RATIONALE: Include a brief synopsis of the background that supports your research problem and explain why this research is

important and if applicable, explain any societal impact of your research.

RESEARCH QUESTION(S), HYPOTHESIS(ES), ENGINEERING GOAL(S), EXPECTED OUTCOMES: How is this based on the

rationale described above?

Describe the following in detail:

• Procedures: Detail all procedures and experimental design including methods for data collection, and when applicable, the

source of data used. Describe only your project. Do not include work done by mentor or others. If you will use published

surveys, questionnaires or tests, describe how you obtained these, including required permission if applicable.

• Risk and Safety: Identify any potential risks and safety precautions needed.

• Data Analysis: Describe the procedures you will use to analyze the data/results.

d. BIBLIOGRAPHY: List major references (e.g. science journal articles, books, internet sites) from your literature review.

If you plan to use vertebrate animals, one of these references must be an animal care reference.

**Rationale**

Dragonfly is a mission to send instruments to Titan which is one of Saturn’s moons. The goal of this mission is to investigate the signs of water-based or hydro-carbon-based pre-life chemistry on Titan because the chemistry on Titan is similar to the chemistry on Earth. The surface of titan contains methane lakes and rivers while the subsurface is believed to contain an ocean of liquid water. Dragonfly will study the properties of this surface and the atmosphere on Titan.

The spacecraft sends down data in the form of CCSDS packets which contain binary data that can be interpreted by scientists but sending down data can take a long amount of time because of the size of the packets and the distance the spacecraft is from Earth. Instead of waiting for this data, if scientists utilize a python interpreter implemented on the spacecraft they will be able to access the data faster and more efficiently. Scientists could send up their python code to the spacecraft to explore data and decide what data they need to increase the amount of relevant data brought down.

**Research Question**

Is it feasible to place a python language interpreter on NASA’s Project Dragonfly?

**Hypothesis**

It is feasible to place a python language interpreter on NASA’s Project Dragonfly.

**Engineering Goals**

The goal is to increase data rates and allow easier access to data for scientists that want to observe it. Improving the data rate can allow scientists to choose the data that is necessary for their research and bring only that data down which permits for the data to be brought down faster.

**Expected Outcomes**

We expect the project to be feasible and for the python interpreter to work on the space system on Dragonfly.

**Procedures**

~~By using Python to read binary files, the CCSDS packets can be classified and put onto a software bus. The software bus allows the file to be put into a place where scientists can access it. The CCSDS packets are comprised of a header which contains important information for classifying the packet. Python scripts can be used to read this CCSDS header and sort the information used to understand the data inside which is written in binary.~~

We will implement a python library that is compatible with the software architecture of the Dragonfly spacecraft to read the CCSDS Space Protocol Packet through the use of python scripts. These packets can then be put onto a software bus that allows it to be ~~accessed by multiple scientists~~ recorded down to Earth communications. We will attempt to demonstrate the feasibility of the project by making the python interpreter work on the hardware that is necessary and proving the data processing used by the python program is good enough to be useful for the Dragonfly mission.

**Risk and Safety**

There are no identifiable risks to the project.

**Data Analysis**

This is a feasibility study which means that the possibility of the project working is observed. With each step of the process it can be determined whether the research is feasible because as the project progresses it means it is working. Overall, by proving that the spacecraft benefits from using a python interpreter, the project would be determined to be feasible.