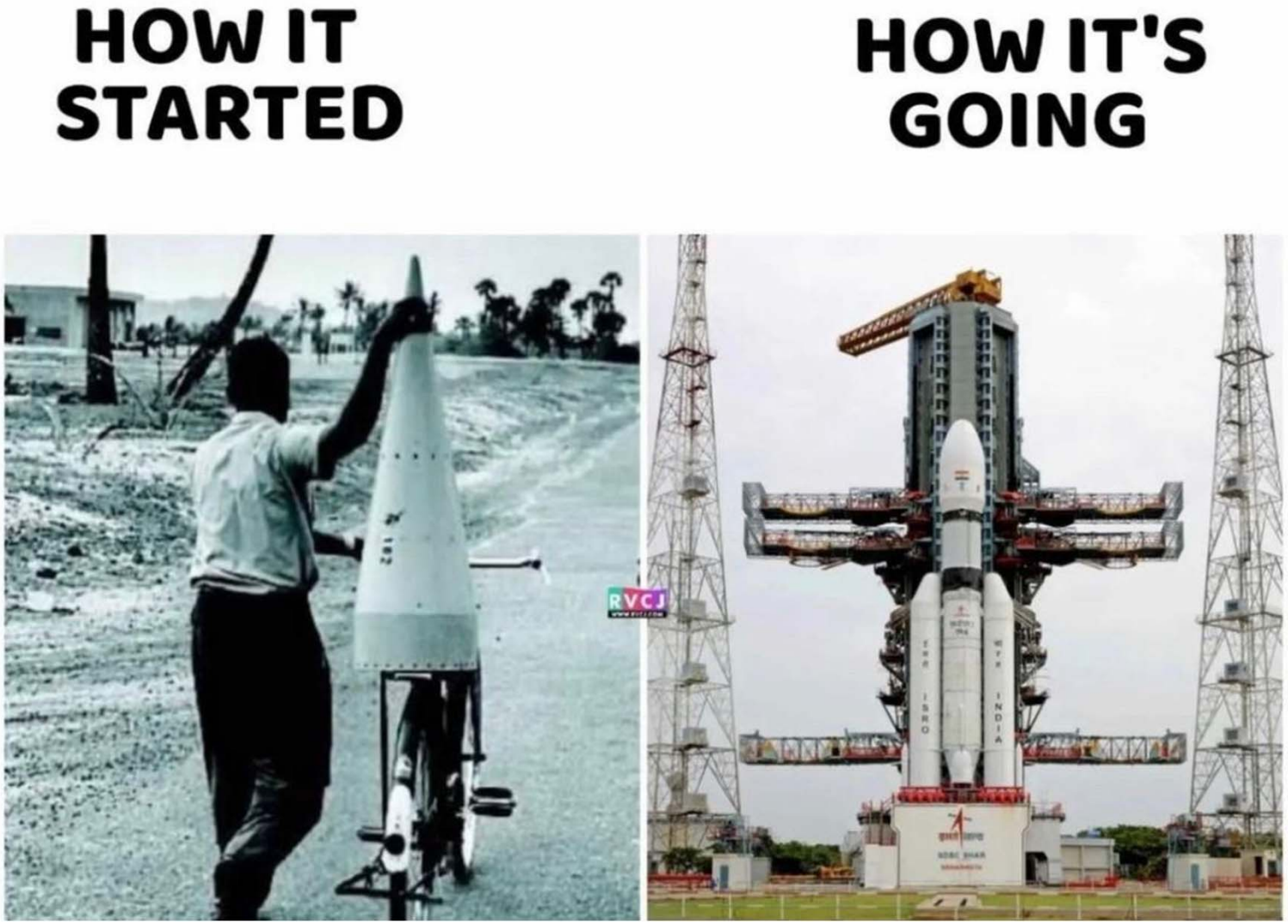
Field portable power review

April 4th 2024
Sorin Constantinescu, KN6YUH

CARES mission

The mission of Cupertino ARES is to maintain and train Amateur Radio volunteers capable of providing professional emergency communications, increasing the City's emergency response effectiveness, and speeding the recovery effort.

The search for a good battery



Packet station

Due to my background (IP networking + Linux), I was attracted by Packet Radio as soon as I heard of its existence.

While building it, I wanted to have the same makes and models that others considered as very good and reliable: 50W radio, TNC and antenna.

Because we live in a rented townhouse, I didn’t want to mount a permanent antenna on top of the house, but one that could be temporarily installed while operating.

