

National Space Transportation Policy
Common Spacelift Requirements
Report

Department of Commerce
Department of Defense
Department of Transportation
National Aeronautics and Space Administration

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COMMON REQUIREMENTS REPORT
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Introduction

This Common Spacelift Requirements Report is in response to direction levied by the National Space Transportation Policy, Presidential Decision Directive NSTC-4, dated August 5, 1994. This document, developed by an interagency team including representatives of the Secretaries of Defense, Commerce, and Transportation, the Administrator of the National Aeronautics and Space Administration, and the Director of Central Intelligence, provides information on the ongoing development of a common set of top level national space transportation requirements. Two aspects of the requirements process are addressed: first, the process for defining the performance and design characteristics required for developing new or modifying existing systems; and second, the mission model process, which tabulates the number of launches per year for spacecraft with specific launch weights and specific orbit requirements.

Background

Currently, the spacelift requirements of the United States defense, intelligence, civil, and commercial communities are being addressed by a combination of vehicles, including the Space Shuttle and the Delta, Atlas, and Titan launch vehicle families, as well as a variety of smaller launch systems. In the case of the U.S. commercial customers, foreign vehicles, such as Ariane, Long March, and Proton, have also been, or are planned to be, used. The U.S. fleet and its associated infrastructure is capable of providing the necessary lift capability, but improvements in cost, operational efficiency, and reliability are required to ensure that U.S. spacelift systems will meet national requirements and remain internationally competitive. Addressing the concern of U.S. spacelift viability begins by establishing specific measurable characteristics that the user and operator communities require for all future spacelift systems.

Spacelift System Requirements

Overview:

Spacelift systems must be *Capable, Operable, Reliable, and Economical (CORE)*. Each of these categories of performance includes specific requirements. Figure 1 identifies the categories and their related requirements as well as constraints on the spacelift system. Establishing definitions of these requirements and measures will help to resolve the fundamental problem of common spacelift terminology among the four primary customers of spacelift, other branches of the Government, and other affected parties. Updates and clarifications of these CORE requirements will be addressed as needed by the means described in the spacelift systems requirements process section below.

