

Mission Assurance Engineer Take Home Assignment



Overview: This is an assignment meant to evaluate your understanding of spacecraft design, space flight regulatory compliance, and your ability to research a specific problem set. You may use any resources available to you to answer this prompt, however, you should have a strong understanding of your solution. Your answer should be in a written long form memo and a block diagram, submitted as a PDF.

The prompt is intentionally lacking in specific details. It's up to you to make assumptions and choose from options of your choice when necessary. You should explain your assumptions and decisions.

When finished, please send the PDF via email to Chanel Ross, chanel@astroforge.io.

Prompt:

Design a deep space asteroid exploration vehicle using entirely commercially off the shelf parts that meets the objectives below. The objective of this hypothetical spacecraft is to reach an asteroid and gather scientifically relevant data from a payload suite to be specified by you. Discuss why you selected this payload and what data will be collected.

The spacecraft will consist of the subsystems listed below. Please create a high level block diagram showing power and data distribution across the spacecraft. Describe your rationale for selecting each component on the vehicle. Discuss the regulatory requirements to launch your spacecraft. Discuss how the spacecraft operates. Provide a mass budget of your spacecraft.

Do not worry about financial cost or material availability/component lead times. Only focus on the performance of the components per the specifications.

Spacecraft Components

- Power Generation, Storage, Management, and Distribution
 - Solar Panels
 - Batteries
 - Power Conditioning Unit
- Avionics
 - Flight Computer
 - Memory Storage
 - Peripheral IO
- Guidance, Navigation, and Control Systems
 - Attitude Sensors
 - Attitude Actuators
 - Propulsion Systems
- Communication Systems
 - Radio (or LaserComm)
 - Antenna
- Structures
 - Launch Vehicle Interface
 - Thermal Control Systems
- Payload
 - Up to you
- Ground Infrastructure
 - Ground Stations
 - Mission Operations Systems

Mission Objectives

- The spacecraft shall operate in a heliocentric orbit between 0.7AU and 1.2AU from the sun.
- The spacecraft shall be equipped with at least 5,000m/s dV capability.
- The spacecraft shall communicate with Earth at distances exceeding 20,000,000km from Earth.
- The spacecraft shall collect scientific data from a target asteroid.

Bonus

- Define spacecraft operating modes and develop a power budget for the mission
- Develop a link budget for data downlink at various mission distances
- Develop the launch and early orbit plans (LEOP).