SECRET

COVER SHEET

EXECUTIVE OFFICE OF THE PRESIDENT

OFFICE OF MANAGEMENT AND BUDGET

Attach this form to SECRET material in use. DETACH the form when material is filed, stored or dispatched.

SECRET

COVER SHEET

OMB FORM 69
MARCH 72

SECRET

OMB-NSIA/SSD-85-3(S)
cy #21

INTERNATIONAL COMPETITIVENESS IN LAUNCH SERVICES

February 1985

Dissemination Control Abbreviations		
	NOFORN (NF)	Not releasable to foreign nationals
	NOCONTRACT (NC)	Not releasable to contractors or contractor/consultants
	PROPIN (PR)	Caution—proprietary information involved
	ORCON (OC)	Dissemination and extraction of information controlled by originator
	REL...	This information has been authorized for release to...
	FGI	Foreign government information
	WN	WNINTEL—Intelligence sources or methods involved

STAT

All material on this page is UNCLASSIFIED.

SECRET

Table of Contents

INTERNATIONAL COMPETITIVENESS IN LAUNCH SERVICES

Highlights

Background

- For many years, the U.S. Government maintained a monopoly in the provision of launch services for the Free World. However, European development of the Ariane Expendable Launch Vehicles (ELVs) has effectively ended that monopoly.

- The leading competitors for supplying commercial launch services are the U.S. Space Transportation System (STS) utilizing the Shuttle, Ariane ELVs, and U.S. commercial ELVs. There are major obstacles to other potential launch suppliers (China, the Soviet Union, and Japan) being able to obtain a significant portion of the commercial market in the time period of the study (1989-1994).

- There is a potential excess of worldwide launch capacity relative to the likely demand for commercial payloads in 1989-1994. Ariane will have the capacity to launch about 50 percent of the target market (communications satellites), the STS could launch about 90 percent, and U.S. commercial ELVs could launch the entire market.

Assessment

- While the National Space Policy commits the U.S. to "maintaining world leadership in space transportation," it does not make any mention of commercial market share. The STS offers capabilities far in excess of that possible with ELVs (e.g., manned space flight, interactive R&D, commercial materials processing). These unique capabilities provide the proper focus for defining U.S. space transportation leadership.

- Success of the STS need not be determined by its share of the commercial communications satellite market. Competition for routine services that could be performed by the private sector is not a threat to the U.S. policy goal of maintaining space transportation leadership.

- Although U.S. commercial ELV companies have been marketing their launch services, the current large price differences between U.S. ELVs and the subsidized STS and Ariane have made it extremely difficult for U.S. ELVs to be successful. The President's full-cost recovery policy for the STS represents the most significant Government decision for encouraging the development of a U.S. commercial ELV industry.

- An STS pricing policy reflecting full-cost recovery for commercial and foreign launches as of October 1, 1988, needs to be implemented soon, or U.S. ELV companies will be unable to sustain their production. If the current ELV production lines close, future prices would be substantially increased, which may preclude any future reopening of lines.

- The NASA-proposed STS pricing plan is based upon the average operating cost of Shuttle flights during the 1989-1991 period. A higher STS cost per flight than proposed by NASA will result if the projected Shuttle flight rate of 24 per year is not attained (as the rest of the Working Group believes is likely) or other cost elements (such as recovery of depreciation of Government assets--the orbiters) are included in the price in accordance with Government-wide cost recovery policy. Changing these assumptions could easily result in a 30 percent higher price.

- At the NASA-proposed STS pricing, the STS and Ariane would compete for the target market. The STS would have a pricing advantage for smaller payloads, while Ariane would have a pricing advantage for larger payloads. U.S. ELVs would be unable to compete in this market.

- Under the 30% higher STS pricing alternative reviewed in the Study, the STS and U.S. commercial ELVs would compete more equally for the target market not captured by Ariane (about half of the nominal demand). Assuming optimum mixing of payloads, Ariane would appear to have a price advantage, especially for the larger payload classes). This STS price would provide U.S. ELV operators with more assurance that the U.S. Government would not undercut their prices and would encourage their participation in this market.

- While no price level can guarantee that U.S. launch systems will be price-competitive with the launch systems of other nations, there appears to be little reason for Arianespace to maintain highly subsidized prices once the STS transitions to full-cost recovery. Arianespace would have a strong economic incentive to maximize its return by raising prices in response to an STS price increase.

- It is uncertain whether the nations backing Ariane would decide to increase its launch capacity to capture more than 50 percent of the market. Factors against such an expansion include the substantial capital investment required, uncertainties about demand, and competing European space program funding needs.

Risk Analysis

- There is a serious risk that by the early 1990's Shuttle availability for commercial and foreign traffic could be reduced by greater than nominal U.S. Government demand (related to Space Station or the Strategic Defense Initiative) or lower than planned flight rates. In the absence of U.S. commercial ELVs, the prospect of this situation would cause a difficult choice for the U.S. Government. By the FY 1987 budget (before the fifth orbiter option expires), the U.S. would have to decide whether to:

  - Expand Shuttle capacity, which would add to the large world oversupply of launch capacity with a huge and very costly ($2.5 billion) increment of new capacity to meet contingent commercial needs.

  - Allow a massive loss of U.S. market share, which would permit foreign competition to dominate the market for launch of commercial satellites, costing the U.S. in business revenues, balance-of-payments, and jobs.

- The U.S. has a better option than the choices outlined above for competing in the international market for launch services. Encouraging the competitiveness of U.S. commercial ELVs would:

  - Carry out the President's ELV commercialization initiative.

  - Require no additional U.S. Government investment.

  - Rely on the private sector for efficiently performing a commercial service.

  - Provide a more economically efficient source of additional U.S. launch capacity.

- U.S. commercial ELVs provide the best hedge available for dealing with the uncertainties in the international marketplace for commercial launch services. The option for U.S. commercial ELVs will disappear unless action is taken now to implement fully a pricing policy for commercial and foreign users that recovers all of the costs of the STS, consistent with Government-wide cost recovery policy.

INTERNATIONAL COMPETITIVENESS IN LAUNCH SERVICES

I. Background

Introduction

This study has been prepared in response to NSDD 144, National Space Strategy, of August 15, 1984, which directs that: (U)

> "OMB, in consultation with DOC, DOT, DOD, NASA, and other agencies, will prepare a joint assessment of the ability of the U.S. private sector and the STS to maintain international competitiveness in the provision of launch services. This analysis should include an assessment of all factors relevant to foreign expendable launch vehicles (ELVs), U.S. ELVs, and the STS." (U)

For purposes of this study, "international competitiveness" is defined as the ability to compete successfully for a share of the market for launching commercial and foreign spacecraft. The U.S. Government's policy of implementing full-cost recovery STS pricing on October 1, 1988, for commercial and foreign users led to a concentration on FY 1989 through FY 1994 in assessing international competitiveness. (U)

As shown in the following section on "Policy Context," maintaining international competitiveness is not an explicit objective of U.S. Space Policy. While the National Space Policy commits the U.S. to "maintaining world leadership in space transportation," it does not make any mention of commercial market share. (U)

Policy Context

The National Space Policy of July 4, 1982, establishes national policy to guide the conduct of the United States space program and related activities. The following excerpts provide pertinent guidance on the question of international competitiveness in the provision of launch services: (U)

- The Space Shuttle is to be a major factor in the future evolution of United States space programs. (U)

25X1

- The United States encourages domestic commercial exploitation of space capabilities, technology, and systems for national economic benefit. (U)

- The United States Space Transportation System (STS) is a vital element of the United States space program and is the primary space launch system for both the United States national security and civil government missions. (U)

- The first priority of the STS program is to make the system fully operational and cost-effective in providing routine access to space. (U)

