TurtleTech Sprint 1

Embry Riddle Aeronautical University Senior Design – Spring 2023

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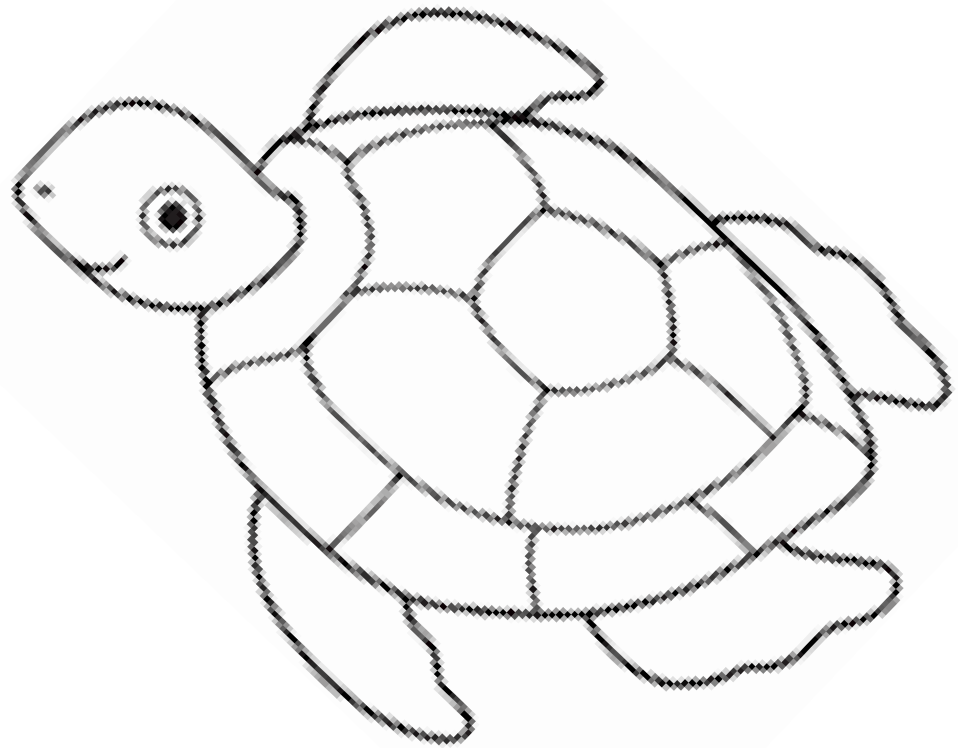
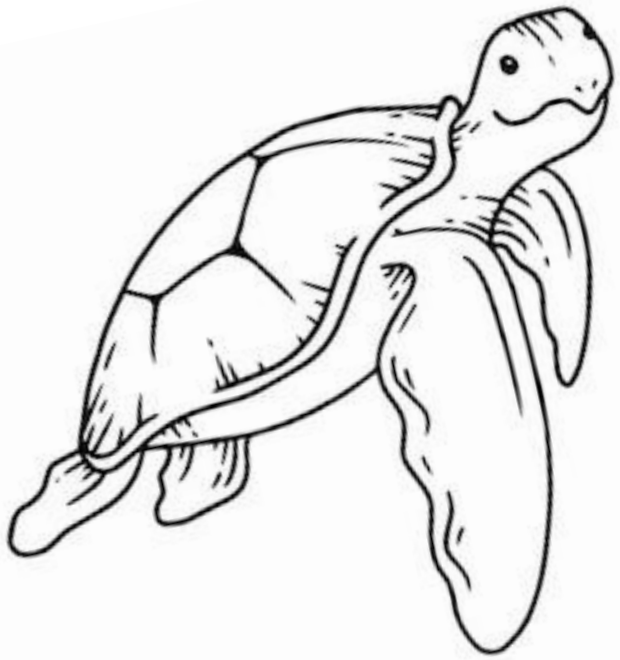
Vision

Our goal is to maintain functionality of the neural network software and hardware payload, while creating a framework and instructions to transition the payload between several UAVs to increase the ease of deployment of the system.





Retrospective & Goals

- Switched the focus of group from software to more hardware
- The goal is to make the payload more adaptable for additional UAVs in future missions
- Adding electrical infrastructure to make payload easier to use for pilots
- Creating documentation to streamline the process of getting started on working on the AI for future groups

Sprint Outlook

1

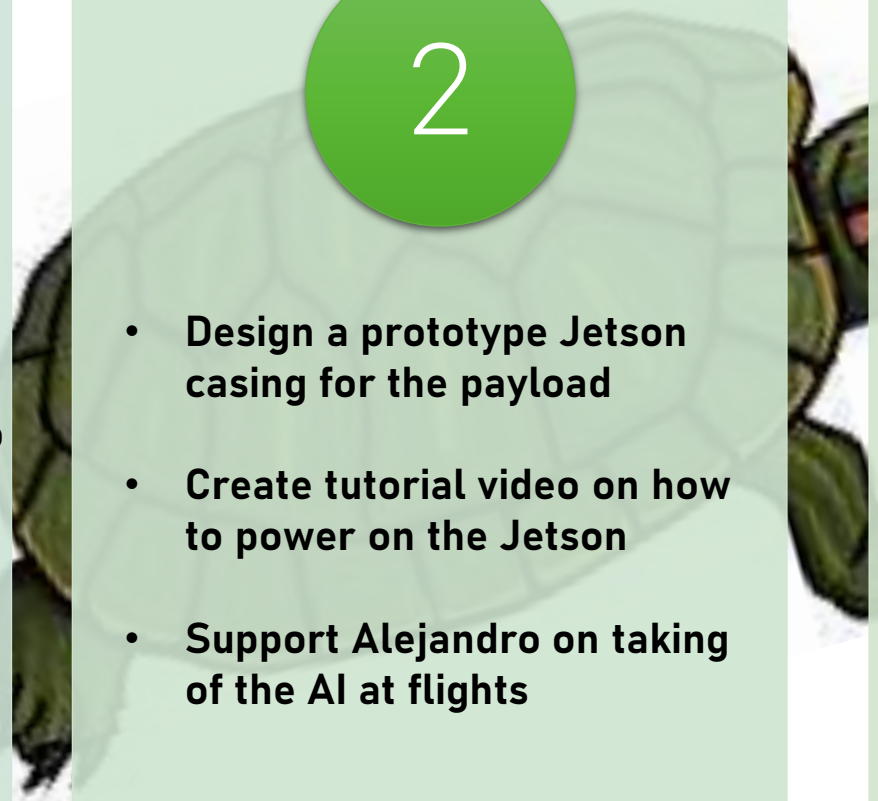
- Get everyone on the same page
- Create documentation on how to start up the Jetson Nano
- Learn inventor and start brainstorming ideas on Jetson casing