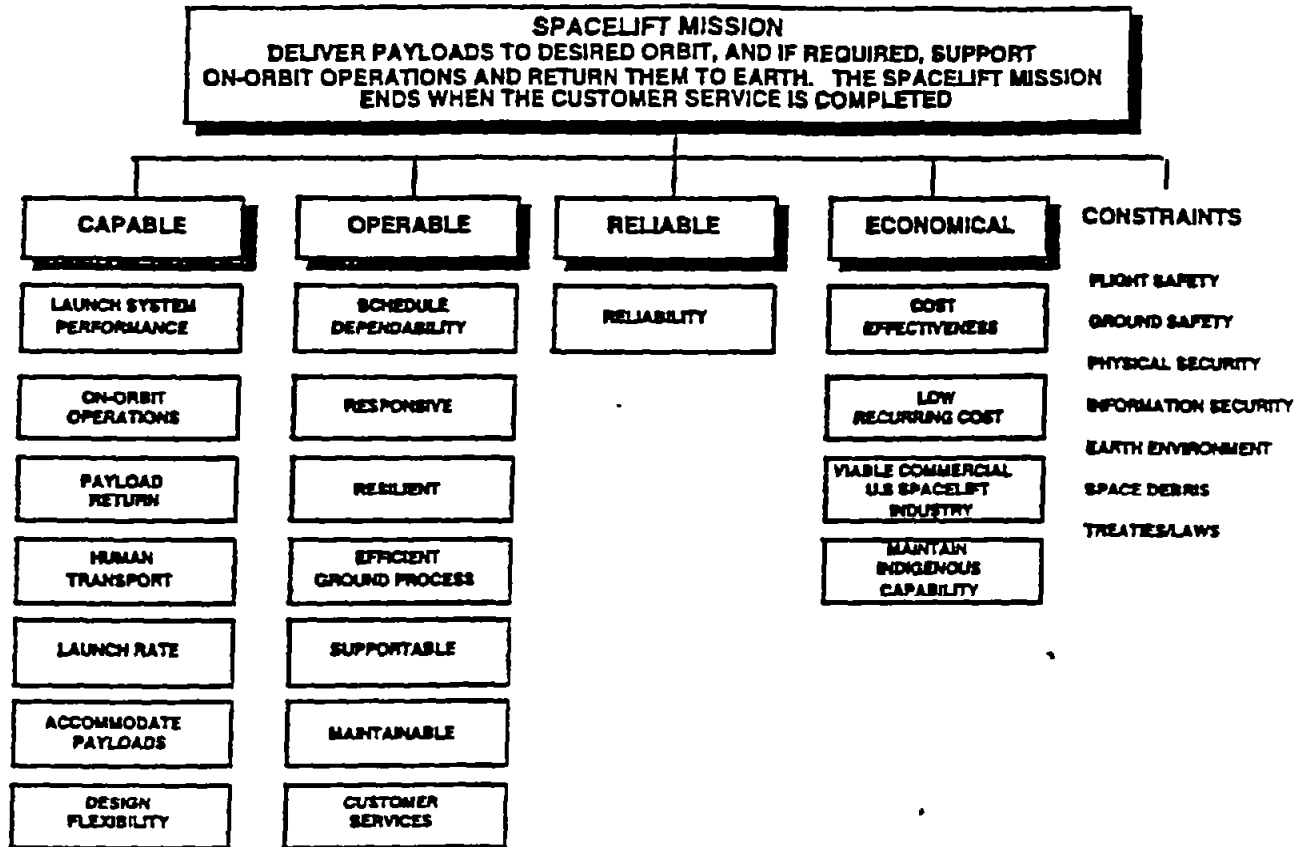


FIGURE 1. Spacelift System Requirements and Constraints

Importance:

Implementation of development programs requires an understanding of the requirements and their relative importance. Among the most important requirements are launch system performance and reliability. Human transport, low recurring costs, payload accommodations, responsiveness, and schedule dependability requirements are also important priorities, but each of these performance characteristics are not equally important for all applications. Once basic spacelift capabilities are confidently demonstrated, emphasis may be placed on other requirements as future programs respond to changing environments.

Emphasis:

In the near term, spacelift requirements will be used to guide improvements to, and the evolution of, the existing fleet of launch vehicles. It should be recognized that due to constraints imposed by the existing vehicles and infrastructure, as well as budget limitations, only limited improvements can be achieved in the near term. The most significant problem facing the U.S. space community today is the high cost of space launch. In the near term, emphasis should be placed on reducing cost and increasing reliability without compromising the performance of the current spacelift systems.

In the longer term, an increase in the use of spacelift, potentially led by commercial endeavors, will also require emphasis on customer services, efficient ground processing, launch rate, and responsiveness.

Spacelift Systems Requirements Process:

Representatives of the Department of Defense, the Department of Commerce, the Department of Transportation, the National Aeronautics and Space Administration, and the Director of Central Intelligence have begun defining, quantifying, and prioritizing spacelift system requirements. An interagency working group has conducted several forums with industry to solicit industry's (spacelift users, developers, and operators) evaluations and factored the industry perspective into the process. Although not complete, substantial progress has been made in developing a common set of terms. Since the requirements tend to change and evolve over time, it is essential that a mechanism be established to complete the working group's activities and to update conclusions on a periodic basis.

The Departments of Defense, Commerce, and Transportation, and the National Aeronautics and Space Administration have agreed to appoint representatives to an interagency team tasked with identifying and verifying a set of spacelift system requirements that describe spacelift system characteristics and attributes. This will be done in consultation with the Director, Central Intelligence and industry. The requirements shall address the needs of the customers of spacelift in the defense, civil, commercial, and intelligence space sectors. Building on the work completed by the agencies to date, the interagency team will further define common terms, spacelift customers, spacelift system requirement categories, spacelift system CORE requirements, and quantifiable measures for evaluating those requirements. The team will also further define constraints and revisit and verify importance and emphasis rankings. The findings of this process will be reviewed and updated on a periodic basis in order to provide ongoing evaluation and traceability of national requirements.