- STS capabilities and capacities shall be developed to meet appropriate national needs and shall be available to authorized users -- domestic and foreign, commercial, and governmental. (U)

- The United States is fully committed to maintaining world leadership in space transportation with an STS capacity sufficient to meet appropriate national needs. (U)

- NASA will assure the Shuttle's utility to the civil users. (U)

- The United States Government will provide a climate conducive to expanded private sector investment and involvement in civil space activities, with due regard to public safety and national security. (U)

National Security Decision Directive No. 94, Commercialization of Expendable Launch Vehicles, of May 16, 1983, encourages domestic commercial exploitation of space capabilities, technology, and services for U.S. national benefit. (U)

- The basic goals of U.S. space launch policy are to (a) ensure a flexible and robust U.S. launch posture to maintain space transportation leadership; (b) optimize the management and operation of the STS program to achieve routine, cost-effective access to space; (c) exploit the unique attributes of the STS to enhance the capabilities of the U.S. space program; and (d) encourage the U.S. private sector development of commercial launch operations. (U)

- The U.S. Government fully endorses and will facilitate the commercialization of U.S. Expendable Launch Vehicles (ELVs). (U)

- o The U.S. Government will not subsidize the commercialization of ELVs but will price the use of its facilities, equipment, and services consistent with the goal of encouraging viable commercial ELV launch activities....(U)

- o The U.S. Government will encourage free market competition among the various systems and concepts within the U.S. private sector. (U)

- o Notwithstanding the U.S. Government policy to encourage and facilitate private sector ELV entry into the space launch market, the U.S. Government will continue to make the Space Shuttle available to all authorized users -- domestic and foreign, commercial, and governmental -- subject to U.S. Government needs and priorities. (U)

- o Through FY 1988, the price for STS flights will be maintained in accordance with the currently established NASA pricing policies in order to provide market stability and assure fair competition. Beyond this period, it is the U.S. Government's intent to establish a full-cost recovery policy for commercial and foreign STS flight operations. (U)

<u>Executive Order 12465, Commercial Expendable Launch Vehicle Activities</u>, of February 24, 1984, designated the Department of Transportation as the lead agency within the Federal Government for encouraging and facilitating commercial ELV activities by the United States private sector. Under the provisions of this document, the President directs the DOT to: (U)

- o promote and encourage commercial ELV operations in the same manner that other private commercial enterprises are promoted by agencies of the Federal Government;

- o provide leadership in establishing procedures that expedite the licensing of private sector launch activities;

- o assure fair and equitable treatment for all private sector applicants;

- o identify Federal statutes, treaties, regulations and policies which may have an adverse impact on ELV commercialization efforts;

- o conduct appropriate planning with regard to the long-term effects of Federal activities related to ELV commercialization. (U)

NSDD-144: National Space Strategy of August 16, 1984, identifies selected, high-priority efforts and responsibilities, and provides implementation plans for major space policy objectives: (U)

- o The STS is a critical factor in maintaining U.S. space leadership, in accomplishing the basic goals of the National Space Policy, and in achieving a permanent manned presence in space. (U)
- o Enhancements of STS operational capability, upper stages, and efficient methods of deploying and retrieving payloads will be pursued as national requirements are defined. (U)
- o On October 1, 1988, prices for STS services and capabilities provided to commercial and foreign users will reflect the full cost of such services and capabilities. (U)
- o The U.S. will encourage and facilitate commercial expendable launch vehicle operations. U.S. Government policies will promote competitive opportunities for commercial expendable launch vehicle operations and minimize Government regulation of these activities. (U)
- o To stimulate private sector investment, ownership, and operation of civil space assets, the U.S. Government will facilitate private sector access to civil space systems, and encourage the private sector to undertake commercial space ventures without direct Federal subsidies. (U)

The Commercial Space Launch Act (P.L. 98-575) -- On October 30, 1984, the President signed legislation to facilitate commercial space launch activities. In its findings, the Congress declared that: (U)

- o private applications of space technology have achieved a significant level of commercial and economic activity, and offer the potential for growth in the future, particularly in the United States;
- o the private sector in the United States has the capability of developing and providing private satellite launching and associated services now available from the United States Government;

- the development of commercial launch vehicles and associated services would enable the United States to retain its competitive position internationally, thereby contributing to the national interest and economic well-being of the United States;

- the provision of launch services by the private sector is consistent with the national security interest and foreign policy interests of the United States;

- the United States should encourage private sector launches and associated services;

- the Secretary of Transportation is authorized to facilitate and encourage the acquisition of Government launch property and Government launch services by the private sector. (U)

II. Description of Launch Suppliers*

For many years, the United States Government maintained a monopoly in the provision of launch services for the Free World. However, European development of the Ariane launch vehicles has effectively ended that monopoly. The Ariane was developed to provide the Europeans with an independent space launch capability. (U)

The leading competitors for supplying international launch services are the U.S. Space Transportation System (STS) utilizing the Space Shuttle; European Ariane expendable launch vehicles (ELVs); and U.S. commercial ELVs. Other potential launch suppliers include China, the Soviet Union, and Japan. (U)

U.S. Space Transportation System (STS)

The U.S. Space Shuttle is a manned, reusable launch vehicle for delivering payloads into low-earth orbit (65,000 pounds) and supporting manned space research. Each Shuttle launch can carry up to several different payloads at one time. Shuttle payloads may be boosted from low-earth to geosynchronous orbit, Earth-escape orbit, or other high altitude orbit by numerous upper stages that include the Government's Inertial Upper Stage (IUS), the future Centaurs, and several commercial stages. The Space Shuttle also serves as an orbital research facility in support of man-tended science and applications experiments. (U)

The Space Shuttle now relies on the commercial marketplace for the supply of upper stages to lift current generation communications satellites (designed originally for launch by ELVs) from low-earth orbit to geosynchronous orbit. (U)

There are three Space Shuttle orbiters in service, with the fourth to be delivered in April 1985. The Space Shuttle is launched from the Kennedy Space Center, with launches also scheduled from Vandenberg Air Force Base beginning in early 1986. The Space Shuttle is a highly versatile system providing--in addition to launch services--capabilities for on-orbit checkout, retrieval, and repair of spacecraft configured to take advantage of those capabilities. The payload volume and lift capacity of the Shuttle were intended to meet national security requirements

STAT

established as design specifications. Its inherent complexity as a manned system also entails additional costs for the users. Safety constraints and associated thermal and structural loads place requirements on the user which, for some user spacecraft designs, could increase spacecraft and launch integration costs, partially offsetting the other advantages of the Space Shuttle. (U)

European Ariane ELVs

The Ariane launch vehicles are operated and marketed by Arianespace, a semi-private company supported by the European Space Agency (ESA) member states. Ariane was developed by ESA and recently turned over to Arianespace with the intent to provide international launch services at a profit. No attempt will be made to recover the investment/development costs, paid by the member states. France is the largest contributor to Arianespace, furnishing 60 percent of its funding. (C NF)

Four versions of the Ariane have been developed or are planned: (U)

- o Ariane 1 (2,300 pounds into geosynchronous orbit) has been launched successfully seven of nine attempts, with the first launch occurring in December 1979. It is now being phased out, replaced by the follow-on versions. (U)

- o Ariane 2/3 (2,700-3,100 pounds into geosynchronous orbit) is an uprated Ariane 1 with lengthened propellant tanks. The Ariane 3 has two solid propellant strap-on boosters. The first Ariane 2/3 launch was in August 1984. (U)

- o Ariane 4 (2,600-5,100 pounds into geosynchronous orbit) will use a new first stage and additional solid or liquid propellant strap-on boosters. The first Ariane 4 launch is not expected before mid-1986. (U)