2

- Design a prototype Jetson casing for the payload
- Create tutorial video on how to power on the Jetson
- Support Alejandro on taking of the AI at flights

3

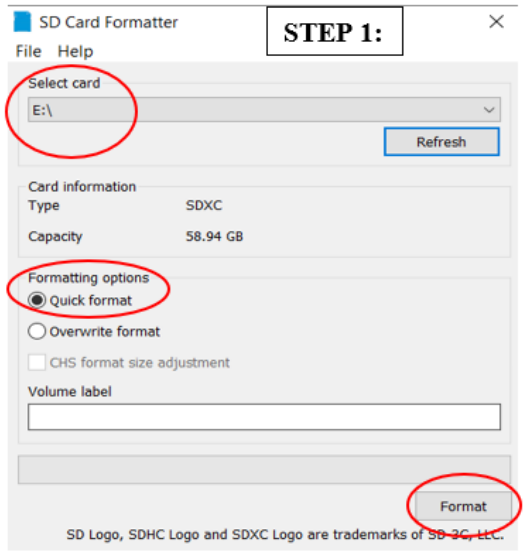
- 3D print Jetson nano casing
- Continue support on AI payload
- Test casing for durability and practicality

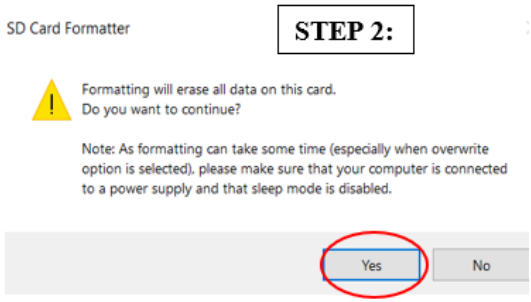


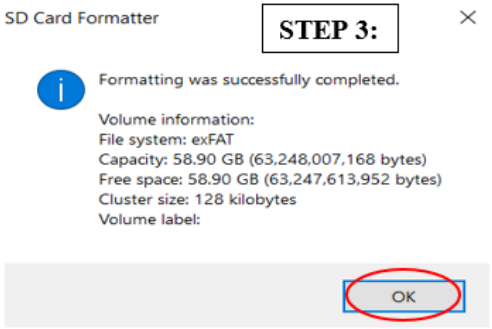
How to Set up and turn on Jetson Nano

Before being able to work with the Jetson you will need to format the SD card. This will walk you through everything you will need to do to get your Jetson Nano Developer Kit up and running.

1. Launch the memory card formatter (not on a school computer).
2. Select the card drive.
3. Select quick format.
4. Do nothing to the volume label.
5. Click format and then yes.
6. Press ok



