A Battery Warmer – Really?

Written by: Dennis S. Nunes – February 2025

Look, up in the sky! It's a Bird. No – it's a Plane. No it's ———— *a Battery Warmer?*

A Battery Warmer?

A battery warmer? Come on, is this a joke? Do I really need a battery warmer? Maybe, Maybe not. But, here's a situation that I found myself in recently.

In November of 2024, I found out when flying my electric powered *Circulas 61e* in cold weather, with the temperature at 40°F, my fully charged 6S 2800 mAh Li-Ion batteries *"ran out of juice"* near the end of the 4-leaf clover on a couple of flights. Battery capacity should not have been an issue. But now was issue! I never had this happen before.

Circulas 61e - 2024 Southwest Regionals - Tucson, Arizona

Prior to this, when I flew in the summer and in the spring, when charging the batteries back up to a full strength, I would input 2100 mAh back in to each 2800 mAh pack. This meant that I had 25% remaining battery capacity. No problem, plenty of "juice".

Once the outdoor temperature rose to about 50°F, my 2800 mAh batteries were fine. So I've come to the conclusion that when flying in cold weather conditions, my batteries are "on the edge" of not having enough capacity. This situation became the main reason for building a set of 3000 mAh batteries. I was hoping the new batteries would give me the needed capacity when flying in cold weather. By the way, the 3000 mAh battery packs are a few grams lighter than my 2800 mAh packs. So more capacity with no weight gain – that's a win-win situation that you can't beat!

But what could I do in the meantime with my 2800 mAh batteries? Was there anything I could do to eke out a few more milliamps to complete a flight? Don't fly in cold weather? That's not an option.

Batterypalooza, was an event held in December of 2024 at Howard Rush's workshop in Olympia, Washington. This event was to learn the ins-and-outs on how to make Li-Ion batteries. We made a few battery packs. Then an interesting discussion came up about flying in cold weather and the effects that cold weather have on the storage and usage

of both Li-Ion and Li-Po batteries. This eventually led to the discussion of keeping batteries warm and the use of … *a Battery Warmer*.

Currently, I store all my batteries in an uninsulated garage, where the temperature in winter can drop down to the mid to high 40's in the morning. I keep all my batteries, in a 'First Alert' - Key Lock Blue Fire Safe available from Ace Hardware. This fire safe is well insulated and is also very heavy, especially when loaded with a bunch of batteries.

'First Alert' - Key Lock Blue Fire Safe

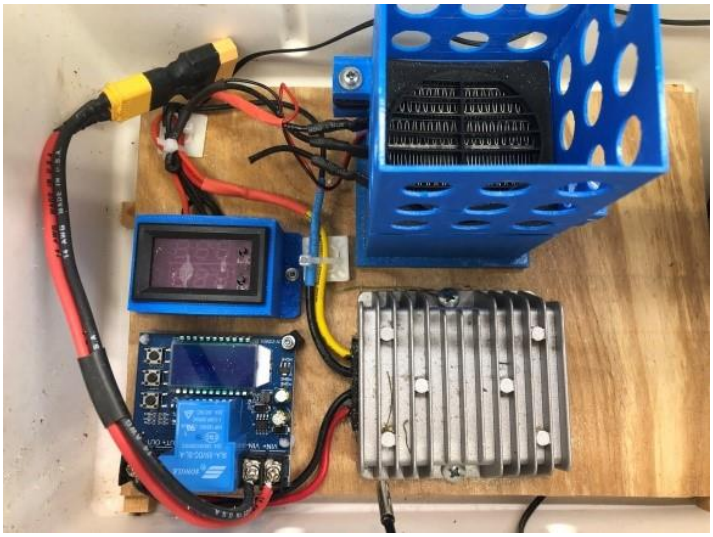
Normally, I charge my batteries in the garage the night before I head out to fly. After charging them, I place them back in the fire safe and leave them in the garage. In the morning, I load the fire safe with the fully charged batteries in to the car and head out to the flying site.

In a discussion with Randy Ling at Batterypalooza, those who live in the upper northwest have been dealing with the effect of cold weather on both Li-Po and Li-Ion batteries for a while. He mentioned several methods that they use to keep their batteries warm before using them, so they don't run into the situation that I ran into.

