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SPECIFIC CONSTRUCTION TASKS

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The issue of Satellite Power System (SPS) "technical feasibility" encompasses not only the embodiment of hardware technology within viable engineering designs, but also the development of feasible operational concepts starting with the mining of resources on earth and ending with the fully constructed satellite in orbit. The evolution of this end-to-end operations analysis begins with the conceptualization of specific construction tasks. The definition of construction tasks - at least initially - must assume processes and machines somewhat analogous to those used on earth. By so doing, one can achieve a reasonable first-order basis for estimating personnel requirements, assembly rates, and material flow demands. From these data, crew sizes, construction schedules, and space logistics traffic models are developed by further analysis. In turn, the on-earth requirements for launch site warehousing and propellant storage, logistics schedules, manufacturing/production and, ultimately, basic resources evolve. Figure 1 illustrates the logic flow of these required functional analyses for both the rectenna and the satellite.

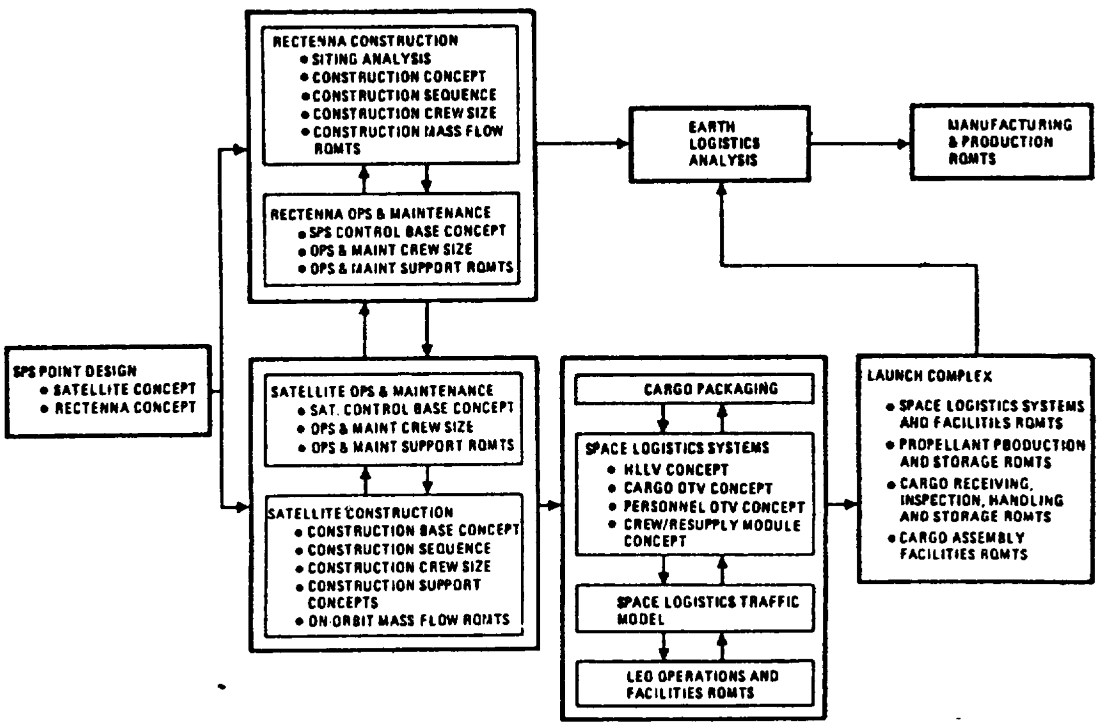

Figure 1. Major Tasks of the End-to-End Analysis

Numerous feedbacks and iterations are required in the analyses of construction tasks. In the case of the satellite, common sense dictates that the structural framework must be assembled first, but one also recognizes that the framework is not designed for earth loads and thus cannot support heavy equipments being moved about freely. Also there is the inherent requirement for minimizing construction crew complements and the time they must spen in space. When these two factors are taken into account, attempts are made to combine as many construction tasks as possible and to automate or semi-automate the most repetitive ones. The satellite design concept places yet another constraint on the construction task.

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System and subsystem elements are defined as to modular sizes and masses within the constraints of manufacturability and earth launch vehicle payload dimensional limits, therefore, construction processes and equipments must be designed to accommodate these elements. Examples of some SPS hardware are depicted in Table 1. The elements shown comprise approximately 72% of the overall satellite mass. (Addition of the high-density klystrons to the masses shown would account for almost 95% of the estimated operational satellite mass).