The Golden Standard

1. Kenwood TM-V71 50W dual-band radio (2nd hand from Ebay)

2. Kantronics KPC3+ TNC (2nd hand from Ebay)

3. Windows Computer - Lenovo laptop (2nd hand from Ebay)

... plus many other smaller things (RigRunner, powerpole cables, console cables, data cable, etc)

Powering up the station

There are two options

1. A good power supply (like the PowerWerx 30A) - which is ~$140

   * but it's not field portable

2. A battery which you can use to operate both at home and in the field

   * The battery also requires a charger

   * It might only be able to power your radio and TNC from its 12V output

Understanding Amp and Watt Hours

Amp Hours (Ah) represents the total amount of current a battery can deliver over time.

Watt Hours (Wh) represents the total energy a battery can store.

Wh = Ah x Volts

Jackery portable batteries

- **290Wh** versus **518Wh**
- 12V output via cigarette lighter port - LIMITED at 10A
- Provides USB-A and USB-C charging ports
  - The old Lenovo laptop can be charged via USB-C !
- Can be charged with a special charger or simply via USB-C
- Cost is roughly $1/Wh
  - I got a great deal on Amazon ($200) for the Jackery 300
  - and got one in May last year

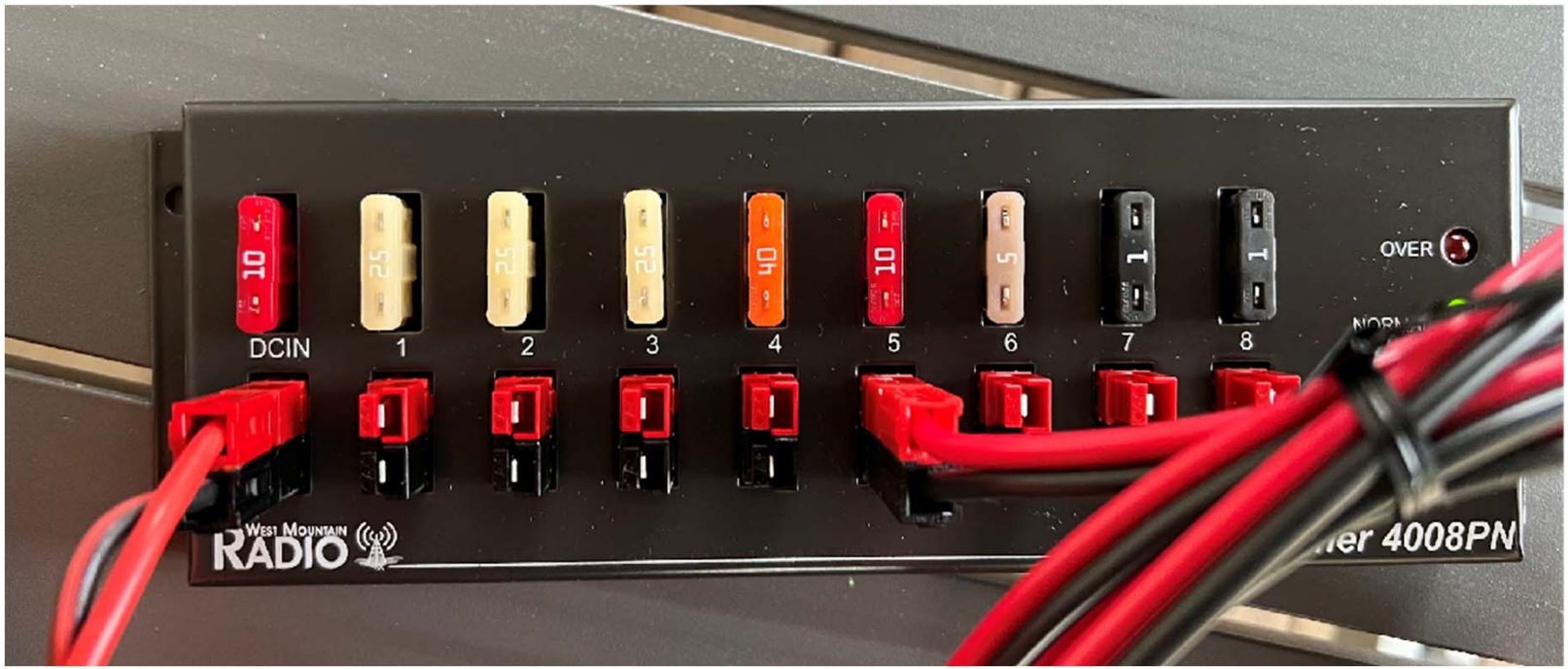
Jackery 300

Jackery 500

RigRunner

One input and multiple outputs.

Uses Anderson PowerPole standard connectors and each port is fused.