- o Ariane 5 (33,000 pounds into low-earth orbit) will use a new high-performance first stage and two large solid-propellant boosters. A new high-performance upper stage will be used for high altitude or escape missions and will be able to place up to 8,800 pounds into geosynchronous orbit. The first launch of the Ariane 5 is not expected before the 1992-1995 time period. (U)

There have been nine successful Ariane launches out of 11 attempts to date, with the last six consecutive launches having been successful. The Ariane 4 and 5 are still subject to developmental uncertainties. (U)

The Ariane family of vehicles injects payloads directly into a geosynchronous transfer orbit, rather than requiring a separate upper stage to reach this orbit. (U)

The Ariane launch systems have real operational and cost advantages over U.S. ELVs: higher payload capability because of their location closer to the equator in French Guiana and a larger common production and operations base over which to spread fixed costs. The launch site in French Guiana is well located for launching satellites into geosynchronous transfer orbits. This translates to about 12 percent more performance capability to geosynchronous orbit than would the same system at Kennedy Space Center in Florida. This advantage provides savings not only in propellants, but in overall system size and complexity for the same payload compared to a launch from KSC.(U)

The various Ariane vehicles share common production facilities and a common launch site for its various configurations of launch vehicles. Thus, while U.S. ELV costs are shown based on annual launch rates of four per year, the Ariane cost (and price) estimates are based on minimum launch rates of six per year, but they will likely attain 8-12 launches per year (including ESA government flights), providing cost advantages on a "per flight" basis. These rate benefits amount to cost savings on the order of 10-20 percent compared to the U.S. ELV presumed rate of 4 per year. (U)

On the other hand, there are also disadvantages to launching out of French Guiana in that it is more expensive and presents logistics problems for both personnel and components (replacement parts). The location on the northeastern coast of South America is less well sited for any launches into high-inclination orbits. (U)

Because the launch vehicle technologies are comparable, if a U.S. ELV were to have the same location advantage and a similar flight rate, its operational costs per pound to orbit could be similar to Ariane. (U)

ESA will not have an on-orbit repair, retrieval, or servicing capability until its spaceplane becomes operational (perhaps the late 1990's). (S)

<u>U.S. ELVs</u>

Potential U.S. commercial ELV suppliers are divided into two categories:

- o Three launch systems which have been developed with Government funds and have already been extensively used in launching satellites for nearly two decades (Delta, Atlas, Titan). (U)

- Other launch systems which may be developed by commercial companies were assessed not to have significant impact on international competition either due to the smaller size of targeted payload or the time frame of interest in this study. (U)

Delta -- The Delta is a two- or three-stage launch vehicle which has been in service since 1960 and has maintained a reliability in excess of 97 percent. The Delta with various upper stages can be launched from the Kennedy Space Center in Florida to place about 1500-pound payloads into geosynchronous Earth orbit. Launched from Vandenberg Air Force Base in California, it can place 4500-pound payloads into low altitude, high-inclination polar orbit. The Delta is manufactured by McDonnell Douglas, and is being marketed by Transpace Carriers, Inc. (TCI). (U)

Atlas -- There are several configurations of the Atlas booster with an overall success rate of 96 percent since the 1960's. With a Centaur upper stage, it has been placing up to 2600-pound satellites into geosynchronous orbit from KSC. The core vehicle without an upper stage is used from the Vandenberg West Coast launch facility to place 3800-pound satellites into low altitude, high-inclination polar orbits. The Atlas and its Centaur upper stage is manufactured and marketed by General Dynamics. (U)

Titan III -- The Titan III has been flown since the mid-1960's, with a success rate of 97 percent over 124 launches. Its present version, the 34D, has liquid first and second stages, with strap-on solid boosters, making it capable of lifting 32,900 pounds due east to low-earth orbit from the East Coast, or 27,600 pounds to low-earth polar orbit from the West Coast. It uses the Inertial Upper Stage (IUS) or the Transtage for upper stages and can lift a 4,200-pound payload to geosynchronous orbit. It is the largest expendable launch vehicle in the Free World. The Titan is manufactured and marketed by Martin-Marietta. (U)

U.S. Titan II -- In addition to the preceding ELVs which have been used as space launch vehicles, the DOD is planning in the President's FY 1986 Budget, modification of the Titan II ICBMs for West Coast launches of Defense and NOAA Meteorological Satellites and Defense navigation satellites in the 1990's. Currently, there are approximately 50 Titan-II's which could be used. Although there are no current plans for commercialization of Titan IIs, there is no inherent reason why they could not be commercialized. (U)

The non-recurring costs of modifying the existing Titan II ICBMs and Vandenberg launch pad has been estimated by the Air Force at about $100 million, with hardware and launch support costs on the order of $25 million per launch. (U)

The prospective availability and costs of the Titan II ICBMs for East Coast commercial launches are unknown since there is no existing Titan II capability there and the Titan III complex would have to be modified to accommodate the Titan II version. The Titan II represents a launch capability in the range of the Delta to Atlas-Centaur class. (U)

Other Potential Launch Suppliers

Summary -- Because of major obstacles facing China, the Soviet Union, and Japan in obtaining a significant portion of the available commercial market in the time period of this study, these systems were not analyzed to the same extent as the leading competitors. In particular, there are major technology transfer restrictions which may prevent the launch of Western-built satellites on Chinese or Soviet vehicles. (See Appendix I.) (S NF)

China -- China has two expendable space launch vehicles in their inventory--the CSL-2 and the CSL-3--and has plans to modify either or both. The two SLVs as well as China's large ICBM--the CSS-4--use the same first and second stage; however, the CSL-3 has an additional liquid hydrogen/liquid oxygen third stage. (S NF NC)

Combinations of increased lengths, increased diameters, and strap-on motors will allow China to develop a flexible series of SLVs which are similar to the European Space Agency's Arianes 1-5. (S NF NC)

The basic CSL-3 and the proposed modified CSL-3 are potential launch vehicles for the target market. The CSL-3 can place about 1,000 pounds to geosynchronous orbit, which is about the size of a Delta-class payload capability. The modified CSL-3 is expected to place 2,630 pounds to geosynchronous orbit, about the size of an Atlas-Centaur payload or two smaller Delta-class payloads. (S NF NC)

China has offered its launch capabilities to at least one foreign customer. (U)

Page Denied

III. Space Shuttle Marketing Strategy and Pricing

Marketing Strategy

NASA's first priority, as directed in the National Space Policy, is to make the Space Transportation System fully operational and cost-effective in providing routine access to space. The Space Policy also directs NASA to ensure the Shuttle's utility to civil users. NASA believes that the launch of commercial spacecraft is consistent with the direction to maintain world leadership in space transportation. (U)

NASA has indicated its intent to market Shuttle services in competition with other launch suppliers through an STS Marketing Plan. NASA plans to implement an aggressive promotional effort to "counter competition" and "increase STS competitive advantages." (U)

NASA currently markets Shuttle services in competition with the Ariane and U.S. commercial ELVS while it phases out its involvement in Government-managed ELVs. NASA has developed an STS marketing plan which is intended to decrease the competitive advantages of the Ariane by eliminating excessive documentation, integration meetings, and overly complex interfaces between the spacecraft and the STS. (U)

According to the NASA mission model, U.S. Government missions will require about 18 of the 24 flights anticipated to be available each year by the four-orbiter fleet in the 1989-1994 period. NASA estimates that about six flights per year will be available for commercial and foreign customers in the 1989-1994 period. (U)

NASA has established the following priority order for use of the Shuttle: (U)

- o First, DOD missions critical to national security. (U)
- o Second, NASA missions with fixed planetary-related launch windows. (U)
- o Third, commercial and foreign customers. (U)
- o Fourth, NASA missions (except as already mentioned). (U)

The STS offers capabilities far in excess of that possible with ELVs (e.g., manned space flight, interactive research and development, commercial materials processing). The Working Group except for NASA believes that these unique capabilities provide the proper focus for defining U.S. space transportation leadership. (U)