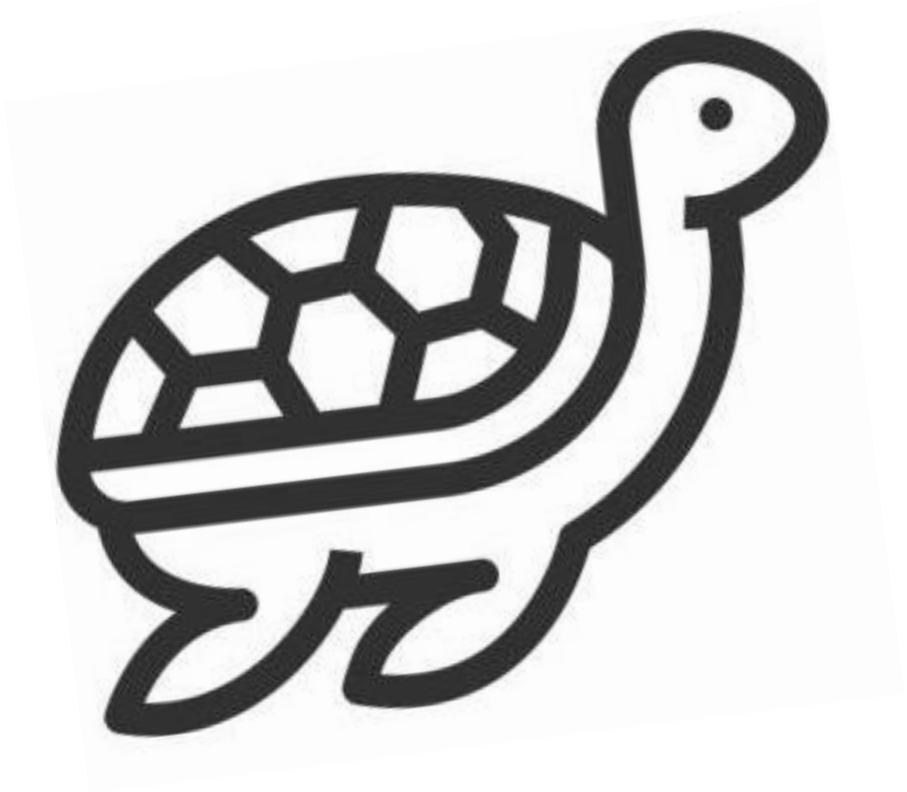


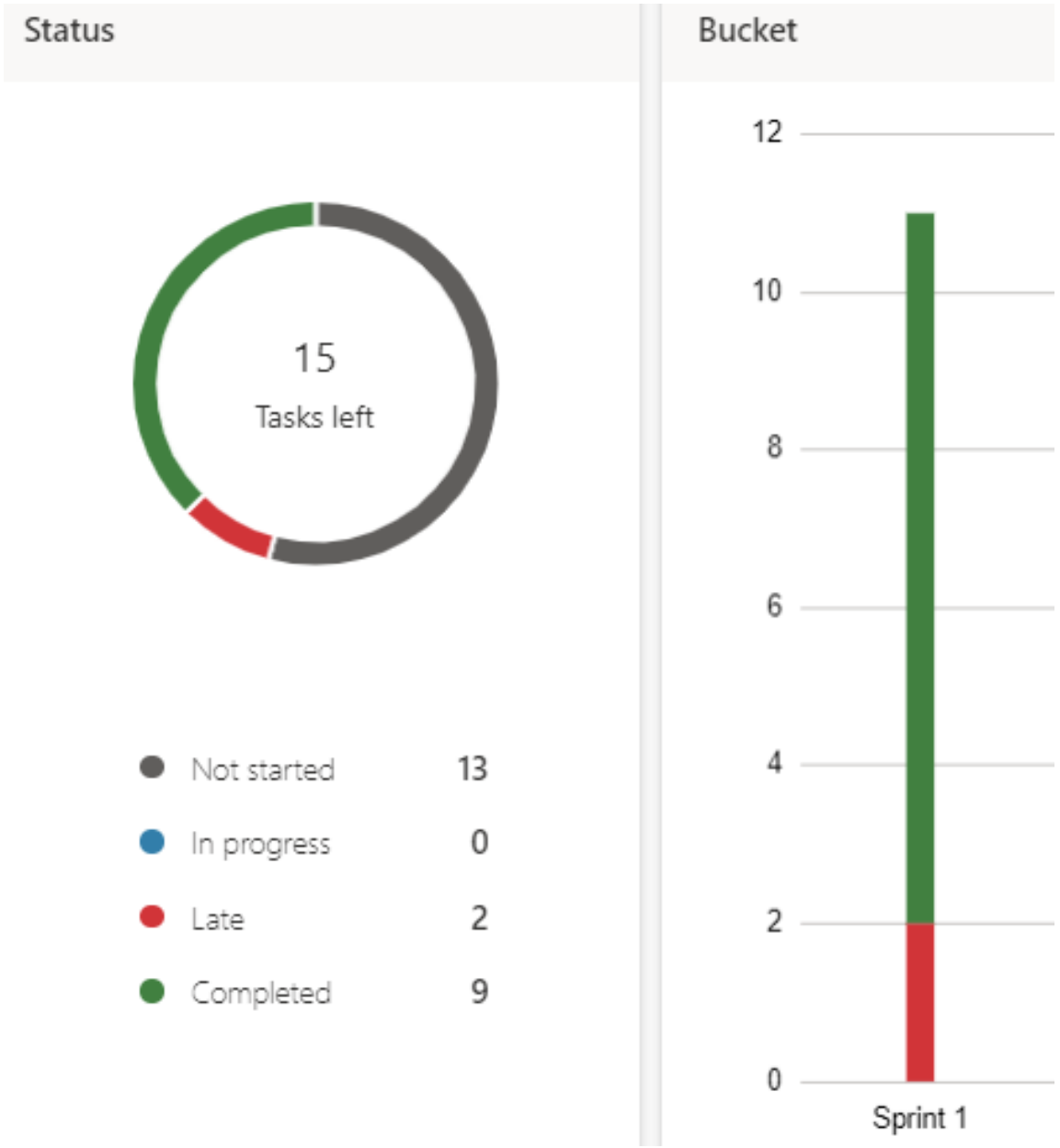


Accomplishments this Sprint

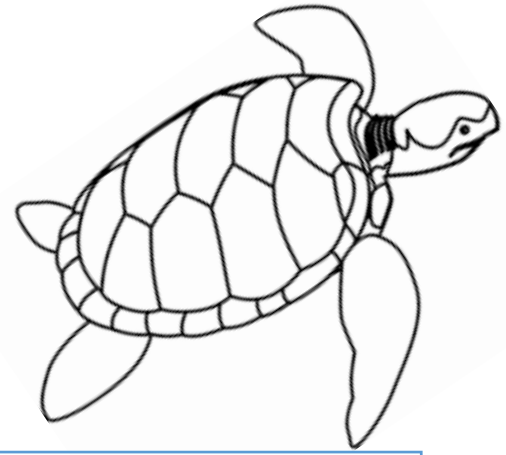
- Created documentation on how to start up the Jetson Nano
- Started using inventor to design frameworks to make the payload more mobile

