

Avionics Specialist Challenge Question

Thank you for your interest in SpaceRyde. The following challenge is designed to assess your technical competency in a particular domain. Please return a complete solution within 5 days of receipt. Do not spend more than 10 hours on this challenge.

Problem

You are tasked with proposing a preliminary avionics architecture for a **balloon-based orbital launch vehicle**. The system is comprised of a rocket suspended below a balloon filled with lighter than air gas. You may **ignore thermal considerations**.

Rocket avionics cannot exceed **15 kg** (excluding structure) and are responsible for the following purposes:

- On-board guidance, navigation, and control of the launch vehicle
 - This includes communication with engine control computers and control of attitude thruster valves
- Telemetry transmission, command, and data handling throughout the flight
- Energy storage and distribution
- Intra-vehicle networking and relay of information and commands
- Must be robust to any radiation event which could cause a computer error or shutdown during flight
- Must operate for at least 5 hours after launch

Using the information provided above, complete the following steps:

Propose an avionics subsystem block diagram indicating all major instruments, power systems, computers, and other devices required.

- Indicate how they will interact such as power distribution and communication protocols to be used.
- Indicate how the overall system is fault tolerant to radiation events and/or sensor malfunctions in your computer architecture. How does the system decide if the output from one or multiple computers is correct?
- Develop rough mass and power budgets for the proposed system.

[BONUS]: Include a brief note for a future detailed design with examples of what commercial parts could be used throughout the rocket avionics such as on-board computers, batteries, transceivers, etc.).

[BONUS]: If there are certain sections of the design with black-boxed digital circuit components that follow a certain logic, indicate (in a truth table) what the logic of those systems are, write code, or design a digital circuit to execute the logic.