The Working Group except for NASA also believes that success of the STS need not be determined by its share of the commercial communications satellite market. Competition for routine services that could be performed by the private sector is not a threat to the U.S. policy goals of maintaining space transportation leadership. (U)

Pricing

NASA's pricing plan to implement full-cost recovery for commercial and foreign STS flight operations was submitted to the White House on September 17, 1984. In response to NSDD 144, NASA's pricing plan for commercial and foreign flights which occur after October 1, 1988, reflects NASA's estimate of the operating costs for these flights. (U)

NASA estimates that the average operating cost of Space Shuttle flights during the FY 1989-1991 period is $83.3 million (FY 1982 dollars) per flight. This estimate is based on a projected flight rate of 24 per year, to be first achieved in FY 1989. NASA states that its proposed price includes direct and most indirect costs associated with Space Shuttle flights. However, the NASA pricing plan does not segregate costs by class of customer (DOD, NASA, and commercial). Furthermore, the NASA pricing plan does not include any fee for the depreciation or replacement of Government assets as required by OMB Circular No. A-25 (User Charges) or Vandenberg operations costs. (U)

NASA proposes to implement the new price for flights in FY 1989 through 1991, and proposes a baseline price of $87 million (FY 1982 dollars) per flight for commercial and foreign customers, with the flexibility to adjust the price by as much as five percent to accommodate special conditions relating to individual customers' situations. (U)

NASA will also continue to provide direct Federal funding for Shuttle flights of selected commercial space activities involving new technology intended to project U.S. space leadership into the future. This approach continues to take advantage of the unique capabilities of the Space Shuttle for new technology development. The proposed pricing policy will not affect NASA's research and development and joint endeavor agreements, which provide reduced cost or free Shuttle flights for new technology developments. (U)

Spacecraft designs (like the Hughes Leasat and 393 series satellite) which optimize for Shuttle's increased weight and volume capabilities will allow spacecraft packaging to become more efficient. With this increased optimization of designs incorporating reduced weight and volume constraints comes greater on-orbit capabilities per dollar. The Shuttle's ability to compete successfully in the future marketplace would be enhanced if more spacecraft designers choose to optimize for Shuttle launched systems. (U)

The data available for this paper were inadequate to allow definitive conclusions on the likely impact of such "Shuttle optimized" designs. However, both a major satellite contractor and an upper stage contractor believe that Shuttle optimized designs will be able to provide "transponders-on-orbit" at about 10 percent less cost than present generation designs. Thus, all other factors being equal, the Shuttle optimized design would provide about a 10 percent price advantage for the Shuttle over other launch systems. (U)

In consideration of the investment required and the resulting dependence on a single source for access to space, most customers still prefer to retain dual STS/ELV launch compatibility rather than commit to Shuttle optimization. Customers have demonstrated a desire to maintain flexibility in the selection of launch vehicles regardless of potential efficiencies in design. (U)

This study of international competitiveness in the provision of launch services does not address the question of the adequacy of NASA's specific pricing proposal for full-cost recovery of STS services and capabilities, which is being reviewed separately. However, the Chapter VIII of this study assesses the potential impact on international competitiveness of a higher STS price. (U)

IV. Ariane Marketing Strategy and Pricing

Marketing Strategy

Arianespace follows an aggressive marketing strategy, setting launch prices competitive with those of the U.S. Shuttle and offering a number of customer inducements in financing, insurance subsidies, launch vehicle availability, relaunch guarantees, and other competitive tactics. Technology transfer and trade offsets have also been used in gaining Third World customers. (S NF NC)

Arianespace marketing officials have indicated their intention to intensify their aggressive marketing program. This marketing program will be oriented towards capturing major portions of the West European, Third World, and U.S. commercial satellite launch markets. (S)

Pricing

To promote the Ariane program outside Europe, the European Space Agency agreed that until mid-1986 ESA members should pay 25 percent more than non-members for launches of their payloads. Moreover, in some cases Arianespace adjusts its price to non-ESA members according to the competition, and on several occasions has underbid U.S. prices. Arianespace has been willing to absorb large initial financial losses to obtain high-prestige launch contracts or to keep its manifest full. (S NF NC)

In February 1984, ESA decided on a pricing policy characterized as being based on full-cost recovery, effective for launches after January 1, 1987. This new pricing policy for Ariane 4 launches will provide a continuous pricing scale based on payload weight. To geosynchronous orbit, a 2,600-pound satellite will be priced at about $54 million (shared launch) and a 5,100-pound satellite will be priced at about $76 million for a single large-satellite launch. The price may be negotiable depending on international competition. (C NF NC)

Ariane prices and costs have been generally reflected in current French francs. The exchange rate with the U.S. dollar thus becomes an important factor in assessing relative cost/price positions. However, with the increased strength of the U.S. dollar, the latest Ariane contracts are being written in U.S. dollars or the German mark to better account for the difference in inflation factors and exchange rates. (The Working Group converted all French francs to U.S. dollars using current exchange rates and U.S. GNP deflators.) (U)

Page Denied

V. U.S. ELV Marketing Strategy and Pricing

Marketing Strategy

It is difficult to describe the current U.S. ELV industry marketing strategy in light of uncertainties about the next phase of STS pricing policies. Although U.S. commercial ELV companies have been marketing their launch services for over a year, to date the large pricing differences between U.S. ELVs and the subsidized STS and Ariane have foreclosed successful competition by U.S. ELVs. No contracts have yet been signed. (U)

At the present time, two companies are actively pursuing commercialization of existing U.S. Government expendable launch vehicles. Transpace Carriers, Inc. (TCI) has signed an agreement with NASA which allows them to market the Delta launch vehicle and provides for access to excess hardware at a negotiated price. General Dynamics/Convair has created an organization to market the Atlas-Centaur and has taken the initial steps toward formulation of an agreement with NASA. (U)

The President's full-cost recovery pricing policy for the STS represents the most significant Government decision for encouraging the development of a U.S. commercial ELV industry. For this industry to have an opportunity to develop, the private sector must be convinced that the U.S. Government will fully implement the President's ELV commercialization policy on schedule. However, if the private sector perceives that the U.S. Government intends to continue to underwrite STS operations in competition with the U.S. private sector, the likelihood of a solid financial commitment from private industry is very small. The $2 million NASA STS marketing Request for Proposals (RFP) and the NASA response to the DOD RFP for procurement of complementary ELVs has heightened industry's concerns regarding NASA's intent to compete with the private sector. (U)

On the other hand, if the U.S. Government implements full-cost recovery pricing for the STS that is perceived by the private sector to be a truly "commercial" price, the private sector is likely to regard their market prospects more favorably. In that case, the success of the U.S. ELV industry will depend upon their ability to compete with Ariane and potential other foreign entrees. (U)

Pricing

Since U.S. commercial ELV companies must recover production and operating costs, as well as future non-recurring development costs and provide a profit margin, their current prices for comparable services are much higher than the present below-cost (subsidized) prices of STS or Ariane. If this U.S. industry is to survive and be a competitor over the long-term in the international arena, STS and Ariane prices must increase to reflect real cost-based pricing. (U)

In the near term, if STS and Ariane projected flight rates continue to fall behind schedule and demand levels remain steady, any resulting deferred payloads would be available to the U.S. ELV industry to service those customers for which schedule, rather than price, is the most important factor. (U)

This study addresses the longer term (1989-1994) ability of U.S. launch suppliers to compete internationally. It has been assumed that an STS pricing policy reflecting full-cost recovery for this period will be implemented soon to take effect for launches on or after October 1, 1988. If this condition is not met, U.S. ELV companies will be unable to sustain their production until STS and Ariane capacity is filled and a stronger demand for ELV services again appears. (U)

