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Battery Powered Circuit Design

SOCOM / 1st SFG

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THE TEAM

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MBA Student

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THE SPONSOR

1st Special Forces Group (1st SFG)

Motto: First in Asia
Area of Responsibility: Indo-Pacific Region
Core Competencies: Foreign Internal Defense, Unconventional Warfare, Special Reconnaissance

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THE SOLDIERS

1st SFG Soldiers are known commonly as “Green Berets”

Green Berets are:

- Army Special Forces Soldiers
- Physically fit
- Typically well educated
- Highly motivated and trained
- Enthusiastic about problem solving
- Used to operating in austere conditions

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THE PROCESS

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Interviews

Original Problem:

Special Forces ODAs need a better way to power their single board computers (SBCs) in order to support intelligence and communications capabilities abroad for more than 24 hours

Current Problem:

Special Forces ODAs need to be able to reliably power single board computers for 24 hours to 30+ days through a combination of off the shelf components, batteries and renewable energy

Stanford University
University of Michigan
University of Washington
MIT Lincoln Laboratory
Adobe
amazon
ANDURIL
Google

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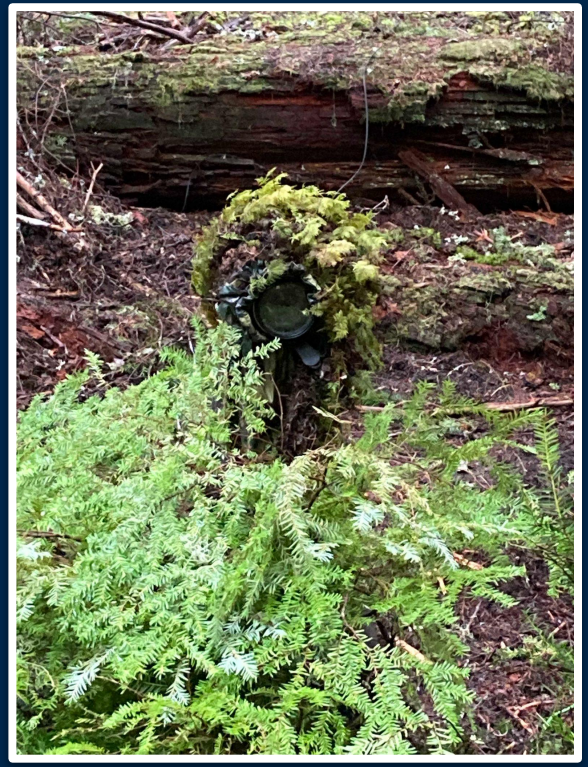
THE SOLUTION

We designed a battery powered circuit that is:

- Commercially procurable
- Simple and modifiable
- Utilizes renewable power
- Has scalable capacity
- Has been field tested



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THE JOURNEY

How did we get here?

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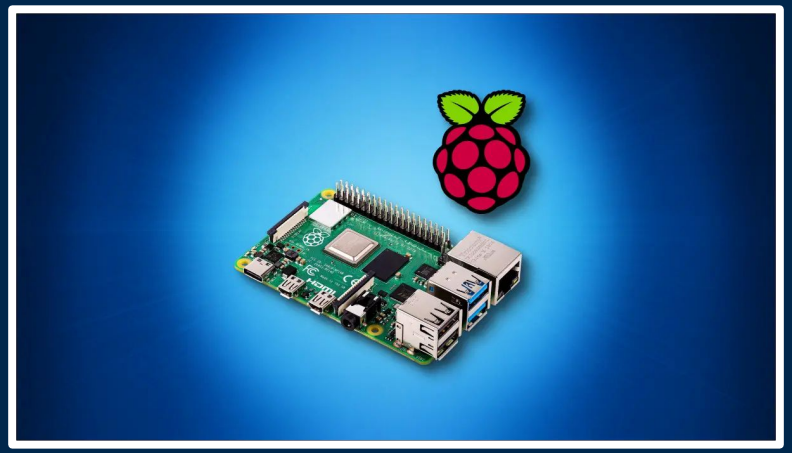
ORIGINAL PROBLEM STATEMENT

Special Forces ODAs need a better way to power SBCs in order to support intelligence and communications capabilities abroad for more than 24 hours, up from less than 12 hours currently, and to keep the warfighter out of harm's way



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ORIGINAL HYPOTHESIS

OR

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THE FEEDBACK

“This is a Billion Dollar Problem”

“You can’t solve this in 12 weeks”

“There are already proprietary solutions built by defense contractors and commercial companies - why don’t you use those?”

