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## 16.851 - SATELLITE ENGINEERING MEMORANDUM

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**TO:** 16.851 FACULTY  
**FROM:** STUDENTS  
**SUBJECT:** PROBLEM SET #4 QUESTION DEFINITION  
**DATE:** 6/21/2004

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**Subject:** Telemetry, Communications, and Power

**Motivation:** A satellite being able to communicate with the ground station is an essential part of the spacecraft mission. The telemetry, communication, and power subsystem collectively establish the satellite's communication link. Various design parameters of Telemetry and Communication impose requirements on the Power subsystem. We will therefore create a tool that aids in making design decisions about optimum frequency and optimum data rate requirements.

**Problem Statement:** Determine the optimum communication frequency and optimum data rate that minimizes the combined mass requirements of telemetry, communications, and power subsystems.

**Approach:**

We will perform the following trade-offs:

1. Given frequencies and data rates calculate transmitter power required. Assuming a particular power system, derive total power subsystem mass associated with the required power output. Choose antenna type and size to minimize power required.
2. Assuming a particular power system, derive total power subsystem mass associated with the required power output. Choose the optimum power subsystem that minimizes mass.
3. Given coverage duration and varying data rates determine the mass of the data storage components. Choose data rate that minimizes mass.

Some of the intermediate steps in our study will be:

- Choose a particular power system and determine relationship between power output and power mass.
- Given a particular data mass storage technology that is space-ready, determine the relationship between data storage capacity and its mass.