**ESA wants to extend a mission lifetime to three years more:**

**Could you explain to the technical Officer what the impact would be?**

**Could your design absorb it?**

increase of battery life, increase the size of the solar array and lenses, improve solar panels + electronic parts because of degradation, degradation ~ years

**ESA wants to modify the orbit characteristics.**

**Could you please explain to the technical Officer what the impact would be?**

**Could your design absorb it?**

more fuel needed but for the ROCKETS (if it’s a higher orbit), difference in fuel in the satellite is negligible, more area for solar panels, could also affect the batteries

**Number of cycles of your batteries**

**-How many number of cycles?**

Nº cycles = (duración de la misión) / T\_órbita= 4años / Teclipse+daylight = 21374 cycles

**How do you deal with the number of cycles?**

**Justify your values for Xe and Xd**

Xe: efficiency. It’s the efficiency of the solar array during daylight periods, from solar cells to batteries/loads.

Xd: efficiency. It’s the efficiency during eclipses, when solar cells cannot provide energy, so it shall be got from the batteries to loads.

|  |  |  |
| --- | --- | --- |
| Platform | Payload | |
| Rockets | Camera infrared |
| Communication antennas | Telescope |
| Control systems | Termometer |
| Batteries | Electronic systems |
| Solar array |  |
| Sensors |  |

**Platfrom vs. Payload concepts. Provide examples about the elements/components encompassed by each of them:**

**Project Officer is challenging your applied margins. You are challenged against all the teams:**

**Objective: margins not the largest, not the shortest**

**Which is the purpose of a specification (electronic unit for a satellite)?**

For designing and development the unit. The specification contents a set of requirements to fulfill some need and to assess/guarantee the unit mission over time and environment

For the verification of the unit. The verification of every requirement in the unit must be specifically addressed

**How many times would you use it?**

The specification is used from the first day to the last one

**How requirement is born (origin from requirements)**

A specification is a contractual document

The customer pays for the requirements that needs to be fulfilled and the verification of them. A specification is a contractual document. It is part of the scope of the contract

The customer establishes the intended purpose of a product, its associated constraints and environment, the operational and performances features.

**Wording and meaning**

**- DOD (Depth of Discharge)** the ratio of the Ampere-hours removed from a battery for a defined charge voltage current profile, discharge load profile and temperature profile of the battery rated capacity E(Ah)\*100 (%)

**-DAYLIGHT -->** part of the orbit where the satellite is exposed to solar light

**- CDMU --> (Command & data handling Management Unit)** On Board Computer of the satellite avionic sub-system

**- lifetime -->** duration of the mission

**Please stand the subsystem for each one of the concepts (unit or part): Thermistor, OBC, Battery Charge Regulator, Antennas**

Thermistor -> Thermal control system, OBC -> Data handling, Battery Charge Regulator -> Power subsystem, Antennas -> Telemetry

**Interactions with thermal Subsystem**

**Being the Power Subsystem Designer, you are in chrge of providing some inputs to the Thermal Subsystem responsible. Name 3 items you should agree with the thermal control system designer.**

Range of temperature of the batteries Li-ion and solar cells, Efficiency of the solar cells (will decrease as temperature increases)**,** PCDU

**Please state the subsysstem for each one of the concepts to a system**

Bus voltage regulation --> power subsystem, AOCS SW --> AOCS Subsystem, Heater --> thermal system, Time Synchronization --> Data handling, mass memory -> data handling, li-ion batteries -> power subsystem, FDIR (Failure, detection isolation, and recovery) -> telemetry tracking and control, Thruster -> propulsion subsystem

**True or false:**

Telemetry and housekeeping are about the same **(F)**

The solar pannels must be sized for the maximum power consumption during daylight **(F)**

The only unit/component requiring thermal control in the power subsystem is the batteries **(F)**

Science data (bulky data) is hosted along the memory provisions both in the payload and platform units **(F)**

Telemetry and housekeeping are about the same **(F)**

Batteries are only used during eclipse periods **(F)**

Solar power can be modeled by a current source **(T)**

The data handling subsystem will host the SW implementing the AOCS algorithm **(T)** although it hosts AOCS SW, the AOCS itself is not part of the system

Mass memory is in charge of data storage **(T)** 🡪 mass memory is primary storage of science instrument data

The specification is used along the complete development of the equipment (until verification) **(F)** --> The specification is uses from the first day to the last one

Enviromental requirements are regarding clean space aspects **(F)** 🡪 tiene que ver con temperatura, free space and dust or radiation

Regulation performance is required in a power bus to avoid uninterrupted power supply to the load: wrong because we want uninterrupted power

Data Handling Subsystem will distribute the commands received from Earth towards the satellite equipment **(T)**

Satellite operation is complex and involves both on-ground resources as onboard resources **(T)**

**Which is the difference between primary power source and secondary power source?**

Primary sources -> convert solar, nuclear, or chemical energy into electrical power. It is used for average energy demand.

Secondary sources -> serve as energy storage to supply the power when primary sources are not available or insufficient (capacitors, batteries (most common), regenerative fuel cells). It is used when there is an energy peak demand.

**ESA Team is impressed with the engineering team and want some advice over their next mission to mars (2 years long)**

SOLAR PHOTOVOLTAIC (due to the short term)

**List and sort the differnces between a power supply used and designed for laboratory instrumentation (ground) and one used in space**

Space: no hay mantenimiento, fiabiidad alta, entornos fisicos duros (termicos, radiaccion etc…)

**Question about the requirements for a cell phone**

Put an example of functional requirement: bandwith/camara

An example of IF(interface) requirement: ports

An example of configuration requirement: design (ej posicion del adaptador de volumen)

**ESA Team is impressed with your engineering team and wants some consultancy advice over the first interplanetary mission. This is a 10-year mission and deep space. Which sort of primary power supply would you use?**

Radioisotope, because is a long mission and the degradation is low. The mission is in deep space and there’s no sun available.

**Why the design (process or equipment) of a space application computer is different, than one to be used at home?a**