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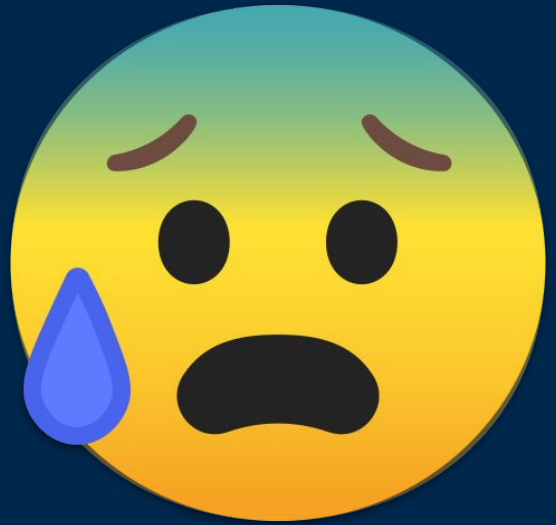
THE FEELING



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THE INTERVIEWS

Through interviews with our sponsor and other warfighters, we learned about key attributes that would shape the future of our project

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KEY ATTRIBUTES

- Commercially available
- Non-proprietary
- Non-attributable
- Easy to use
- Repairable/replaceable
- Able to be acquired and assembled while in the theater of operations

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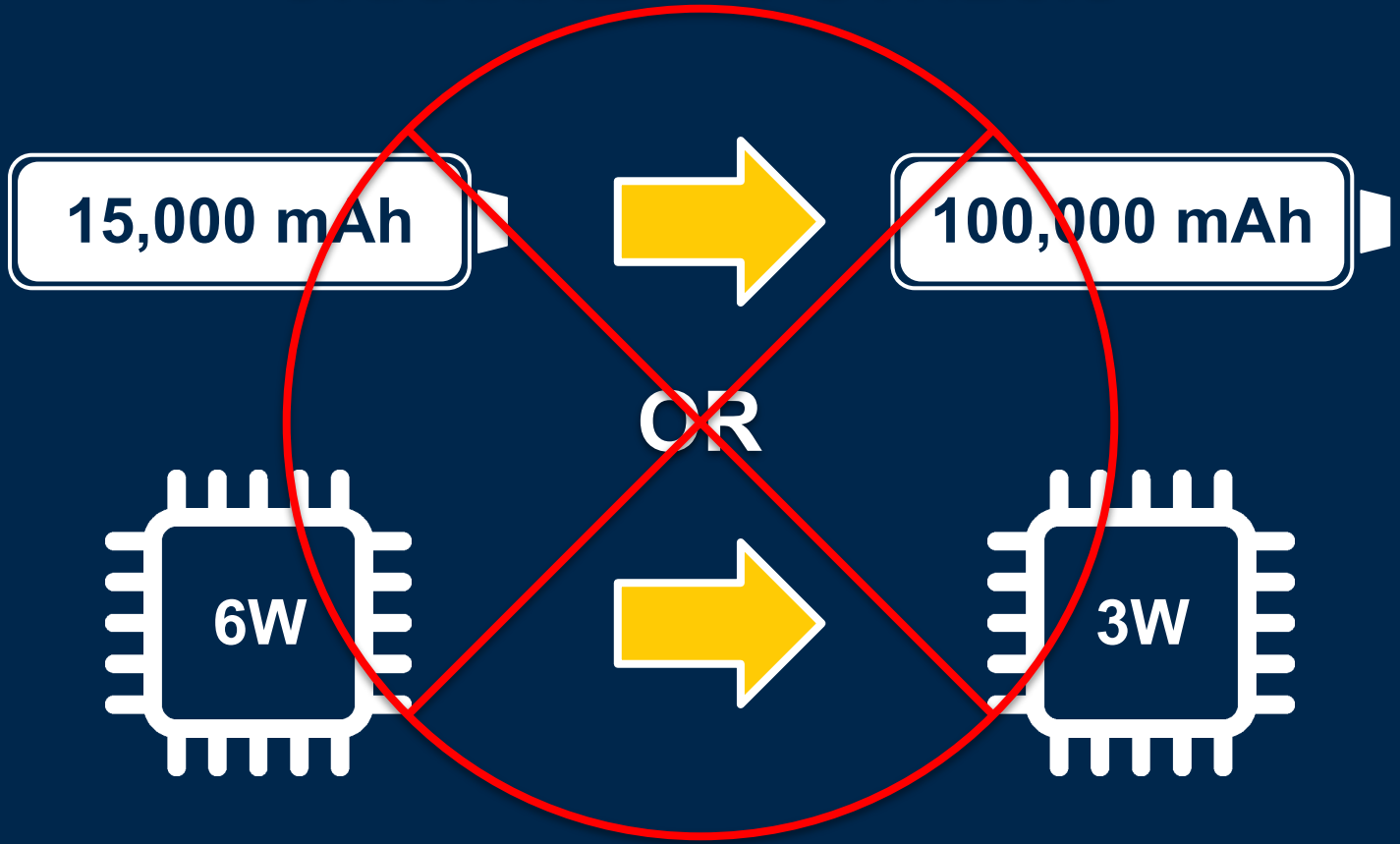
ORIGINAL HYPOTHESIS