Burndown Chart





Aspects of System Design



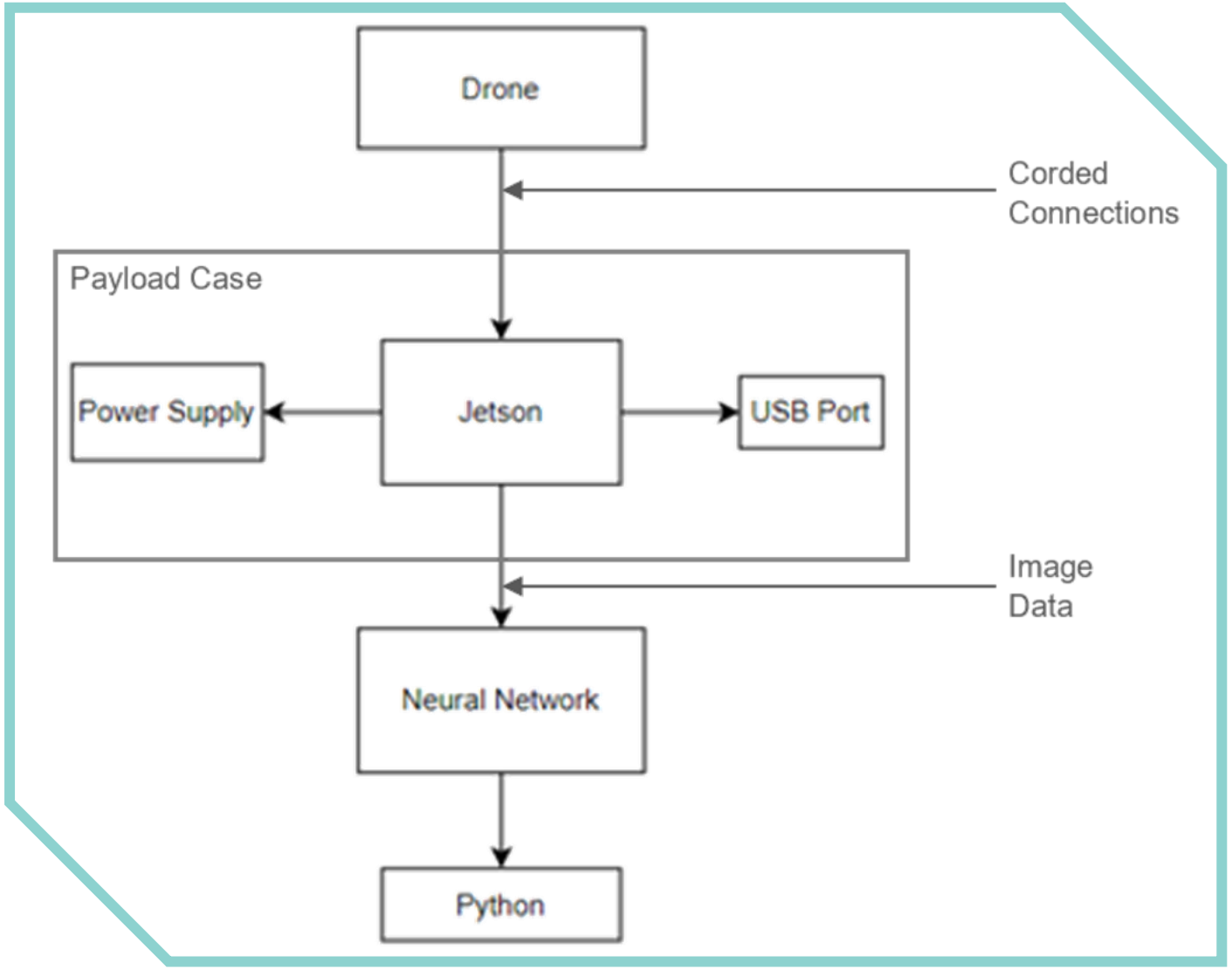
General Constraints

- The framework we design contains all necessary payload components
- The framework must be able to be design on the available tools, and must fall within the limits of our manufacturing methods (Fused Deposition Modeling)

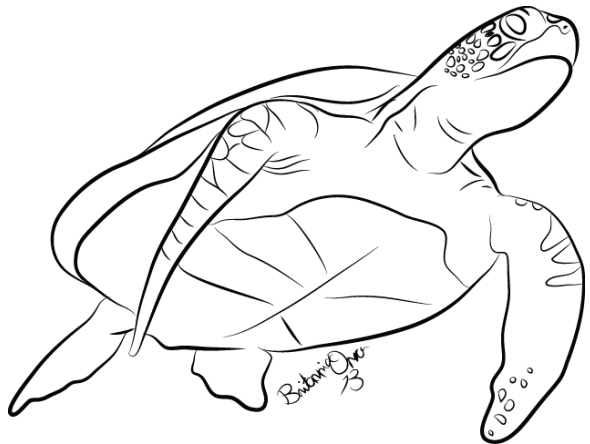
Design Considerations

- The current Censys payload bay has specific manufacture standards for the payload bay, meaning modifications from the original casing are limited
- Thus, the design must be pratical and comply with manufacture standards

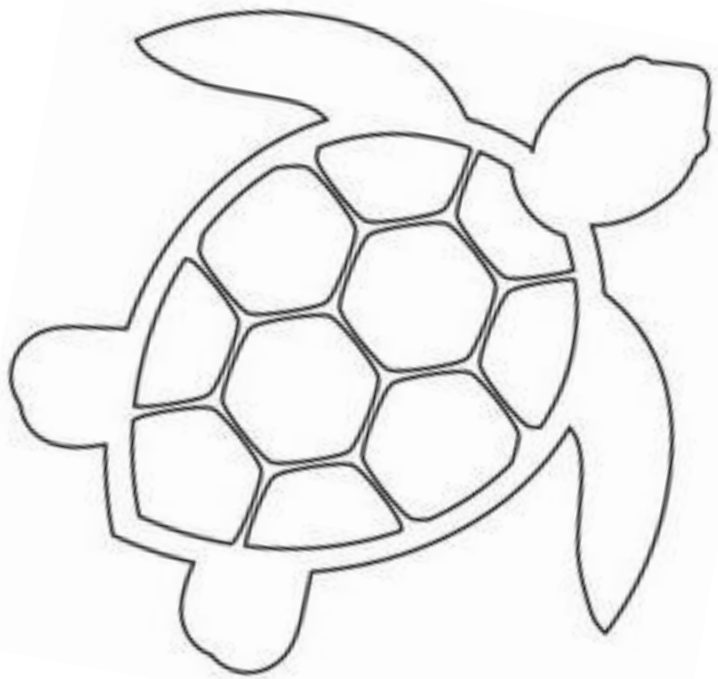
System Architecture



- The system is outlined in our new Jetson Directives, and power/data transfer remains the same.
- The payload case will ease access to external connections, making transfer of the Jetson into the UAV chassis more streamlined.