A major factor that directly affects ELV prices is their flight rate. An adequate flight rate is required to justify an economic production rate. Analysis has shown that below four vehicles per year, the unit costs rise sharply; above this rate, the unit costs drop gradually. (U)

Because of the domestic ELV industry's inability to be competitive with current subsidized pricing of STS and Ariane, their production lines are beginning to close down or will close down in the very near future if the commercial prospects do not brighten. The production line for Delta is effectively closing now, the Titan line is nearly closed, and the Atlas line will close soon. Without firm contracts signed within a year, these manufacturers cannot afford to sustain a capability costing tens of millions of dollars per year. (U)

If the current ELV production lines close, future prices (compared to those in this study) would be substantially increased because of restart costs and may preclude any likely future consideration of reopening the line. These increases would be caused by start-up costs for both the manufacturers and their suppliers; the dispersion of the technical and production personnel to other jobs; the need for retooling; and the need to reestablish production facilities. Such increases would greatly limit the domestic ELV industry's future ability to compete internationally. (U)

Defense ELVs

The Department of Defense plans to acquire and use a limited number of ELVs on the East Coast to complement its primary launch vehicle, the Space Shuttle. DOD is proceeding with plans to procure competitively an ELV based on the Titan or Space Shuttle solid rocket boosters. The vehicle chosen as a result of this competition will carry a Shuttle-equivalent payload and is intended to provide DOD with assured access to space. DOD's plan could also facilitate commercialization of U.S. ELVs by:

- supporting their underlying production infrastructure over the next several years (even if a different sized launch vehicle is produced for the commercial market);
- helping assure their longer term viability. (U)

Defense procurement of one ELV system could also provide some indirect benefit to supporting the production base of other potential U.S. ELV suppliers. In some instances, different booster configurations use the same rocket motors from the same suppliers. For example, it should be noted that although the vehicle manufacturers are different, each uses rocket motors (liquid or solid) that are made by Rocketdyne, Aerojet General, Thiokol, and UTC's Chemical System Division. (U)

In addition, DOD is now planning use of the Titan II ICBMs as a West Coast space launch vehicle which would further broaden the support base for U.S. ELV operators, allowing both apparent longer term viability and the likelihood of lower prices than considered in this study. These factors would help to increase U.S. commercial ELV international competitiveness. (U)

VI. Launch Demand and Capacity

Payload Demand Assumptions

The total Free World demand for launch services includes all military, civil government, scientific, experimental, international, and commercial payloads. Such a projection does not exist in a single document. To create an estimate of total demand, the following sources were used: The NASA mission model (1982-2000), the DOD launch projections, the STS manifest, the Ariane manifest, and the Battelle Low Model of foreign and commercial payloads. (U)

In analyzing the market for Free World payloads, the following assumptions have been made: (U)

- o Government-sponsored payloads will generally fly on the launch vehicles of those nations until the available capacity of the national system is exhausted (except for cooperative research payloads with other nations). (U)

- o The remaining market and thus the demand for commercial launch systems is limited to the residue of payloads that are not identified as belonging to a nation. This residue of potential demand has been termed the "competitive" or "target" market. (U)

By subtracting government payloads from the estimate of total Free World payloads, a target commercial market was developed. For the period covered by this study, this target market consists essentially of communications payloads to geosynchronous orbit. (U)

There are many different launch demand projections made each year. All have historically overstated the demand for launch services. One of these demand projections is that made by Battelle's Columbus Laboratories. Each year Battelle makes a high and a low model demand projection of payloads. The Battelle Low Model has been the most conservative of all the projections; although, it should be noted that historically projections four years or more in the future have been too high by about 25 percent. (U)

The Working Group agreed to use a modified Battelle Low Model as a nominal case. The Working Group made adjustments to update the Battelle Low Model, which effectively increased it by 10-15 percent to reflect projected payload slippage from Ariane. This projection is lower than other available projections and was selected in an effort to not overstate demand. Battelle maintains that the model has been corrected for earlier over-optimism. While the modified Battelle Low Model used by the Working Group calls for 17 to 22 payloads to be launched each year starting in 1988, the current manifests for STS and Ariane in 1987 are now projecting only a total of 12 payloads. (U)

TABLE I (U)

Working Group Estimate of Competitive Commercial Satellite Market

Payload Size Class 1/	FY 88	89	90	91	92	93	94
PAM D	8	9	8	7	15	8	5
PAM D II	1	3	4	4	4	10	6
Atlas/Centaur	5	3	2	3	1	1	9
Large	3	5	3	5	--	3	2
Total Payloads	17	20	17	19	20	22	22
(Equivalent Shuttle Flights) 2/.......	(6.2)	(7.8)	(5.8)	(7.4)	(4.7)	(7.3)	(7.4)

1/ See Appendix II for definition of payload classes (pounds to geosynchronous orbit).

2/ Equivalent Shuttle Flights is a term used historically to normalize the various sized payloads and launch vehicles by indicating how many Shuttle flights would be required to carry these payloads. In the same manner as that used in calculations determining Shuttle Charge Factor (see Appendix II), the size of a particular payload (weight or volume) is compared against the capacity of a nominal Shuttle orbiter to determine how much of the Shuttle's capacity is used by the payload. For example, a payload (spacecraft) 30 feet long and/or weighing 32,500 pounds would occupy one-half of the Shuttle's capacity for one flight. Dividing by 0.75 to reflect non-optimum launch loading (for numerous reasons, all Shuttle flights will not be 100 percent full but will "average" 75 percent full) gives an Equivalent Shuttle Flight of 0.66.

Launch Capacity Assumptions

U.S. Space Transportation System (STS) -- The baseline assumption of STS flight rates for this study is the NASA FY 1986 budget submission to OMB through 1991 and the Under Secretary of the Air Force's commitment letter of November 2, 1984. In this projection, a steady state flight rate of 24 flights per year is achieved by FY 1989. NASA estimates were used to update the out-years. See Table II. (U)

TABLE II (U)

Nominal Planned Shuttle Flights

	85	86	87	88	89	90	91	92-94
Projected STS Capability 1/	11.0	13.0	17.0	19.0	24.0	24.0	24.0	24
Less:								
Projected U.S. Government Demand 2/								
NASA	3.8	6.7	7.8	6.1	7.2	9.3	8.3	9
DOD 3/	2.0	2.3	5.7	8.0	10.3	8.3	9.0	9
Subtotal	5.8	9.0	13.5	14.1	17.5	17.6	17.3	18
Available for Commercial and Foreign	5.2	4.0	3.5	4.9	6.5	6.4	6.7	6

1/ NASA has established 24 flights per year after 1989 as a planning baseline for budgeting purposes. NASA believes that the currently funded facility investment and continued improvement in launch processing time lines could support launch rate capability estimates up to 28 flights per year. While accepting a capability of 24 flights per year, the rest of the interagency Working Group believes that an actual rate of 18-20 flights per year will more likely be realized.

2/ The outyear U.S. Government demand projections reflect use patterns consistent with those in the preceding years. These projections do not reflect changes in use patterns which may occur because of the Space Station program. NASA believes that it is far too early to quantify such projections with any validity. Previously, NASA projected 4 to 6 Shuttle flights per year to support a Space Station. In addition, the projected DOD demand does not include additional launches which may be required for the Strategic Defense Initiative.

3/ The DOD STS flight rate assumes that two launches per year will be made on complementary ELVs starting in 1989. However, there has been no assumption made about potential U.S. Government use of Titan IIs.

