DESIGN SPECIFICATION DOCUMENT (DPD)
Due: Close of Business, November 10, 2022

Requirements specify what the system must do, not what it is. Requirements describe what is needed, not what will be delivered. Requirements identify those capabilities that the customer considers essential. Without these capabilities, the customer is not interested in what you have to propose.

Working from your initial concept, you completed trade studies to weigh different design options in light of how well each one fulfills the requirements. In the DPD you will expand on the requirements in the RFP as they apply to your down-selected concept. System requirements are decomposed and allocated to the subsystems or components of the chosen concept. Requirements are much more detailed and specific than those in the RFP. Each requirement is described in a separate numbered paragraph for future reference. The purpose of the DPD is to make sure you and your customer are aligned page from the beginning of the program. Agreement from both parties is crucial to the ultimate success of the program. Be sure to check your requirements to ensure they exhibit the qualities of good SMART requirements – they are unique, unambiguous, verifiable, traceable, consistent, specific, descriptive, essential, and complete. The required content of the DPD is as follows:

- Front Matter
    - Title page
    - Abstract (summary of this document's content)
    - Table of contents
    - List of acronyms and abbreviations
    - List of figures
    - List of tables
- System Overview
    - Purpose (Why the design team is submitting this design specification document)
    - Objectives (What the system is expected to accomplish)
    - Benefits (Supported with realistic theory, facts, and data)
    - System architecture (a graphic in "cartoon form" showing the relationships between major system elements is an effective tool to help communicate the architecture)
    - Concept of operations (describe how the system is expected to perform)
- System Level Requirements
    - Include requirements that apply to the overall system as well as those that apply to the various top level architecture components
    - Discuss how the system level requirements address the system objectives
    - Discuss how the design team will verify each requirement is satisfied (test, analysis, inspection, demonstration)
    - Discuss the trade studies you have or will perform to ensure your design decisions best meet the requirements
- Subsystem requirements (repeat for each subsystem)
    - Include requirements that apply to this specific subsystem
    - Discuss the origin of each requirement. (How does each requirement contribute to the system level requirements?)

    - Discuss how the design team will verify each requirement is satisfied
    - Discuss the trade studies you have or will perform to ensure your design decisions best meet the requirements
- Conclusion
- Back Matter
    - Requirements Verification Matrix
        - Include a table that captures every requirement, the design metric(s) associated with each requirement, and the method (test, inspection, demonstration, or analysis) that you plan to use later in the program to verify each requirement is met (See example below)
    - Design team organization chart
    - Budget
        - Summarize the expected cost of the proposed project. This should be justified by allocating the overall cost to system and subsystems elements.
        - Show that the expected cost, including a management reserve, is no more than the available funds.
    - Schedule
        - Provide a Gantt chart depicting the major phases of your project over its complete lifecycle and how you will support the critical milestones of your internal and/or external customer(s).
    - Acknowledgements
    - References (document any information that didn't originate from the design team)

Example Requirements Verification Matrix:

Requirement			Design Metric	Verification Method
Number	Title	Description		
1.1	Total Mass	spacecraft dry mass ≤ 10 kg	S/C dry mass	test
1.1.1				
⋮				
2.1	Pointing Accuracy	pointing error ≤ 5 deg	azimuth error	test
2.1.1				
⋮				
3.1	Assembly Time	assembly time from storage to demonstration ready ≤ 30 min	standardized parts; modular design	demonstration; inspection
3.1.1				
⋮				

Design metrics are features of the design the engineers can control. They help distinguish one design from another.