Subsystems Overview



Jetson Directives

Optimize the deployment time of the Jetson system for current and future flights.

Payload Swap Framework

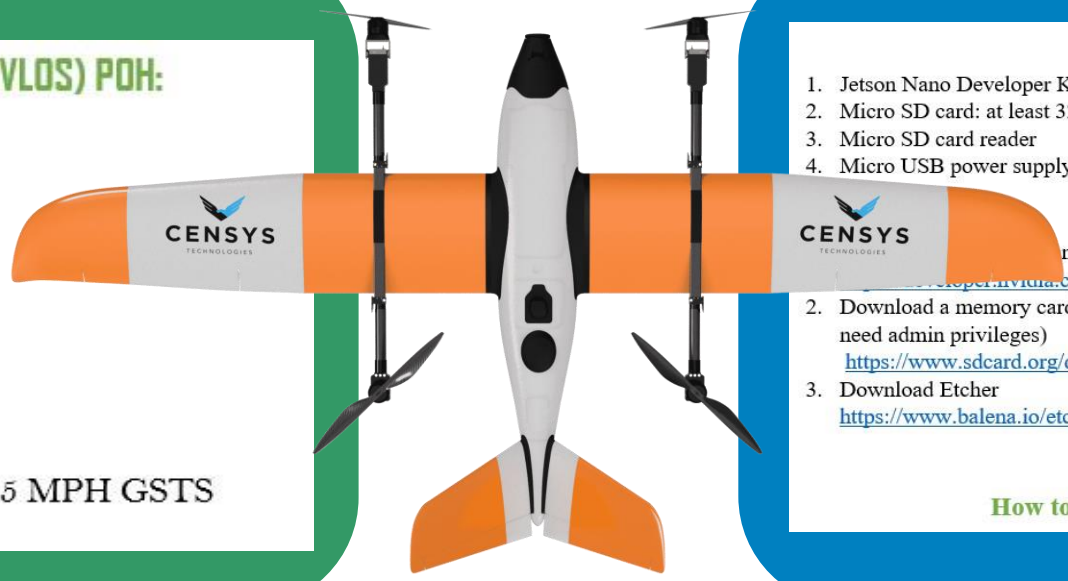
We intend to speed the transition of the software payload into UAVs for flight testing.

Subsystem Jetson Directives

Sentaero POH

Sentaero Beyond Visual Line of Sight (BVLOS) POH:

- Wingspan: 90.5 in
- Max Range 55 miles
- Max flight Time: 1.2 hours
- Max Cruise Speed: 45 MPH
- Empty Weight: 18 LBS
- Launch/Recovery: VTOL
- Payloads: Field-swappable
- Max Winds: 20 MPH SUST/25 MPH GSTS



Jetson Nano Tutorial

Items Needed

1. Jetson Nano Developer Kit
2. Micro SD card: at least 32 GB
3. Micro SD card reader
4. Micro USB power supply: 5V = 2A

Applications Needed:

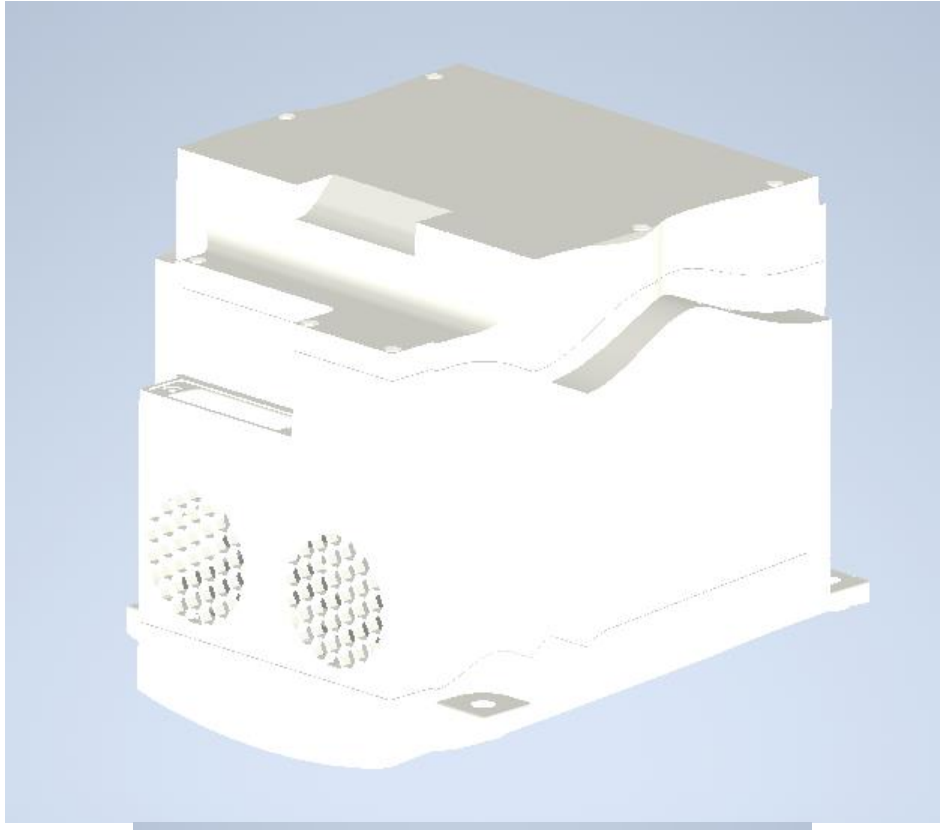
no Developer Kit SD Card Image.
com/jetson-nano-sd-card-image