25X1

U.S. Commercial ELV Capacity -- Nominal, near-term production rates for each potential commercial launch vehicle, based on production capacity, have been provided by the individual companies. However, the existing lines are now closing. It should be noted that the maximum production rates using current facilities could be as much as 50-100% higher than shown below. See Table IV. (U)

TABLE IV (U)

	88	89	90	91	92-94
Delta	8	8	8	8	8
Atlas	8	8	8	8	8
Titan	4	4	4	4	4
Total ELVs	20	20	20	20	20
(Equivalent Shuttle Flights)	(7.6)	(7.6)	(7.6)	(7.6)	(7.6)

STAT

Page Denied

VII. Factors Affecting Choice of Launch Vehicle

Decision Criteria

During the course of the analysis, members of the Working Group contacted a variety of U.S. launch companies and satellite operators to establish what went into decisions on launch service selection. (U)

The customer's selection of a launch system depends on a number of factors. The most predominant factors are price, schedule availability, and schedule reliability. Other factors, such as vehicle reliability and insurance, also influence the decision, but not to the extent of the first three factors. The weight of these factors will vary depending on whether the client is replacing a satellite on a planned schedule, or is undertaking a new application. (U)

Price

Results of the survey showed, in essence, that a difference in price per launch of any appreciable amount ($0.5-2.0 million) was sufficient to affect the selection of a launch vehicle, all other factors being equal. In reality, all other factors are never equal. For example, the added assurance of using more than one launch system can alter this criterion. The limit seems to be about five percent of launch price. Above this magnitude of differential, price becomes the dominant factor. (U)

Schedule Availability

The significance of being able to place the payload in orbit at a specific time varies greatly depending on whether this is a planned replacement for an expiring satellite (less urgency) or a new application. For the new application, it is of major importance to get the revenue-stream started, begin the return on investment, and get ahead of future competitors. Some of these costs can be converted into time-value costs and some cannot. Time-value costs of a delayed schedule can be derived by calculating the present-value of the delayed revenue stream. For communications satellites, whose revenues can run from $20 to $30 million per year, a delay of only a few months can begin to increase costs noticeably. (U)

If the real (inflation adjusted) cost of capital is five percent, a six-month delay in launch schedule from the needed date could be worth about a $4 million differential in the quotation for launch services. Further, the loss of competitive advantage by not being there early and capturing potential customers for the satellite cannot be quantified. (U)

Schedule Reliability

The same time-value factors cited above also apply to the problem of schedule reliability. While the customer can pace his procurement and investment around the planned launch date to minimize interest and capital costs, unanticipated delays beyond the schedule date result in increased costs for additional interest, lost revenues, and lost customers. However, historically, there is an 80 percent probability of experiencing at least a two-month, and likely a six-month, schedule slip. (U)

Communications satellite operators often contract with customers on the basis of penalty clauses if service is not available when promised, with automatic termination after six months. For many applications, the need for schedule protection can overcome some differential (perhaps five percent) in the quoted price of launch services. However, this depends critically upon the customer's assessment that the launch supplier is able to meet schedule commitments. (U)

Vehicle Reliability

U.S. ELVs have proven their system reliability over several hundred flights. Both the Ariane and the STS have established their system reliability over a small number of launches (11 and 14, respectively). (U)

From the perspective of a user, the issue is not that of the reliability of the individual launch vehicle components as much as it is that of the total system. For example, the reliability of the upper stage must be combined with that of the Shuttle or a commercial ELV. Current upper stage problems for payloads launched by the Shuttle have reduced the overall success of the Shuttle to that comparable with Ariane. (U)

Insurance

25X1

[redacted]

Financing

Every indication is that for commercial U.S. ELV operations, the U.S. financial community can match any financing option offered by Arianespace if it is financially prudent to do so. (U)

Marketing

A strong marketing effort based on the approach of serving the customers' needs and protecting their launch dates can be important in the awarding of the launch services contract. Thus, Arianespace and the U.S. commercial ELVs have a marketing advantage over the STS, which is publicly recognized as being dedicated to servicing the U.S. Government's needs first. Changing Government priorities combined with the possibility (however unlikely) of pre-emption by the DOD could jeopardize the launch schedules for private sector users of the STS. However, the NASA Administrator has testified to Congress that NASA intends to assign only critical U.S. Government missions a higher priority than commercial and foreign payloads. (U)

Impact of Other Laws and Policies

In the past, the USG has on occasion denied export licenses for U.S. satellite manufacturers to export their products for launch overseas. Although one direct and desirable impact of this action is to ensure that U.S. manufacturers use U.S. approved launchers, another less desirable result may be to stimulate users to buy both their satellite and their launches overseas. (U)

Declassified in Part - Sanitized Copy Approved for Release 2012/03/23 : CIA-RDP92B00181R001701630002-1

VIII. Comparative Pricing

The two dominant components of launch costs are those of the launch vehicle and the upper stages. Cost and price estimates were obtained from the following sources: (U)

- STS. Estimates of STS total operating costs and proposed prices were obtained from NASA's pricing study. The STS price reflects NASA's estimates of both the cost of Shuttle launch operations and the price for the upper stage required by current generation commercial satellites. An Alternative STS Pricing Case was also analyzed to illustrate the effect of a range of pricing assumptions on international competitiveness. (U)

- Ariane. Estimates of Ariane pricing were obtained using the pricing formula ESA has made available to potential customers starting in 1987. These prices are consistent with cost estimates provided by the Intelligence Community. These prices are higher than the current subsidized Ariane prices and are believed to more closely reflect their actual costs. However, Arianespace is expected to adjust its prices to remain below the prices charged by its competitors. (U)

- U.S. ELVs. The three primary ELVs included in this study are Delta, Atlas, and Titan. Each competitor covers a range of lift capabilities. The specific pricing data for each variant were provided by the contractor community on a proprietary basis. In order to make these data available in the report, a range of domestic ELV prices for each payload class was calculated. This avoids the publication of contractor-sensitive data and the implication of the Government evaluating individual company viability as opposed to the commercial industry viability. These data are based on a production rate of four vehicles per year with any non-recurring development costs recovered over the first eight vehicles. (U)

- Upper Stages. Prices for upper stages used in this study were supplied by both NASA and the contractors. (NOTE: The Ariane system does not require an additional upper stage; a factor taken into account in the calculation.) (U)

In the analysis, typical NASA load and charge factors are used for each payload class to obtain the appropriate STS prices. Estimates of STS optional services are also included. (See Appendix II.) (U)

25X1

[redacted]

Domestic ELV performance and mixing capacities provided by the respective suppliers were used to project appropriate ELV prices for individual payload classes and when flown in combinations. (U)

STS Pricing

The following cases illustrate a range of pricing for the STS: (U)

- o NASA Proposal -- Proposed NASA FY 1989-1991 charge per flight--$87M (82$) or $101.7M (86$). Based upon NASA's estimates of the average operating cost of Shuttle flights. (U)

- o Alternative Case -- 30% higher price -- $109M (82$) or $132.2M (86$). Reflects inclusion of some additional cost elements in the price (such as recovery of depreciation of Government assets). (U)

STS Prices by Payload Class* (U)
(1986 $M)

PAM-D	PAM-D II	Atlas-Centaur	Large
30-37	42-51	62-74	116-141

* Includes upper stage hardware, launch support, optional and mission unique services as follows: PAM-D -- $9M; PAM-D II -- $12M; Atlas-Centaur (AMS) -- $22M; Large (TOS) -- $35M.