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THE PIVOT

How can we get to a solution that meets the needs of the 1st SFG?

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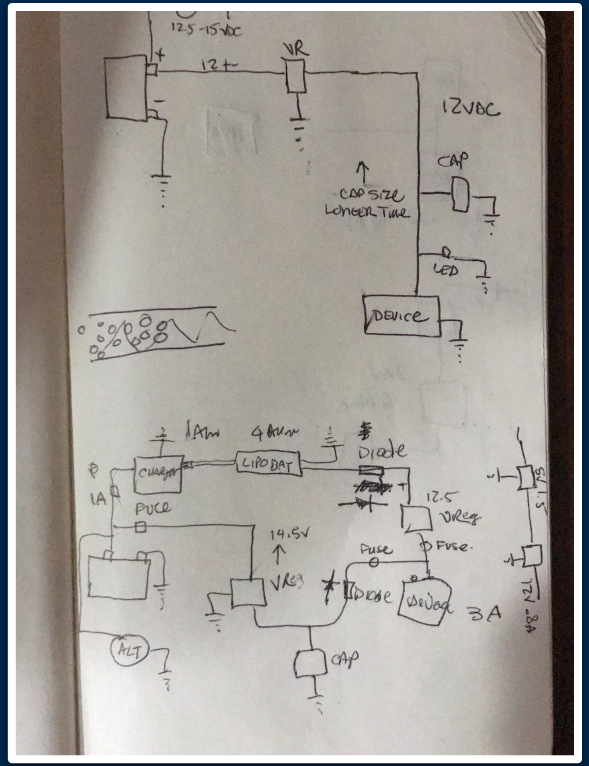
NEW HYPOTHESIS

Using off the shelf, non-proprietary and non-attributable parts, we will be able to power a SBC and its connected components for more than 24 hours using a combination of rechargeable batteries and renewable energy sources