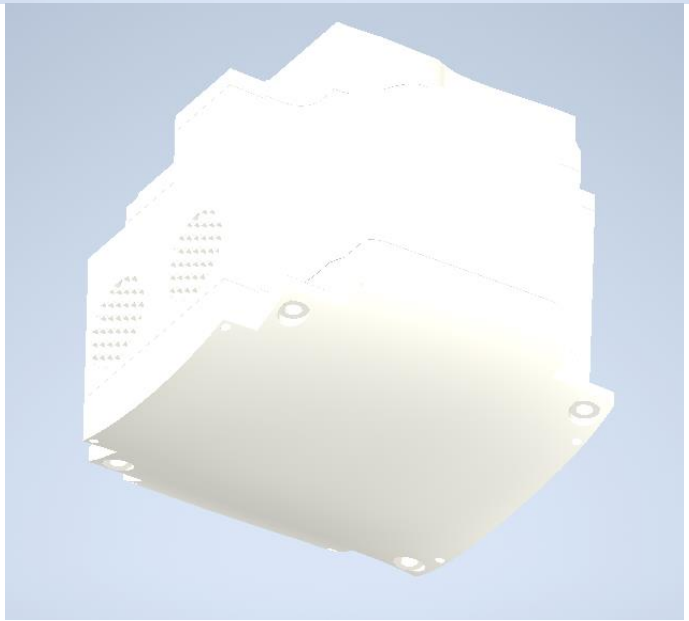
2. Download a memory card formatter (note this cannot be done on school computer as you need admin privileges)
   https://www.sdcard.org/downloads/formatter_4/eula_windows/
3. Download Etcher
   https://www.balena.io/etcher