25X1

U.S. ELV Pricing

The ELV prices shown below reflect nominal likely prices (not costs), as reported by the U.S. ELV industry, for servicing the classes of payloads indicated. It is important to note several key assummptions that were used in deriving these ranges. Where applicable: (U)

- o A production rate of 4 per year was assumed. (U)

- o Non-recurring costs were amortized over 8 vehicles. (U)

SECRET

- o The unit production costs of the vehicles were averaged over the first two years (i.e., the second year's production run was usually cheaper because of start-up costs incurred in the first year). (U)
- o A reasonable profit margin was assumed. (U)
- o Mixing of payloads was assumed where viable. The lowest price represents the optimum mixing of payloads while the highest price assumes no mixing of payloads. (U)
- o Upper stage hardware and launch servicing costs were identical to similar systems on Shuttle. (U)

U.S. ELV Prices by Payload Class* (U)
(1986 $M)

PAM-D	PAM-D II	Atlas-Centaur	Large
37-42	50-55	67-77	116-130

* Includes upper stage hardware, launch support, optional and mission unique services as follows: PAM-D -- $9M; PAM-D II -- $12M; Atlas-Centaur (AMS) -- $22M; Large (TOS) -- $35M.

Summary of Prices by Payload Class (U)

	PAM-D	PAM-D II	Atlas-Centaur	Large
STS	30-37	42-51	62-74	116-141
Ariane	27-33	38-45	54-67	76-117
U.S. ELVs	37-42	50-55	67-77	116-130

Assessment

The results of the above analysis are summarized in Figure 1 which shows a range of estimated pricing for the U.S. STS, Ariane, and U.S. ELVs for four payload classes. For each payload class, the top and bottom ends of the bar graph shows a range of prices as discussed above. (U)

For the STS, the bottom end of the bar graph shows the NASA proposal for STS pricing. The top end of the bar graph indicates STS prices under the Alternative STS Pricing Case. (U)

With the implementation of full-cost recovery for the STS, the zone of price competition among the providers of launch services is very likely to shift upward. That is, Ariane's pricing is expected to rise with that of the STS to enhance economic return--but will probably be kept slightly below the new STS or U.S. ELV pricing for competitive purposes. Whether the STS or U.S. ELVs can be commercially competitive in the longer term depends largely on how high the "full-cost pricing" becomes for both the STS and Ariane. (U)

At the NASA-proposed STS pricing, STS and Ariane would compete for the target market. As shown in Figure 1, the STS would have a pricing advantage for smaller payloads, while Ariane would have a pricing advantage for larger payloads. However, U.S. ELV operators would be at a significant price disadvantage (the NASA-proposed STS pricing would be $7-10 million per flight below the mid-point of the U.S. ELV pricing range) and U.S. ELVs would be unable to compete in the international marketplace for launch services. (U)

A higher STS cost per flight than proposed by NASA will result if the projected Shuttle flight rate of 24 per year is not attained (as the rest of the Working Group believes is likely), or other cost elements (such as recovery of depreciation of Government assets--the orbiters) are included in the price in accordance with Government-wide cost recovery policy. This study makes no attempt to calculate the amount of pricing increase that might be related to any specific changes in such assumptions. However, changing some of these assumptions could easily result in a 30 percent higher price as reflected in the Alternative STS Pricing Case. The Alternative STS Pricing Case illustrates the sensitivity of international competitiveness to such an increase in STS price. (U)

Under the Alternative STS Pricing Case, STS and U.S. ELV prices would be much closer. At this pricing, STS and U.S. commercial ELVs would compete more equally for the target market not captured by Ariane (about half of the nominal demand). Assuming optimum mixing of payloads, Ariane would appear to have a price advantage, especially for the larger payload classes. (U)

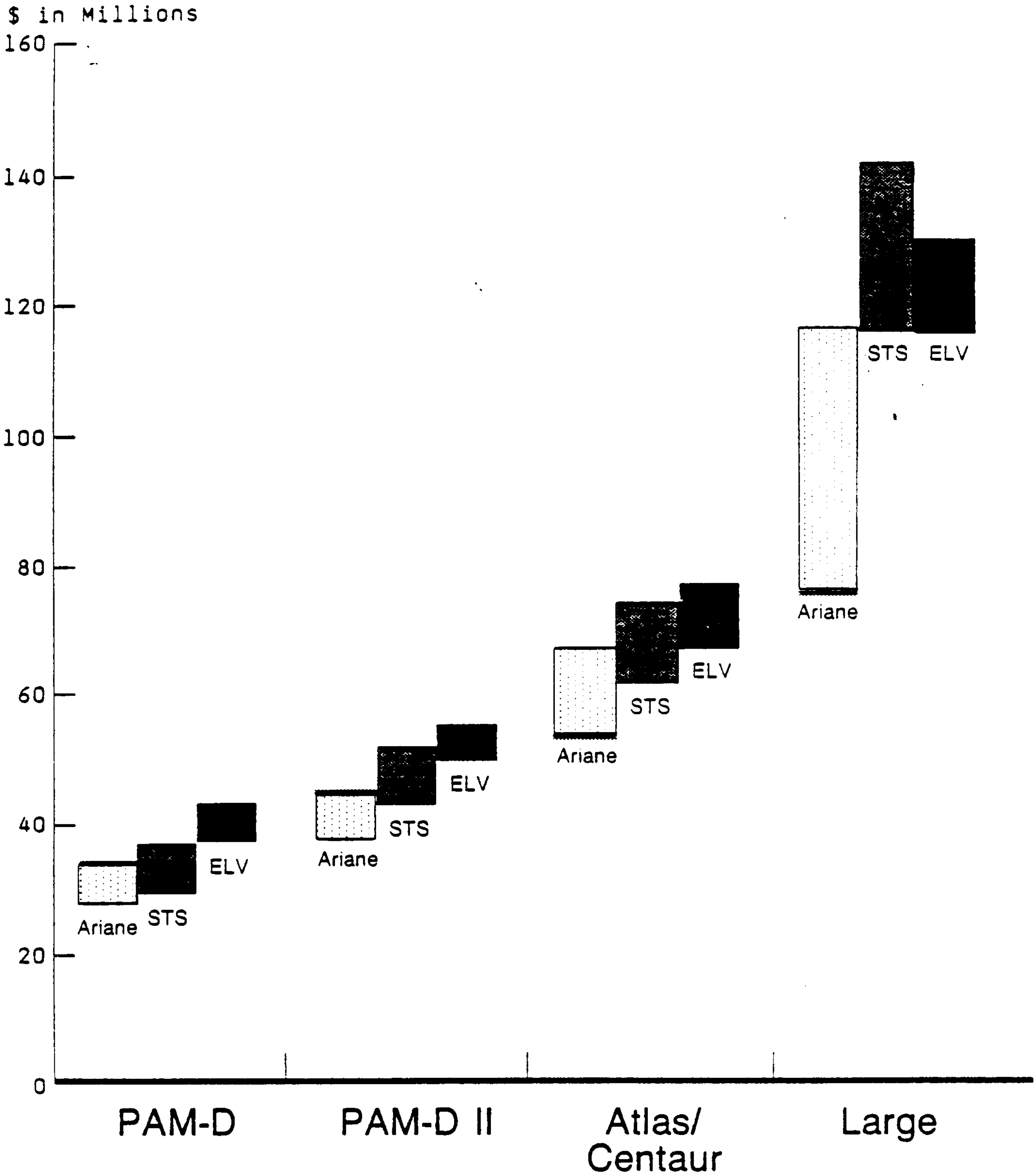
The Alternative STS Pricing Case would establish a different competitive environment in the international marketplace for launch services. It would provide U.S. ELV operators with more assurance that the U.S. Government would not undercut their prices and would encourage their participation in this market. No price level can guarantee that U.S. ELVs will be price competitive with the launch systems of other nations; that depends upon the pricing policies adopted by those nations. However, there appears to be little reason for Arianespaçe to maintain highly subsidized prices once the STS transitions to full-cost recovery. (U)

The Alternative STS Pricing Case would also decrease the competitiveness of the Shuttle as a launch vehicle for routine commercial payloads and would likely result in a net reduction in the Government's collection of reimbursements. A previous study supporting the initiative to commercialize U.S. ELVs concluded that this loss of reimbursement is less significant than the benefits of maintaining a U.S. commercial ELV industry. Even without any commercial traffic, the Shuttle's unique capabilities would continue to demonstrate U.S. leadership in space transportation. (U)

The effect on international competitiveness of lower STS pricing than proposed by NASA was not assessed since such pricing would be inconsistent with the President's full-cost recovery policy for commercial and foreign STS flights effective on October 1, 1988. (U)

Figure 1

Launch Prices by Payload Class



▬ = Arianespace published price for launches after January 1, 1987.