Cupertino Packet in the Park

Duty Cycle

N6MEF's doc on the scc-ares-races.org (AGM vs LPF Battery Testing) is a great resource! (link)

- **Field Op** Duty Cycle: 3m idle, 12m TX, 45m RX
- **Net Control** Duty Cycle: 3m idle, 32m TX, 25m RX

Packet operator: no results; similar to Field Op, but likely much less TX and RX

Weighted average discharge current

Field Ops 1.395 A 14h 2.315 A 8.6h

State	Duration/Cycle	Medium (10 W)	High (50 W)
Idle	3 sec	0.5 A	0.5 A
Transmit	12 sec	4.6 A	9.2 A
Receive	45 sec	0.6 A	0.6 A

Net Control 2.728 A 7h 5.18 A 3.8h

State	Duration/Cycle	Medium (10 W)	High (50 W)
Idle	3 sec	0.5 A	0.5 A
Transmit	32 sec	4.6 A	9.2 A
Receive	25 sec	0.6 A	0.6 A

The “rule of thumb” for calculating expected rating is to divide the LFP battery rating (20Ah for example) by the weighted discharge current depending on the duty cycle and transmit power.

Ammo can battery

As the Jackery would sometimes die with 30-40% remaining charge and hearing that I'd have to send it back for repairs (not have a battery for some time), I decided to look for a second battery.

Ammo can battery

- Made from repurposed LiFePo batteries from electric bicycle(s)
- ~13V output with 28Ah capacity (8Ah larger than my Jackery)
- Built by our very own Tae (N6TAE)

It has been my main mobile radio battery at home (and in the field) since getting it!

- Weekly nets
- Weekly packet practice
- Monthly packet practice

Packet printer

I’ve got my packet station running, so what about adding a printer that I could power from the Jackery?

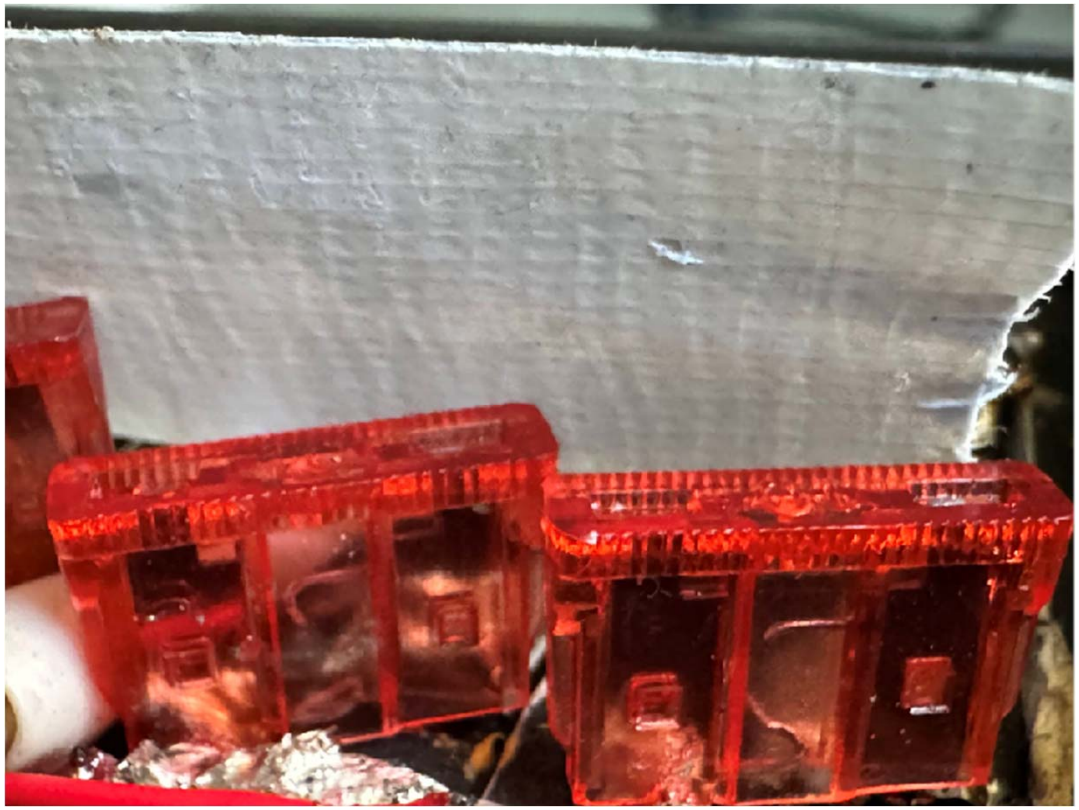
Not just any printer, but a small and lightweight **HP LaserJet M110w**.