The spacelift system requirements that result from this process should be addressed and elaborated upon in spacelift system-specific documents. It is recognized that some requirements will not be appropriate for all applications; for example "human transport" is not required for all spacelift systems. Where a national requirement is not intended to be met by a specific system, it should be clearly stated in the spacelift system-specific documents.

Mission Requirements

Overview

Mission requirements continue to be defined by mission models. Mission requirements are a complement to the spacelift system requirements described in the preceding sections, presenting the dynamic changes of schedules and spacecraft mission plans. Analogous to airline departure schedules, they are tools for tabulating the gross requirements for annual launch rates for the different classes of launch vehicles. The DoD, NASA, and DoT produce models for their own respective needs and planning, with the DoD National Mission Model collecting requirements from the other models. These models will continue to be used for planning procurement quantities, financial planning, industrial activity assessments, traffic management of

launch base resources, and other spacelift related activities. The models must be updated periodically to reflect changes in schedules and mission requirements.

DoD Mission Requirements Process

The DoD uses the National Mission Model Requirements Review to produce mission models semiannually. These models include mission requirements for national security, civil, and commercial missions. At the beginning of a fiscal year, a Requirements Based National Mission Model is produced to show total user requirements. At the end of the year, an Executable Mission Model is produced to show the effects of fiscal issues on the model. The process for producing these documents is defined in Air Force Space Command's Charter for Mission Model Requirements, 28 July 1994. The models are also used to assess the demands on the DoD's spacelift infrastructure (launch pads, range resources, and other support resources) by the combined national defense, commercial, and civil missions. Space Shuttle-unique resources are managed by the NASA mission model. The models project mission requirements for the next 13 years. In addition to these models, Air Force Space Command produces a supplementary Space Launch Manifest providing more details on combined mission requirements on a monthly basis for the next three years.

DoT Mission Requirements Process

The DoT works with industry to forecast future commercial launch events. DoT periodically solicits launch information from the Commercial Space Transportation Advisory Committee (COMSTAC), and individual industry contacts on the number and type of commercial launches planned or expected for a given timeframe. DoT provides that information to the Department of Defense to use in the National Mission Model, and also uses the information to analyze market trends. These analyses, in turn, help determine future launch needs, such as future U.S. launch system responsiveness to possible new requirements in the low earth orbit (LEO) satellite market. Current DoT information suggests that LEO launches could increase the current annual launch rate for commercial launch vehicles by as many as four to five launches per year, in a six to eight year cyclical pattern. DoT's tabulation of commercial mission plans also provides information on geosynchronous (GEO) market trends and launch infrastructure needs.

NASA Mission Requirements Process

Each of the customers for the U.S. launch fleet have their own unique set of requirements based on the range of missions that must be accomplished. For NASA, these missions include transport of cargo and Space Station crews both to and from Space Station and a wide range of science, applications, and technology missions.

On a monthly basis, NASA updates the Mixed Fleet Launch Manifest. Internal to NASA, all of the relevant program organizations are solicited regarding their near-term and future requirements for launch. These mission requirements are compiled in a summary, annualized traffic model and verified to be consistent with the anticipated future NASA budgets. The NASA mission model can only project future launches with specificity for about four years for Space Shuttle payloads and eight years for ELV payloads; beyond that point, the missions are undefined, and a representative

estimated mission model is assumed, based on conservative extrapolation of current requirements and planned programs.

Currently, NASA has embarked on a high priority program to downsize science and applications satellites to permit more launches on small, low-cost launch vehicles. As a consequence, the mission model is being significantly altered. Thus, the mission model is a living document changed to reflect shifting agency priorities.

Conclusions

It is clear from their importance that requirements deserve periodic review in light of changing priorities and conditions. The Departments of Defense, Commerce, and Transportation and the National Aeronautics and Space Administration, in consultation with the Director of Central Intelligence and industry, will continue to define spacelift system requirements through a formalized interagency requirements process. The agencies will also continue established procedures for producing mission manifests and the mission requirement models, ensuring that missions planned by the civil, commercial, defense, and intelligence space sectors are accurately represented.