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Paper Session II-B - The Role of the Delta Rocket in America's Space Future

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THE ROLE OF THE DELTA ROCKET IN AMERICA'S SPACE FUTURE
Initiatives to Assuring the Future

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ABSTRACT

This is a status report of progress in the development of America's commercial space transportation industry. Government policies have provided the enabling impetus to begin restoring the needed resiliency in our national capability by creating the setting for a commercial industry. If the U. S. is to realize its full potential in the international arena it is essential that government and industry collaborate in the pursuit of a variety of initiatives which will promote growth and long-lived vitality to this new industry. This vitality will ultimately be derived from our success in moving to a purely commercial launch services footing. The rationale for this view is presented and the key initiatives identified.

INTRODUCTION

As one of the early developers of space transportation systems, McDonnell Douglas (MDC) has remained a leader in launch systems. The Delta heritage has positioned MDC to again respond to a national need, providing for delivery of the Air Force's Global Positioning Satellites (GPS). MDC also offers Delta launch services to commercial users and currently has eight (see table) firm commercial launch contracts with customers throughout the world.

Fluctuations in our nation's space policy, and the Challenger tragedy, have contributed to an erosion of America's preeminence in space. The ability of our launchers to compete in the world commercial market is
DELTA COMMERCIAL LAUNCH SERVICE CONTRACTS

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<tr>
<th>Program</th>
<th>Client</th>
<th>Launch Date</th>
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<tr>
<td>INSAT</td>
<td>Indian Department of Space</td>
<td>1989</td>
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<td>BSB</td>
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<td>INMARSAT</td>
<td>INMARSAT</td>
<td>1989</td>
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<td>Palapa</td>
<td>Sattel (Indonesia)</td>
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<td>NATO</td>
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<tr>
<td>SATCOM C-5</td>
<td>General Electric (ALASCOM)</td>
<td>1991</td>
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Figure 1. History of Delta Growth
vital to assuring our long-term leadership role and the attendant benefits of contributions to a favorable balance of payments, jobs and international prestige. Additionally, the commercial launch sector is a vital national security resource with respect to our access to space. This leadership can only be assured if a number of initiatives are successfully pursued through a collaborative partnership between government and industry. A strong beginning has been achieved and it serves to illuminate a variety of problems still to be addressed.

EXPENDABLE LAUNCH VEHICLE (ELV) HISTORY

The origins of the Delta rocket are the Thor IRBM and special programs (Transit and Tiros) based on the Thor booster. NASA applied this technology in the late 1950's to the development of the Delta vehicle which first flew in 1960 and has been used continuously since that time (over 180 missions). It was uprated in the ensuing years in response to the satellite community's need for ever-increasing launch capability (see Figure 1) and reliability. The applications have been varied: communications and navigation (nearly 40 percent of all launches), meteorological, scientific, and Earth observation. Both government and commercial missions have been flown. Those commercial missions (contracted by NASA with domestic and foreign entities), exceeding 40 to date, provided a vital and energizing economic stimulus to this longevity.

In the late 1970's the nation, in the interest of promoting development of reusable manned space transportation, established policies making expendable launch vehicle transportation for civil space applications uneconomic. The result was a closing down of Delta production. The tragic Challenger accident in January 1986 caused the decision to restore our nation's ELV capability in order to assure access to space. Concurrently, policy was established to foster commercialization by the launch vehicle contractors by establishing the Department of Transportation as the one-stop enabling agency and allowing the government provision of the property, facilities, goods and services needed to support commercial launches.
GOVERNMENT AND COMMERCIAL BUSINESS: THE CHICKEN AND THE EGG

The mix of commercial and government ELV activity in the pre-shuttle era was built upon an initial capability developed through government funds. Upgrades in capability were funded from both government and private sources. While one could argue whether a purely commercial industry could have developed and sustained a world-class competitive stable of launch vehicles, there is no questioning that the U. S. commercial industry to date has been built upon vehicles developed through government-funded programs. To this point it has been clear that the international commercial marketplace could not support the development of new launch vehicles. Conversely, government programs have profited indirectly from the economies of scale and rate modulating benefits realized by parallel commercial activity. Even more than in the past, commercial business adds energy and stimulus to the product line, with the pressures of the market place compelling the industry to be innovative in producing, launching and marketing if it is to stay competitive.