How to Set up and turn on Jetson Nano

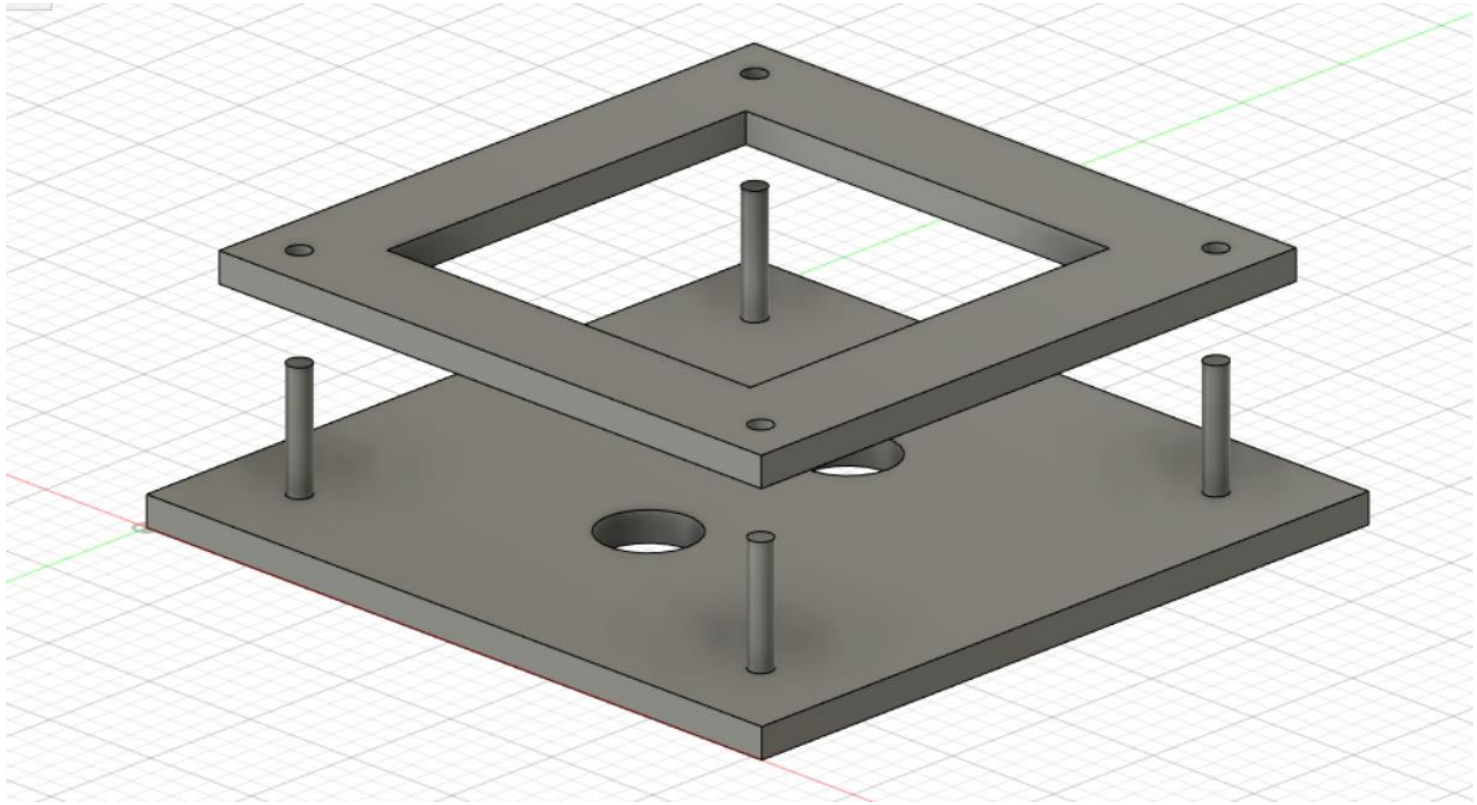
Subsystem Payload Swap Framework

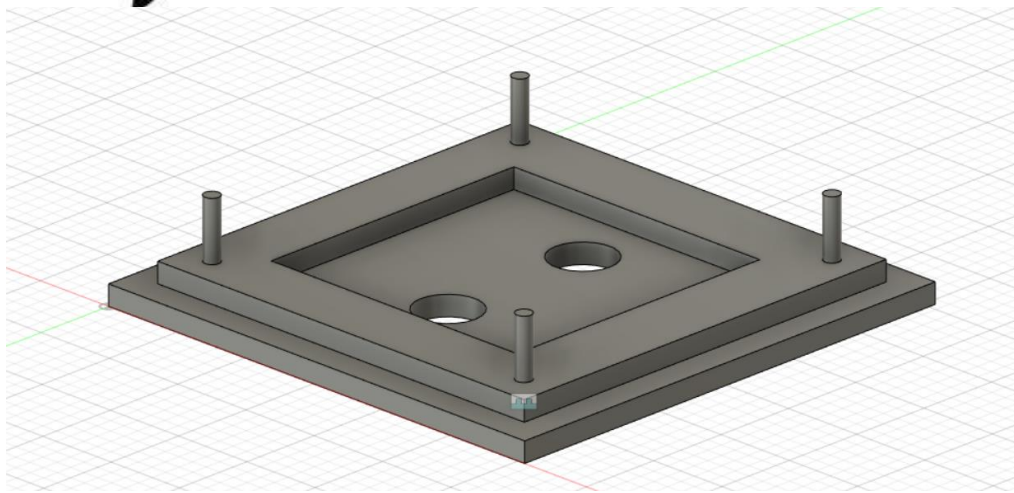
- For rapid transition of the payload into UAVs, we need a containment unit or case
- We've brainstormed some 3D models for this case
- Our team is learning Inventor to design those models for manufacturing