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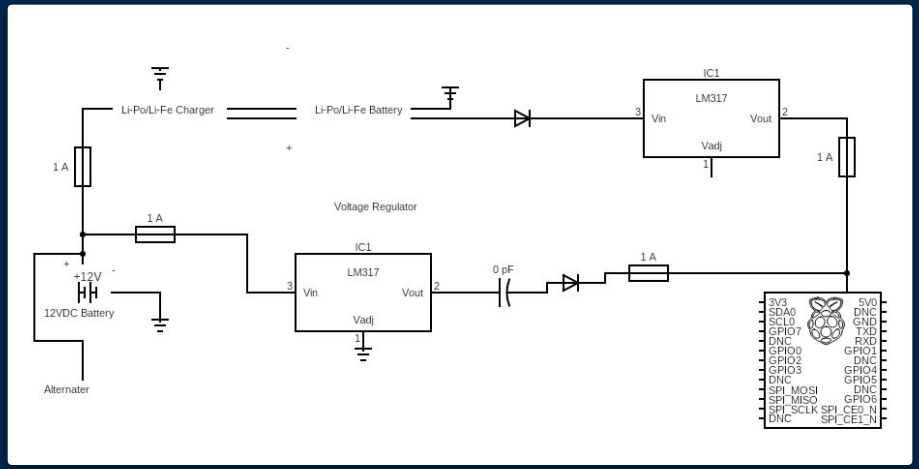
THE MVP

MVP v1 - Sponsor Provided:

Our sponsor had built out a simple circuit that relied on shore based electricity to power a SBC and charge a single battery. This solution was untenable, as the battery would last for less than 12 hours once disconnected from the hard power source

HYPOTHESIS MET: **NO**



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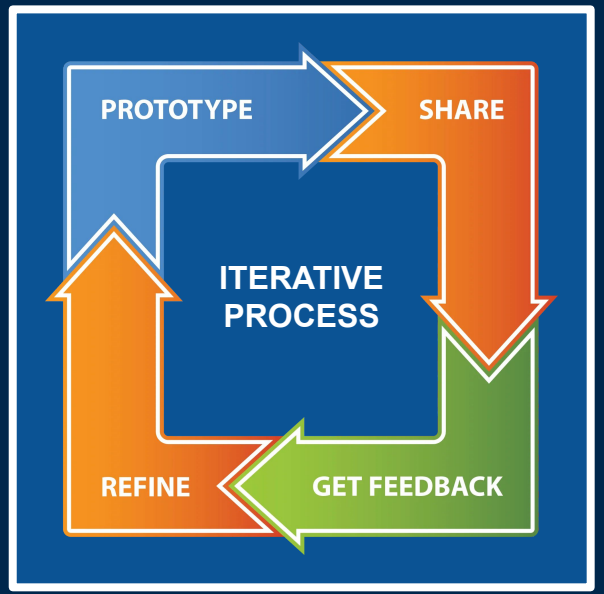
THE MVP

MVP v2 - v6:

“Wrong charging module”
“Add a capacitor”
“You need 2 regulators”
“Use a 12v bus”
“We’ve built something like this”



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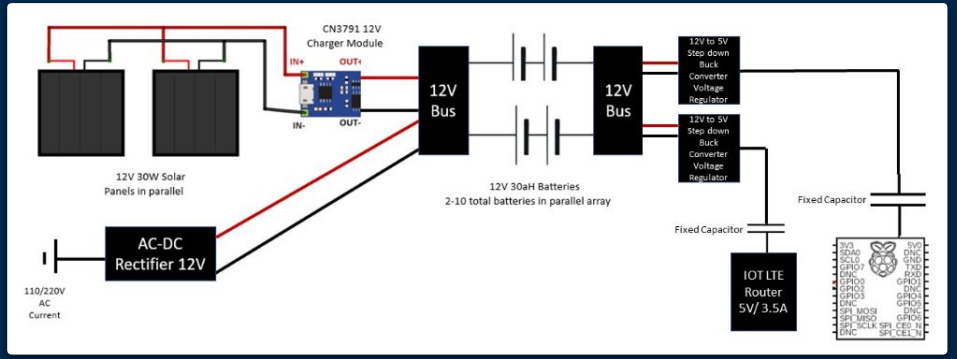
THE MVP

MVP v6:

Our final MVP was a modular solution that could accommodate an array of multiple batteries and is able to be recharged by both hard power and renewable energy sources