What could go wrong?

- The draw current on power-on was too much for the Jackery 300
- So I got a 600W inverter that I connected to the ammo box battery!
  - Only the the draw was still too high, and it blew a bunch of 10A fuses protecting the battery elements

What next?

- The laser printer apparently consumes between around 300W when printing, but 700W when it's turned on and has to warm up.
- I decided to park the idea of having the laser printer with me in the field
- Switching to an ink-jet printer would also be an option



Cupertino Weather Alert February 2024

Message from AlertSCC:

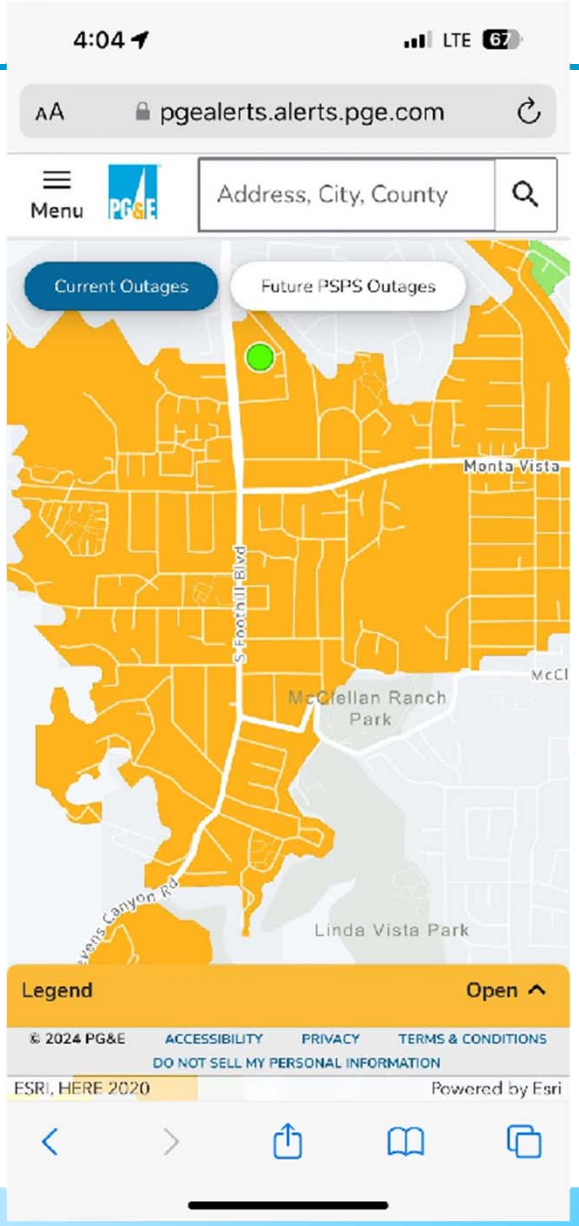
A High Wind Warning will be in effect from 10 p.m. on Saturday, February 3, 2024, to 10 p.m. on Sunday, February 4, 2024, for the Santa Cruz Mountain areas of the County and the East Santa Clara Hills. Forecasted sustained winds of 40 mph or more are expected, accompanied by gusts exceeding 68 mph at elevations between 900 and 2500 feet. Saturated soils increase risk of runoff to creeks, streams, and roadways that may increase the risk of flooding and mudslides.

Avoid driving if possible. Dangerous road conditions are anticipated throughout the region. Do not attempt to drive through flooded roads. Bring pets inside during the storm to keep them safe from weather impacts, falling debris and water ways. Assume all downed power lines are electrified and dangerous. Report downed power lines immediately by calling 9-1-1 and then call PG&E at 1-800-743-5002.

Power down event #1

Lost power on 02/04 at ~2PM

PGE fixed it at ~9PM, with a downtime of 7 hours.



Power down event #2

Lost power on 02/07 at 7PM.

PGE fixed it next day at 11AM, with a downtime of 16 hours.

Unlucky to have an electric oven, but grateful to be able to move out to the barbecue!

Jackery 1500 Pro

Two power cuts in a week were sufficient to get “approval” for a bigger battery:

We can all use it at home during PG&E’s frequent power cuts

In an emergency, I can use it to power my field station!