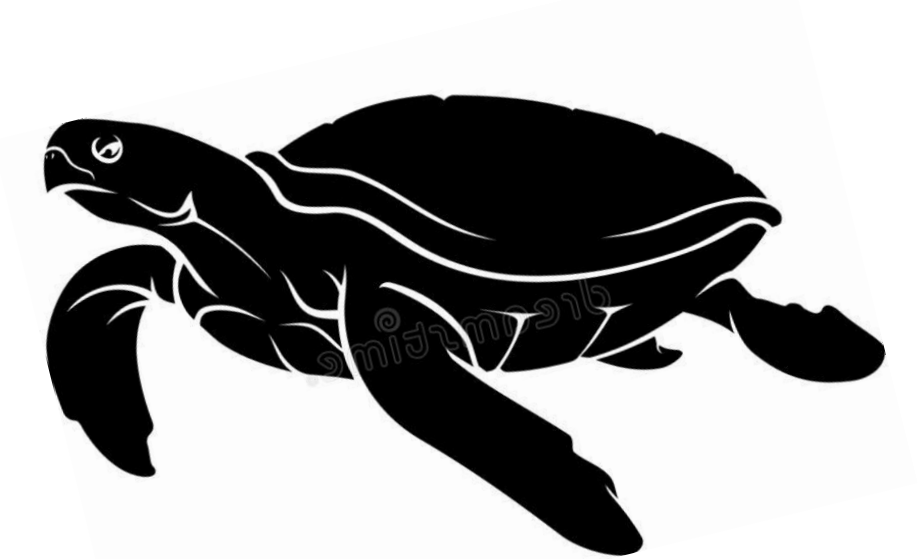


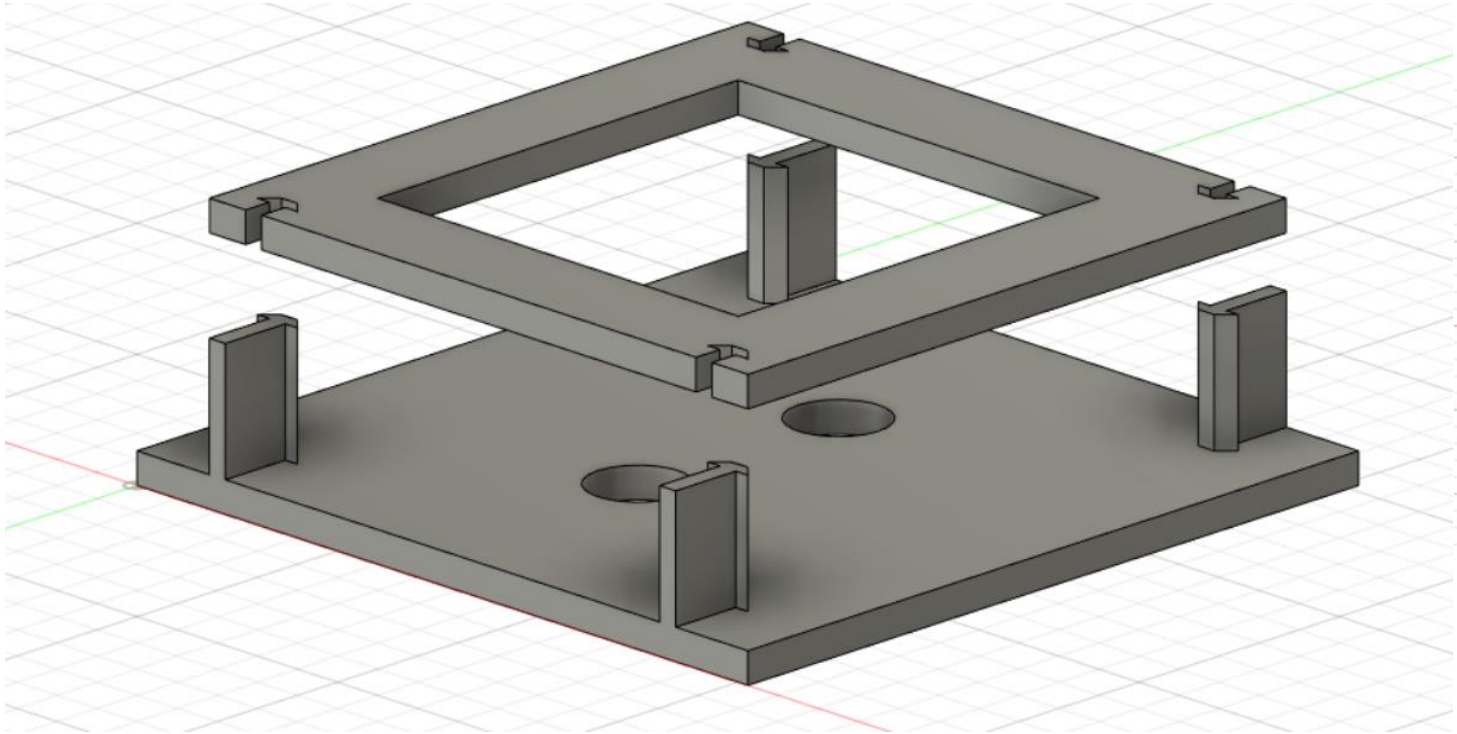
Mounting Concept 1

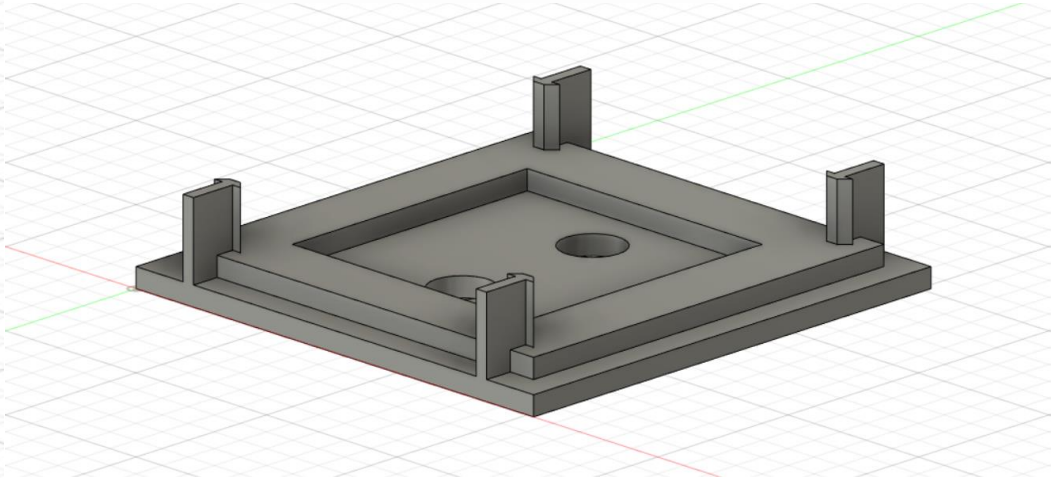




Mounting Concept 2







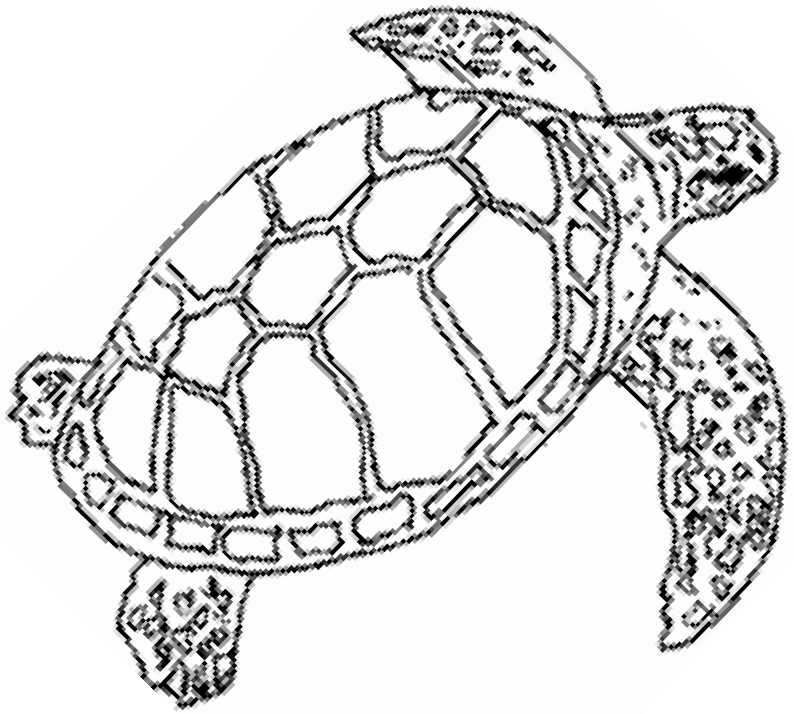
Interface & Exports

Current design set is run on Windows machines

Instruction set will assist in starting up software/hardware on the Jetson

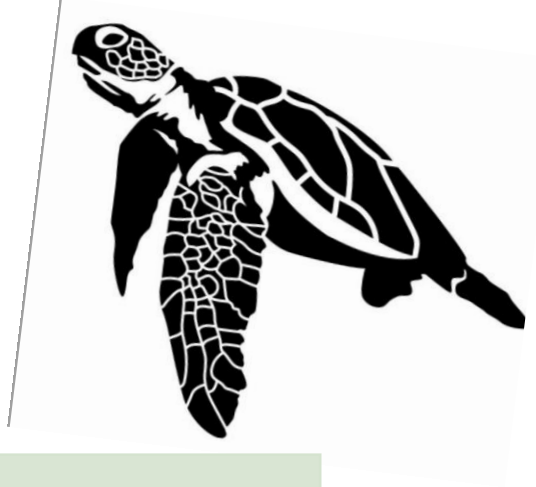
Exports will be functional to run on the Jetson that can be operated on multiple UAVs

Lessons Learned



- Hardware restrictions to run design software
- Limitations of resources available on Jetson hardware
- Reaching out to knowledgeable sources for information about standard operations

Next Steps



1

Tutorial Video

2

Design a prototype model of the Jetson case

3

Attend a flight to shadow Alejandro


QUESTIONS?