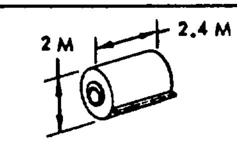
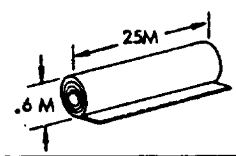
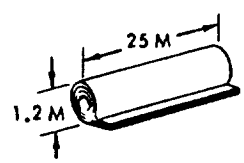
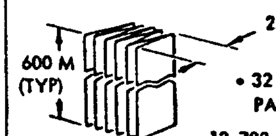
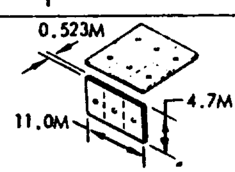
SPS ELEMENT	PACKAGING	PACKAGE DIMENSIONS	NO. REQUIRED	NOTES
STRUCTURES	CASSETTES OF ALUMINUM TAPES		1188	6 DIFFERENT TAPE LENGTHS 2500 KG AVE MASS
SOLAR BLANKETS	ROLLS		1632	750 M LENGTH/ROLL 7136 KG/ROLL
REFLECTORS	ROLLS OF FABRIC-HINGED ALUMINIZED KAPTON SHEET		144	 • 32 "HINGED" PANELS •12,780 KG/ROLL
MW ANTENNA WAVEGUIDE PANELS	SUB ARRAYS		6993	• ALL SUBARRAYS HAVE SAME OVERALL DIMENSIONS • 10 DIFFERENT POWER MODULE SIZES - QUANTITY VARIES WITH SIZE • SUBARRAY MASS (AVE) = 716 KG

Table 1. Cargo Packaging

The construction tasks, when defined and combined into an integrated schedule, establish a timeline for construction mass flow demands. These demands must be satisfied by the space transportation systems, i.e. a traffic model will have to be established as a function of time and hardware elements. An example of satellite construction demands and HLLV delivery capabilities is shown in Figure 2. In the presentation, specific construction tasks will be discussed to illustrate how these demands are developed.

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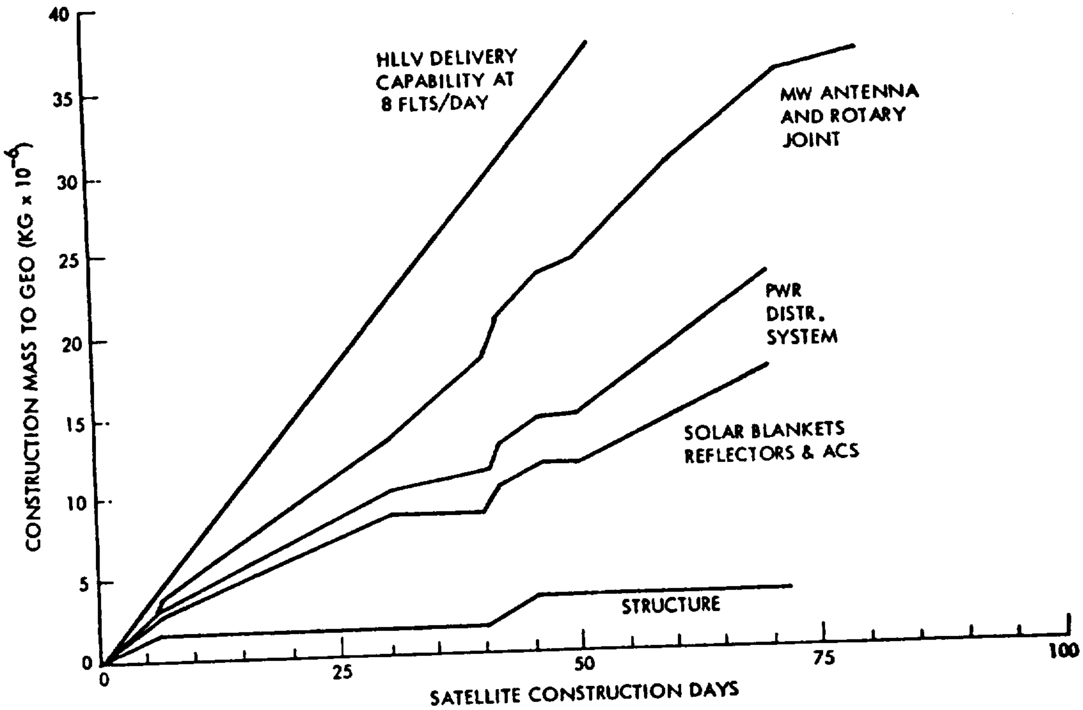

Figure 2. Mass Flow Demands for Satellite Construction