- Method 1: Leave their batteries in a warm car until the last minute. (I've heard of individuals placing their batteries in a warm engine compartment while parked at the flying site to keep them warm.)
- Method 2: Keeping batteries in their pockets.
- Method 3: Use of a small cooler and heat up a microwavable heating pad. Place the heating pad in the cooler along with their batteries.
- Method 4: Randy spoke about a very sophisticated battery warmer that he built. His warmer was powered by a 6S 5000 mAh Li-Po battery. It included a 24v to 12v 20 amp step down Buck transformer, along with a low voltage disconnect, a thermostat, along with a small 12v car heater and fan. It keeps his batteries nice and warm for 4-5 hours.

The first 3 methods didn't appeal to me. The problem with Method 1 was that my car, in most cases, is too far from the flying circle to run back and forth to get a warm battery. For Method 2, I already have too much "stuff" in my pockets. I really don't want or need to be carrying batteries in my pockets. Also, this method can be very dangerous especially if you have metal objects (coins, keys, etc.) in your pocket. For Method 3, the microwavable heating pad or "rice bag" only lasts for about an hour. This would not be long enough, as it takes me anywhere from 45 to 90 minutes just to drive to the flying sites where we normally fly for several hours.

Method 4, Randy's device, was very impressive and works extremely well but I was short on time to order all the components needed and put one together. I really liked Randy's idea of using a Li-Po battery and the 12v car heater/fan.



Randy Ling's Battery Warmer

However, I was hoping to use something that was a little less sophisticated and less expensive. Also, Randy's device would require me to use too many brain cells to put one together. I don't want to be an electronic specialist any more than I have to. I have enough electrical stuff going through my head from building my batteries to keeping everything associated with electric powered planes working. I needed something that is a *no-brainer*, something very simple and inexpensive. And of course, I needed it quickly. Because in two days, we were planning on flying in the morning in Napa, California where the morning temperature was forecast to be 40°F!

I was looking on Amazon's website at various "microwavable" heating pads, but I couldn't find one that I liked or one that I could get delivered the next day. I even looked at a couple of YouTube videos on how to make microwavable heating bags using rice or split peas. But I needed something that would work longer than an hour or so.

As I was searching for microwavable heating pads, I came across several 5v USB heating pads that are made for traveling. However, most of these were too big to place in my small cooler. Then I found a 5v USB powered portable baby bottle warmer that seemed to be just the right size. It was inexpensive, a little over $9, and I could get it the next day.

5v USB Powered Portable Baby Bottle Warmer (Isn't it cute!)

How do I power the baby bottle warmer? Good question. Could I use the USB port connection in my car? Yes I could. But I wanted something to keep my batteries warm for several hours and not be tied to my vehicle, which could be parked a distance away from the flying circle.

Then I got to thinking *(which by the way, can be very dangerous)*. I just happened to have a 38800 mAh portable charger that I use when traveling to charge my iPhone. It has (4) 5v USB ports. All I needed was one port. The portable charger is a little bigger than my batteries and just a little heavier. This would fit very nicely in my small cooler with no problem.

38800 mAh Portable Phone Charger

I also had a small Digital Thermometer with a humidity gauge that fit nicely inside the cooler, and a small Igloo Cooler, both of which were just laying around.

Digital Thermometer (left) and Small Igloo Cooler (right)

I had everything I needed. I placed a piece of soft foam at the bottom of the Igloo cooler to keep the batteries from rattling around. I attached the digital thermometer and the portable charger on the insides of the cooler with strips of 3M SJ4570 Dual Lock Low Profile Reclosable Fasteners. Finally, I laid the USB 5v Baby Bottle Warmer flat on top of the foam.

An Inside View of my Battery Warmer, without the Batteries

Testing My Battery Warmer:

Though I was short on time, I wanted to see if this contraption would work. So once the portable baby bottle warmer arrived, I conducted a – *highly scientific test*. I brought the Igloo cooler *inside* the house and let it warmed up to room temperature, which was 70°F. I connected the bottle warmer to the portable charger, placed it inside the cooler, along with a thermometer and closed the lid. This highly scientific test was to check two things, (1) How warm would the inside of the cooler get and (2), how much power would be used from the portable charger. This test took placed inside my house, not in the cold, uninsulated garage.

After an hour, I opened the cooler and looked at the thermometer. The temperature was at 79°F and the portable charger was down only 5% of its capacity. After two hours, the temperature was at 82°F, with charger down only 8%. Now that was a successful, highly scientific test! Now I needed to test this unit in the field, under cold conditions and see what happens.

