Reducing the Cost of Spacecraft Ground Systems and Operations
Rutherford Appleton Laboratory
27-29 September, 1995

Abstract for

“Cost-Effective Space Mission Operations”

Overview:

1. Introduction to Cost-Effective Space Mission Operations
   - Dr. Wiley J. Larson, United States Air Force Academy

2. Functions Performed by Mission Operations
   - Mr. Gael Squibb, Jet Propulsion Laboratory

3. Developing a Mission Operations Concept
   - Dr. Daryl G. Boden, United States Air Force Academy

We propose the series of three presentations described above for inclusion in your symposium. These presentations are similar to those we presented last November in a plenary session at the Third International Symposium on Space Mission Operations and Ground Data Systems. Each presentation lasts 40 minutes and the presentations are designed to be given in order. The information in our presentations is extracted from a book of the same title scheduled for publication in August, 1995. Please note that since we have a book covering this topic, we will not prepare separate papers. An overview of each presentation is shown below.

I. Introduction to Cost-Effective Space Mission Operations
   - Dr. Wiley J. Larson, United States Air Force Academy

   A. Trends observed in space programs and space mission operations with emphasis on reducing cost and complexity of space mission operations.

   B. Space Mission Analysis and Design Project
      1. Improve communication within space community.
      2. Enhance education and performance of users, designers, and operators of space missions.

   C. Description of space mission concepts and space mission architectures.
      1. How we get from a mission objective to a mission concept,
      2. Description of mission elements that makeup a space mission architecture.
D. Process for developing a space mission concept with emphasis on mission operations element.

1. Determine mission objectives, mission requirements and constraints, and type of mission.
2. Develop alternative mission concepts.
3. **Identify** and perform key trades among mission elements and organizations.
5. Select a baseline mission concept.
6. Develop alternative mission operations concepts to support mission concept,
7. Develop a mission operations plan and allocate resources.
8. Assess mission utility and life-cycle costs.
9. **Iterate** and **document**.

E. Example

**IL Functions Performed by Mission Operations**
- Mr. Gael Squibb, Jet Propulsion Laboratory

A. Definition of a Mission operations System (MOS)

1. Data systems (ground and spacecraft).
2. Operations organization.

B. MOS Functions - including information required, products generated, and key considerations for each function.

1. Mission Planning
2. Activity Planning
3. Mission Control
4. Data Transport and **Delivery**
5. Navigation Planning and Analysis
6. Spacecraft Planning and Analysis
7. Payload Planning and Analysis
8. Payload Data Processing
9. Archiving and Mission Data Base
10. Systems Engineering, Integration, and Test
11. Computer and Communication Support
12. Development and Maintenance Support
13. Management

C. Relative cost of performing each **function**.
III. Developing a Mission Operations Concept
   - Dr. Daryl G. Boden, United States Air Force Academy

A. Definition of a Mission Operations Concept (MOC)

B. Information required to develop a MOC.

C. Process for developing a MOC
   1. Identify mission concept and supporting space mission architecture.
   2. Determine mission operations functions to be performed.
   3. Identify options for accomplishing functions.
   4. Perform trades for accomplishing functions.
   5. Develop operations scenarios.
   6. Develop timelines for scenarios.
   7. Determine resources needed for each scenarios.
   8. Develop data flow diagrams.
   9. Characterize the mission operations organization.
   10. Assess mission utility, complexity, and cost of operations.
   11. Identify derived requirements.

D. Contents of a MOC document.