness of the battery and its holding device (battery box) or do not take the time for the battery to receive a top off charge prior to the termination of the flight; may and will experience a dead battery at a most inconvenient time, like the next flight, landing at a remote landing area that probably can't support a restart. This situation happens often; real often and the cost is astronomical in lost time, battery cost and the cost of responding to a situation that could have been avoided with a little care on the part of the squadron and /or flight crew A poorly maintained battery probably causes the most grievance during flight operations of an aircraft.

The Alaskan cold season (about five months), is usually the period when this wing experiences battery failures; e.g. dead battery from lack of sufficient charging, frozen battery, damaged battery plates because the battery water level was allowed to evaporate below the plates, or corroded battery terminals.

We also have an unusual number of starter failures during the cold period. Some of the starter failures can be traced to over cranking without allowing the starter to cool between cranking cycles, low starter cranking amperage because the battery does not have sufficient energy to turn the starter at its rated rpm for engine start. Low cranking power decreases starter life and can result in backfiring resulting in a carburetor fire. Over priming and low battery charge is the primary cause of backfiring.

Remember the emergency procedure for an engine fire?

["Keep cranking until the fire is out" then complete the emergency checklist"]. If the battery is low, the engine will not turn fast enough to pull the flame back into the engine extinguishing a carburetor fire. Adequate cranking power will pull the flame back into the engine. If the battery is low or won't turn the starter at its rated rpm, a carburetor fire may start and cause extensive damage within the engine compartment. Carburetor fires have been known to completely destroy an aircraft. At the maintenance facility we have seen several signs of fire damage during the inspection of the engine, the tell tail signs are most evident. Very seldom are carburetor fires ever reported, the latest one being N6266E. Most if not all carburetor back firing can be prevented by paying attention to proper starting procedures especially priming, checking the battery system to assure proper battery voltage is available for cranking the engine. Starter failure and carburetor fires can be reduced if the pilots will observe proper starting procedures IAW the POH.

Starters will normally provide reliable service until the engine needs to be overhauled. Aircraft batteries are known to provide reliable service between two and three years (and longer) with proper maintenance, **"BUT"** neither the starter and /or battery will provide reliable service if neglected. Starter failures in most case are the result of low charge or frozen battery that was not properly maintained. Please treat the CAP aircraft as you would your own.

**Battery servicing:** The aircraft battery must be service every **25 hours** of flight time and the servicing shall not exceed a maximum of 3 calendar months before being looked at. The battery service will be documented in the aircraft operational manual as to servicing, condition of battery at the time of service, and distilled water added if any. Battery terminal will be inspected for corrosion and cleaned of corrosion (if the AC has a jell battery, servicing is slightly different, it is a sealed battery) and the serving of the battery must be signed off by the squadron maintenance office (or his designee) that servicing has been completed IAW this memorandum.

If your squadron is in need of battery service instruction contact the Wing maintenance facility or the Director of Maintenance to learn how to care and service an aircraft battery. In the mean time follow this instruction when servicing an aircraft battery: **EXERCISE CARE TO PREVENT**

**INADVERTENT SHORTING OF THE BATTERY TERMINIALS. SERIOUS DAMAGE TO THE AIRCRAFT STRUCTURE (FRAME, SKIN AND OTHER SUBSYSTEMS, AVIONICS, WIRE, FUEL ETC) CAN BE SUSTAINED BY THE RESULTANT HIGH DISCHARGE OF ELECTRICAL ENERGY. THIS CONDITION MAY NORMALLY BE AVOIDED BY INSULATING THE TERMINIAL POST DURING REMOVAL AND INSTALLATION PROCESS.**

Remove the grounding lead first for battery removal, then the positive lead. Connect the grounding lead of the battery lead last to minimize the risk of shorting the “hot terminal” of the battery during the installation.

Never try to charge or jump a frozen battery; the battery may explode causing injury to personnel as well as contaminating the surrounding area with acid.

### **Preheating.**

Below 20 degrees Fahrenheit (F), aircraft are sometimes impossible to start, many are, and some will start below that temperature. The problem that one runs into is, it is very abusive on the aircraft systems and can/will cause abnormal wear and tear of the engine. The following should be followed for PREHEATING the airplane.

**Temperatures less than 20 F,** and the airplane has set less than an hour, it's a pretty sure thing the engine will start. If the plane sits longer than an hour, you will need to preheat. One way to avoid preheating, if the plane is to sit longer than an hour is to scheduled a restart. It may require a 15 or 20 minute run to bring the temperatures back up, of course the colder the temperature, the shorter time for restart and somewhat longer warm up.

**Temperatures between 20 and 30 degrees:** do not allow the plane to sit longer than 2 hours before restarting the engine. Between 30 and 40 degrees: 4 hours. If the temperature is 10 degrees, and the plane sits for two hours, you may have a real problem starting it.

I can vouch that with determination and several preheaters, you can restart an engine at 50 degrees below zero, “but”, I do not recommend trying this as practice, it one of those things best left to hangar talk in hopes you never have to experience conditions as described, but don't forget what you heard.

Treat the CAP aircraft as your own, take good care of the plane and turn it over to the next crew as you would like for them to leave it for you.

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