Another idea popped up during this testing that turned out to be the ultimate *"ace up my sleeve". Normally*, Li-Ion batteries get very warm after a flight, in my case with the 2800

mAh batteries, get hot! If needed, I could place the hot battery that comes out of my plane back into the cooler. It would allow the heat from the hot battery to contribute to the overall heat of the cooler. *Would this work?* According to the old cliché, *"Nothing ventured, nothing gained"*. Again, all I was looking for was something to keep my batteries warm enough to have enough capacity to fly a full pattern. But in the back of my twisted mind I said, *"If it's good enough for baby's milk – it's got to be good for keeping my precious batteries warm"!*

To the Field:

The next day, I was headed to Napa around 7:30 am. In Stockton, where I live, the morning temperature was 31°F. Napa was a degree or two warmer according to my weather app. *Very cold!* Would my make-shift battery warmer work?

The night before I left for Napa, I put the fire safe with my fully charged batteries in the house to warm up to room temperature. When I woke up in the morning, I connected everything up, removed the fully charged batteries from the fire safe, and placed my new 3000 mAh batteries along with my older 2800 mAh batteries in the cooler (10 batteries all together). This was exactly one hour before getting into my car and heading to Napa.

Prior to placing the cooler on the floorboard of the front passenger seat, I took a quick peek at the thermometer in the cooler which showed a reading of 75°F. After a 90-minute drive to Napa and another quick check of the cooler, the temperature was at 76°F. Hmmm…

By the time I got to Napa, the outside air temperature was at 42°F. It was a beautiful clear sunny day. The actual battery packs were holding at a nice 72°F, with the cooler being several degrees warmer.

I converted my *Circulas 46 IIe Profile* to use a Fiorotti timer and Li-Ion batteries. This plane is now my new official *"battery test plane dummy"*.

Circulas 46 IIe Profile – My New Battery Test Plane Dummy

I had to do several 1-minutes flights to get my newly installed Fiorotti timer set and make a couple of handle adjustments. It was time for the big moment; a full flight. I reached in and pulled out a “warm” 3000 mAh battery. The battery pack temperature was still holding at 72°F. I did the flight with no issues whatsoever. I measured the battery temperature right after the flight. Surprisingly it was only at 110°F. My older 2800 mAh Li-Ion batteries usually heated up to around 135°-145°F on *Circulas 61e*.

By 11:30 the outside temperature rose to a blistering 52°F. To my surprise, the cooler had heated up nicely also, to 96°F! At this point, I disconnected the charger from the USB bottle warmer. The portable charger only used 30% of its capacity after working for 4 solid hours. It could have continued on for several more hours if needed. This inexpensive battery warmer had did its job and worked flawlessly! I was very pleased.

Now for an interesting side issue. After several full flights, with my new 3000 mAh batteries, the battery temperature after the flights were surprisingly low. The hottest battery measured only 110°F. This was outstanding!

On my last flight, I decided to put in one of my older 6S 2800 mAh “warm” batteries. After the flight I measured the battery temperature. It was a whopping 150°F! Too hot to hold on to for any length of time. Why was it so hot? I’m not sure, but I’ve always had temperature issues with these batteries. It may have been caused by the *MoliceI* P28A cells used in these older battery packs. At this point, I really don’t care, especially if my new 3000 mAh batteries run cooler and work.

But I still had one problem. I never tested my new 3000 mAh batteries *without* the battery warmer on a cold day. So I really don’t know yet whether I have enough battery capacity without using the battery warmer. All I do know is that with the battery warmer there was plenty of capacity on that cold day to allow me to get through full patterns with both of my old 2800 batteries and the new 3000 batteries!

When I got home I charged the 3000 mAh packs back up to full strength. The charger put 2200 mAh back in. This calculates to 26% remaining battery capacity, which is fantastic. Now I need to build more 3000 mAh battery packs!

Do I Really Need a Battery Warmer?

So, do you really need a battery warmer? Not everyone does, especially if you have tons of battery capacity or you’re flying in warm weather. But if you find yourself in the same situation that I experienced, flying in cold weather and running out of juice, try this battery warmer. It’s simple and easy to use.

To be fair, I should have used *Circulas 61e* for all the testing. But I was a little hesitant using my #1 plane to test new batteries and battery capacity, hence the reason for reconfiguring my *Circulas 46 IIe Profile* for testing purposes. Oh and on a side note, in switching from the Li-Po to the Li-Ion batteries, I was able to reduce the plane’s overall weight by a full two ounces. Now my profile flies even better!

I eventually put my new batteries and my battery warmer to a full test on *Circulas 61e*. This occurred on February 2, 2025 at the 75th Southwest Regionals Control Line

Championships in Tucson, Arizona. By the way, the morning temperature that day was a nice, crispy 38°F! My new batteries and battery warmer passed with flying colors and worked perfectly.

Enjoy,

Dennis S. Nunes