Total Cost: $422

HYPOTHESIS MET: **YES**



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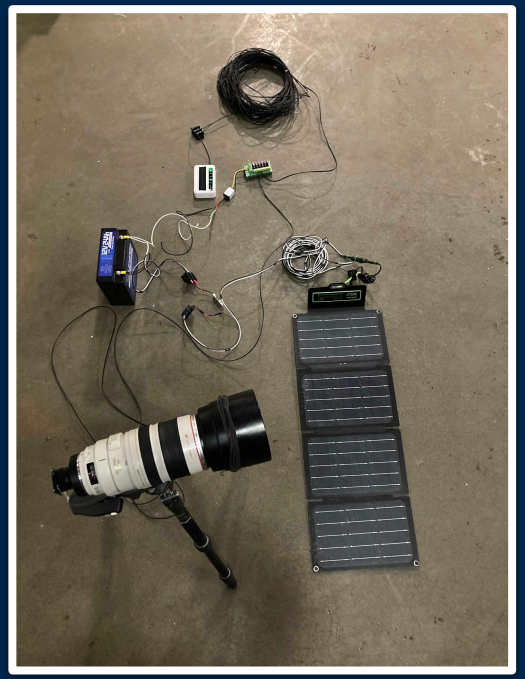

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THE TEST

The 1st Special Forces Group and its Technical Surveillance Detachment were able to field test our prototype in simulated exercises during the week of March 4th, 2022 in the Pacific Northwest

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THE FEEDBACK

“We tested the circuit and were able to leave it on its own for several days without providing land based power”

“Our group commander was super impressed with the H4D design”

“We should be able to learn from, and share this with the rest of SOF, but we can’t”

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WHERE WE ENDED UP

Were we successful?

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WHERE WE ENDED UP

Through a highly iterative process, our team produced a design that met both the needs and requirements of the 1st SFG

This design is being refined further and our Sponsor plans to field this to 1st SFG ODAs overseas

However…

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WHERE WE ENDED UP

Through our conversations with various members of the special operations community, we learned that this problem had already been solved by various other SOF commands

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WHERE WE ENDED UP

How did 1st SFG get here?

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WHERE WE ENDED UP

Our problem was actually a symptom of larger issues

Collaboration amongst technical experts and problem solvers within the SOF community and the private sector is hindered through overclassification and poor usage/design of communicative tools

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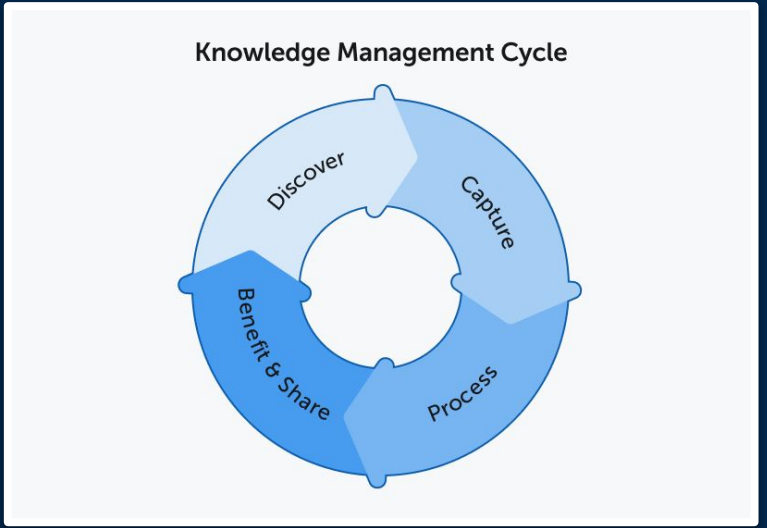
THE OVERARCHING PROBLEM

SOCOM and its subordinate commands lack knowledge sharing and management tools to solve technical and tactical problems across the broader special operations community



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RECOMMENDED NEXT STEPS

Our design should be further refined, fielded, and deployed to ODAs

However, we believe that the most prudent investment opportunity would be a knowledge storage and sharing tool that can facilitate better collaboration amongst members of the SOF community

QUESTIONS