COMMUNICATIONS AND DATA HANDLING FOR THE GSFC MODULAR SPACECRAFT

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With the objective of reducing future spacecraft cost, a great deal of effort has been spent maximizing portions of spacecraft systems that can be considered common from mission to mission and, consequently, reducing portions which must be considered mission peculiar. The common elements of our traditional spacecraft designs have been an electrical power subsystem, an attitude control subsystem and a communications and data handling subsystem. In the past, we have placed emphasis in characterizing these subsystems to accommodate a specific class of missions, and as a result, 23 sets of spacecraft subsystems have been designed and flight qualified for earth orbiting missions alone. Much of the usual non-recurring costs can be eliminated and even some of the recurring costs can be reduced by designing the common subsystems with sufficient flexibility and capability to support a variety of missions.

In support of the GSFC Modular Spacecraft development activities, a Communications and Data Handling Subsystem has been designed to fulfill the requirements of NASA's earth orbiting spacecraft programs projected through the early to mid 1980's. Major features of the design are:

1. Shuttle compatible RF, command, and telemetry needed for payload launch, on-orbit checkout and retrieval.

2. On-board distribution of commands and data acquisition through remote units interconnected via a serial multiplex data bus. A minimum of wires connecting subsystems and instruments is needed to accommodate on-orbit refurbishment of the spacecraft.

3. Application of a centralized on-board computer to provide functions such as time and data dependent execution of stored commands, attitude control law computation, power and thermal monitoring and control, TDRSS antenna pointing, and summary message generation. Through use of the OBC, a variety of missions can be supported with standard hardware configurations.

The multi-mission applicability of the subsystem provides numerous cost saving benefits. Some of these benefits are:

1. Minimum non-recurring cost.

2. Reduced recurring cost through volume buys.

3. Use of common spares.

4. Standardized ground checkout and operations - both equipment and procedures.

5. Lower cost through more extensive use of LSI.

Other cost saving benefits, which derive from the use of a centralized on-board computer, range from a reduction in special spacecraft hardware to a reduction in the salaries for operations personnel that can be realized through the application of on-board autonomy.