SCR/SRR Expectations

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System Concept Review (SCR)

Expectations and Deliverables

SCR: Potential Topics of Discussions

- What is the experiment you want to conduct in space?
- What data product will be delivered from this mission?
- Why are you interested in this experiment?
- Who is your customer?
- Can this experiment realistically be done on-orbit?
- Is there value in the science of this mission?
- Has the experiment been done before?
- Why does this experiment need to be done in space?
- What is the relevance / contribution?

SCR: What are we looking for?

- Understanding of science objectives
- Good Concept Development
- Good Experiment Plan
- Goal is to have a mission concept that has a clear understanding of how it is going to be accomplished.
  - How the science and data is going to be collected
  - What can you realistically do
  - Critical mission geometry

Mission Design Document *(Users Guide 8.2.4)*

Mission Overview

- High level intro to the mission and supporting satellite system, and includes mission objectives, minimum/full success criteria, and a discussion on military relevance.

Experiment Plan

- Addresses what experiment(s) the satellite will perform. Not a step-by-step procedure.

Concept of Operation (CONOPS)

- Step-by-step procedure and timeline of spacecraft operations. Describes modes of the system.

SCR Deliverables

MISSION DESIGN DOCUMENTS

SCHEDULE

POWERPOINT PRESENTATION

PROTECTION PLAN (RECOMMENDED)

Due a week before your scheduled SCR.

System Requirements Review (SRR)

Expectations and Deliverables

SRR: What are we looking for?

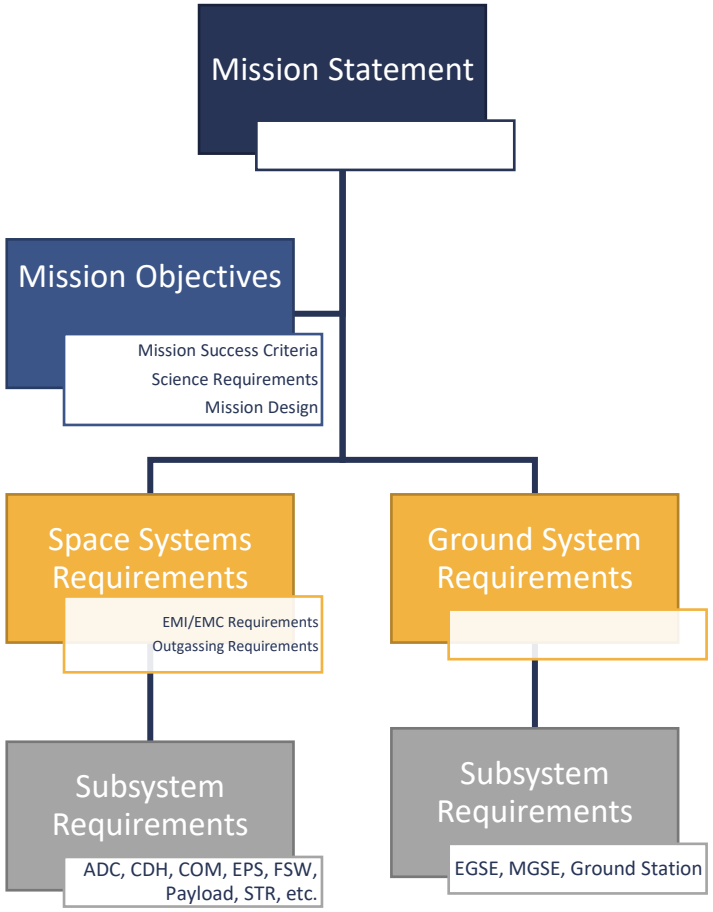
- Understand how subsystems support the higher-level requirements and mission objectives.
  - Clear path to verifying those requirements.
- Requirements are easy-to-understand statements that express clear needs of the satellite for it to achieve its mission.
  - Must be verifiable, preferably quantifiable
  - Writing requirements is an iterative process
  - Refer to *2.1.2 Requirements Development*
- Next week's EATs on SE II will go into more detail.

- Requirements:

✓ Flow down from the Mission Objectives

✓ Inherited from Control Documents (UGs)

✓ Constraints



SRR: Requirement Verification Matrix (RVM)

- Main focus of this review
  - Requirements will drive your entire design.
  - Focus on mission-specific requirements, proper flow down, analysis/justification behind requirements, and path to verification.
  - UNP-levied requirements should be included but need minimum attention at SRR.
    - Unless you have specific questions/concerns.
  - Include and address relevant constraints as well
    - Constraints can be programmatic, mission, hardware, or even form factor
  - Refer to the User Guide for more details on RVM deliverable expectations.

Number	Requirement	Source	Verification Method	Status	Verification Document
COM-1	There shall be a minimum of 6dB margin in the telecommunications link analysis both for the uplink and the downlink at 10-degree elevation mask.	UNP11-77	Inspection	Incomplete	CSD ICD
ADCS-1	The satellite shall be capable of three-axis stabilization.	MO-2	Analysis	Incomplete	ADCS-D-001

How do science requirement trickle down through the RVM?

Mission Statement (simplified)

- Want to have a better understanding of atmospheric density.

How can this be fulfilled?

- Potentially through a neutral mass spectrometer.
- You find that to fully characterize the atmosphere; you calculate that data needs to be collected for at least 100 orbits within 400 – 500 km.

Through this process it has been determined:

- Orbit lifetime and preferred altitude

The purpose of the satellite is to fulfill the science mission, and, in this way, all subsystem requirements trickle down from the mission science.

Example Flow-Down

Mission Statement (PolarCube – past UNP mission)

- To perform high spatial-resolution, cloud-penetrating tropospheric temperature sounding and observation of sea ice/open ocean boundaries, and in doing so provide representative data inputs to tropospheric weather models applicable to severe mesoscale weather and hurricane forecasting.

Objective

- Achieve a full width half max (FWHM) spatial resolution at nadir at an altitude of 410 km approximately twice that of operational microwave temperature sounders.

Related System Requirements

- SYS-1: PolarCube shall provide brightness temperature data from an altitude of sea level to 20 km ± 3 km.
- SYS-2: PolarCube shall provide brightness temperature data with a vertical spatial resolution better than 2.5 km ± 1 km.
- SYS-5: PolarCube shall have an orbital altitude between approximately 400 km and up to 650 km (TBR).

Example (cont.)

Related Instrument Requirements

- RAD-1: MiniRad shall have an angular beam width of 2.3 degrees.
  - Drives pointing

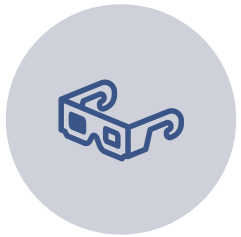
ADCS Requirements

- ADCS-1: The subsystem shall be able to point the desired payload axis along the velocity vector during Science operations to within 2.3 deg.
  - Driven by RAD-1
- ADCS-2: The subsystem shall have knowledge of the attitude to within 0.13 deg during Science operations.
  - Driven by analysis of RAD-1 + SYS-1 + SYS-2 + SYS-5
- ADCS-3: The subsystem shall point towards the sun to within .10 of a degree during science operations.
  - Driven by Power budget during science operations
- ADCS-4: The subsystem shall point the +z axis of the satellite nadir during science operations
  - Driven by instrument sensitivity to the sun

SRR Deliverables

MISSION DESIGN DOCUMENTS

SCHEDULE



RVM

PROTECTION PLAN (RECOMMENDED)

SOFTWARE DESIGN DOCUMENT

Due a week before your scheduled SRR.