COMMERCIAL START-UP CHALLENGES

Fundamental to successful conduct of a commercial industry is peaceful coexistence between the commercial and government product lines. In the case of Delta, customer segments (see Figure 2) include the U. S. Air Force, NASA, SDIO, foreign governments, and domestic and foreign businesses. All of these customer groups expect the same high standard of quality that has been associated with Delta over the years. This dictate for high quality and the mandatory requirement for efficiency necessitate common production and launch operations. Successfully integrating government and private activities requires reconciliation of a myriad of regulations grown out of years of defense procurement activity. While national policy encourages simplification of government contracting practices, and encourages government agencies to procure commercially, there is still a gulf between policy and practice. Contributors to the failure to comply with these policies are the existing procurement regulations which did not anticipate the need to commercially procure launch services. Many of these regulations stand as inhibitors at best, and barriers at worst, to realizing the potential economies associated with commercial practice.
Figure 2. Delta Launch Forecast

Figure 3. Commercial Delta Agreements
**Government Services** - Many of the resources (launch facility, production tooling, test equipment, Quality Assurance and launch support) needed to build and launch a rocket are owned by the government. Agreements (see Figure 3) had to be reached for provision of, and charging practices established for, these resources. This created a reversal of traditional roles in that the government (used to being the customer) was the supplier and the launch contractor (used to being the supplier) was the customer. The task yet to be concluded is that of enforcing charging practice policy addressing the definition of "additive costs".

**Launch Manifesting** - A major factor in the success of the Delta has been its track record of on time launches. Changes in launch schedules over the course of a given program are inevitable. This raises the requirement for flexibility in remanifesting launches (and reassigning hardware in production flow) between government and commercial missions. Accountability systems have to be developed to allow efficient "borrow-pay-back" between government and commercial contracts, recognizing that the government holds right of approval on use of material accountable to their contracts.

**Risk Management** - The commercial launching contractor assumes total liability for risks associated with the launch, specifically in the areas of injury to third parties and damage to government property. These risks have to be quantified and risk mitigation (insurance) solutions found. This area was the focus of a major government-industry effort due to the prospect of unbounded risk. This cooperative effort resulted in legislation which in effect bounded the contractor's liability by providing a layer of indemnification and establishing limits of insurance requirements. Much remains to be done in defining liability in ways that are compatible with the way the insurance industry underwrites risk, such as in defining government property for which the launching contractor is liable.

**Schedule and Material Priorities** - Coexistence of government programs designated as a defense priority rated program (DPAS) and commercial programs create a whole set of unique problems when schedule
difficulties and/or material shortages are encountered. These problems to date (viz., with respect to Ammonium Perchlorate) have been resolved by characterizing the commercial launches in the context of national security. The 1988 Commercial Space Launch Act Amendment also prescribes very specific safeguards against launch preemption by a government mission.

Foreign National and Media Access to National Ranges - In the case of a commercial launch of a foreign satellite much is at stake in terms of international prestige, in addition to the strictly commercial value of the mission. Media coverage is an essential aspect of this. National security dictates that access by foreign nationals be carefully controlled. Current practices require about sixty days to secure range access clearance for foreign nationals. As a matter of practical necessity, procedures must be put in place that clear the way for commercial launch customers to visit launch sites on short notice.

INDUSTRY AND GOVERNMENT: CLARIFYING THE ROLES

Challenges to the viability of America's commercial launch services industry over the long term will come from the international market place in the form of competition by foreign launchers. These challenges will have to be met through a cooperative government-industry effort. This effort will be most effective if and when roles are clearly defined. Broadly, the government's role should be that of the enabler and industry's role to deliver a competitive product. The ability of our industry to compete will be ultimately dependent on price, which will mirror our success at lowering costs without compromising quality. A vital aspect of this cost reduction process will be the transition to a uniform commercial launch services approach, common to both government and private sectors. To the extent that the government requirements impose more severe oversight, the industry will be incurring unnecessary costs in its management systems.

Government as the Enabler - Government can be effective in this role through developing regulations that promote and enable commercial procurement of launch services by government agencies by commercial contracting means, thereby diminishing the gap between commercial and government programs and improving the efficiency of the industry.
Existing legislation will no doubt require clarifying amendments from time to time. Examples where this would be beneficial include extending or eliminating the sunset clause on capping third party and government property risks and formalizing the defense priority of commercial launches.

**Trade Agreements** - Heavily subsidized foreign competition is straight arming the competitiveness of U. S. launchers. An immediate task (already underway) is that of developing and negotiating trade agreements that serve to "level the playing field" of international competition. This is especially challenging where the competition comes from a "non-market" economy. A closely cooperative effort is required here with industry support and counsel being made directly available to the U. S. Trade Representative and through such forums as the ISAC (Industry Sector Advisory Council) and COMSTAC (Commercial Space Transportation Advisory Committee).

**CONCLUSIONS**

The future competitiveness of the U. S. space transportation industry can best be served by government moving toward procurement of launch services on a commercial basis thereby eliminating the differentiation between government and commercial sector launches. In turn, industry must assist this process by continuously applying its energies to staying competitive through improvements in productivity and by suggesting ways in which government can streamline procurements, tailor specifications and reduce government oversight without compromising product quality.