Jackery 1500 Pro

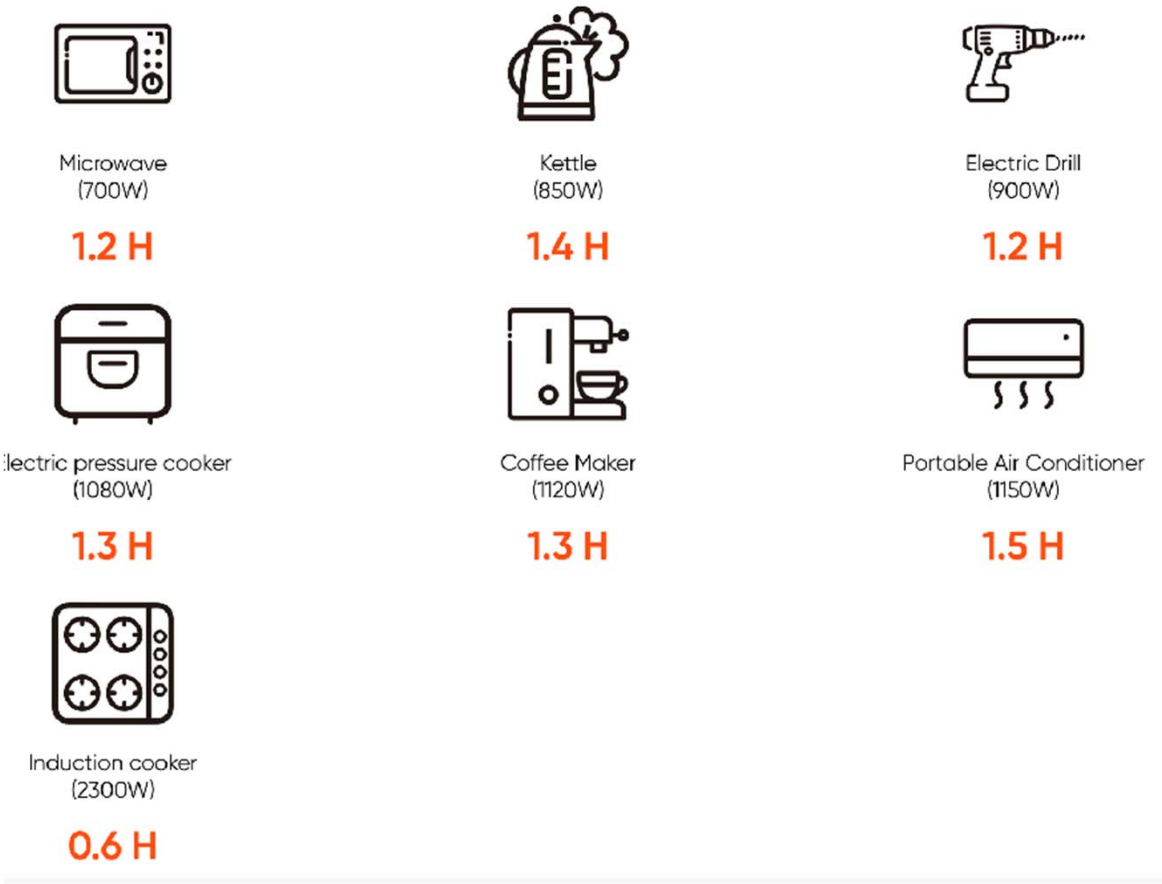
Jackery 300’s BIGGER brother!

- 1512Wh Capacity, 1800W AC Output
  - More importantly, can power the laser printer with no sweat!
- Quick Recharging in 2 Hours via AC
  - Useful for a quick recharge
- Lightweight at "just" 37.4 lbs
- Comes with 200W solar panel that can recharge the battery in 11 hours

What can you power with it?

Many appliances can be powered on!

I’ve also powered on my espresso machine, and used 25% of the total capacity for two cups of coffee.




Jackery

FARS Winter Banquet 2024 Raffle

Raffle Prize Winners


Yaesu FT-991 Xceiver


Nano VNA Network Analyzer


Tiny SA Analyzer


USDX+ QRP Transceiver


Digital Oscilloscope


Radioddity GD-73A


ATS-20+ AM/FM/SSB Receiver


Bio Enno LiFePo Battery


Baofeng VHF/UHF HT


Retekess Portable Radio


Centech Power Pack


ARRL Antenna Book


Pixie QRP CW Transceiver


Flashlight

Bioenno 15Ah

I was lucky to win two prizes at the FARS Winter Banquet, one of them being… a 15Ah Bioenno LiFePo battery!

The Kenwood TMv71 has 0.6A draw when just receiving. This means that on a single charge, you could use the radio to receive for up to 25 hours!

Recommendations

- Try to calculate the duty cycle and make an educated guess of the operating time
- Choose the battery that can last for the estimated duration and duty cycle
- Consider a simpler battery pack (12V only) augmented by a separate USB-C PD pack to charge laptop/phone

Thank you

Any Questions?

References