IX. Uncertainties and Risks

There are major uncertainties in the outlook for international competitiveness in the provision of launch services, including: (U)

- o The possibility of alternative communications technologies (e.g., fiber optic cables), which could reduce the number of satellites needed. (U)

  - Ground alternatives to space communications satellites are becoming more competitive, and movement away from satellite communications to ground-based alternatives may be accelerated by the inherently high costs of most current space launch technologies. The launch vehicles now competing commercially (primarily the Shuttle and Ariane) require national subsidies to offer prices which do not recover all of their costs. Recovery of total costs would require increases in launch prices. Some communications satellite vendors believe that such price increases may be sufficient to accelerate the movement away from space communications to ground-based alternatives. (U)

  - Unless the inherent costs for space launch can be truly reduced (i.e., not artificially reduced by setting prices less than total cost), a movement by the communications industry away from space, because of increased prices, may be in the best economic interest of the U.S. The U.S. taxpayer may subsidize the space mode when more economically efficient technologies are available. Private ELV manufacturers believe their vehicle technologies are sufficiently low in cost to permit space launch services that are both competitive and economically efficient. (U)

- o The trend toward larger, more capable and longer-lived satellites, which could also reduce the number of satellites needed. (U)

- o The extent to which there will be timely demand by adequate numbers of compatible payloads to permit efficiently using the full capacity of launch vehicles ("mixing)". (U)

- o Possible changes in projected nominal U.S. Government demand. (U)

- Decreased demand could result from program delays or cancellations. (U)

- By the mid-1990's, increased demand could result from the Space Station, space commercialization, or the Strategic Defense Initiative (SDI). (U)

o The ability of the Space Transportation System to achieve the build-up of flight rate from four per year in 1984 to 24 per year by 1989. Although NASA is confident that the planned flight rate will be achieved on schedule, the rest of the Working Group believes that an actual rate of 18-20 flights per year is more likely. (U)

- NASA has been able to achieve only about one-half of its projected launch rate buildup in 1983 and 1984. (U)

- The National Academy of Sciences report stated in 1983: (U)

  "In the event of extended mission duration, more frequent repair, longer overhaul period, or contingencies that incapacitate an Orbiter for a prolonged period, the number of yearly launches may be reduced significantly below 24." (U)

o Whether Arianespace will raise its prices substantially in response to an STS price increase. Arianespace would have a strong economic incentive to maximize its return from current investment by raising prices. However, Arianespace could decide to restrain its price increase to seek a larger market share up to the limit of its capacity. (U)

o Whether the nations backing Ariane decide to increase its capacity to capture a larger market share. (U)

- Factors against such an expansion of capability include the substantial capital investment required, the length of time before additional revenues would be realized, uncertainties about demand, competing European space program funding needs (e.g., the man-rated Ariane 5), and the overall European economic situation. (U)

- However, Arianespace could still decide that the potential additional benefits are worth the additional investment and risk. (U)

- It should be noted that Ariane did not substantially increase its market share objective when introductory Shuttle prices were doubled to the FY 1986-1988 level. (U)

o Whether other national launch systems (Chinese, Soviet, Japanese) choose to enter the market more aggressively than is presently assumed, and if so whether they can overcome barriers such as technology transfer restrictions. (U)

Most of the uncertainties outlined above are beyond the control of the U.S. Government (these include technological developments, commercial demand, or decisions of other governments on the supply or pricing of their launch services.) The factors which the U.S. Government can control or influence are its own demand and the supply and pricing of U.S. launch services. (U)

Historical trends suggest that demand (both commercial and Government) and flight capacity (e.g., flight rate) will all rise more slowly than currently projected. (U)

Assuming the STS is able to compete for a high proportion of commercial and foreign traffic into the early 1990's, the continued availability of the STS for such traffic would be very sensitive to small increases in U.S. Government demand or small decreases in achievable flight rate. This occurs because commercial payloads are usually much smaller than many Government payloads. Each Shuttle flight can typically carry several commercial size payloads. A decrease in achievable flight rate of one flight per year, or an increase in Government needs by one flight, could displace several commercial payloads, causing the U.S. to lose up to 12-25 percent of the world demand. The U.S. would be especially vulnerable to such loss by the mid-1990's when the Space Station or SDI may substantially increase U.S. Government demand and potentially displace commercial payloads. (U)

There is a serious risk that by the early 1990's Shuttle availability for commercial and foreign traffic could be reduced by greater than nominal U.S. Government demand or lower than planned flight rates. In the absence of U.S. commercial ELVs, the prospect of this situation would cause a difficult and predictable choice for the U.S. Government. By the FY 1987 budget, the U.S. Government would have to decide whether to: (U)

- Expand Shuttle capacity. This would add to the large world oversupply of launch capacity with a huge and very costly increment of new capacity to meet contingent commercial needs. Because a Shuttle orbiter is such a large increment of capacity, this option would provide a far less economically efficient matching of supply and demand under varying market conditions. Because of the long leadtimes involved in expanding Shuttle capacity, the U.S. Government would have to make a $2.5 billion decision by next year (before the fifth orbiter option expires). (U)

- Allow a massive loss of U.S. market share. This would permit foreign competition to dominate the market for launch of commercial satellites, costing the U.S. losses in business revenues, balance of payments, jobs, and taxes. (U)

The U.S. has a better option than the choices outlined above for competing in the international market for launch services. Encouraging the competitiveness of U.S. commercial ELVs would: (U)

- Carry out the President's ELV initiative. (U)

- Require no additional U.S. Government investment. (U)

- Rely on the private sector for efficiently performing a commercial service. (U)

- Provide a more economically efficient source of additional launch capacity. (U)

U.S. commercial ELVs provide the best hedge available for dealing with the uncertainties in the international marketplace for commercial launch services. It would be appropriate to take reasonable steps to encourage the viability of U.S. ELVs. (U)

The option for U.S. commercial ELVs will disappear unless action is taken now to implement fully a pricing policy for commercial and foreign users that recovers all of the costs of the STS, consistent with Government-wide cost recovery policy. (U)

Other Potential Launch Suppliers*

Summary

The CIA believes that both the Peoples' Republic of China and the Soviet Union have the technical potential to become competitors in the commercial launch services arena within the time period of the study. However, there are major obstacles to China or the Soviet Union capturing large shares of the launch services market. These obstacles include technology transfer restrictions which may prevent the launch of Western-built satellites on Chinese or Soviet vehicles, the perceived reliability of Chinese and Soviet space launch vehicles, scheduling reliability, financing, and the willingness of Chinese and Soviet authorities to be open about their space launchers and facilities. (S NF)

China and the Soviet Union have made public statements concerning their entry into this arena, and both nations have a surplus launch capability that could satisfy some customer needs. The Chinese launch services would be primarily restricted to low-earth orbit, at present, with limited services to geosynchronous orbit. Increased production of the CSL-3 third stage would permit the Chinese to have the potential to capture a major share of the geosynchronous launch services market. (S NF NC)

Chinese ELVs

China is probably formulating plans to participate in the expanding launch services market. A high-ranking Chinese space official, stated publicly in September 1984 that "China was now in a position to launch satellites for other countries," and that they had rockets for launching both large low-orbiting and geostationary satellites. (S NF NC)

25X1

In September, China also signed their first space cooperation agreement with a Third World country--Brazil. That agreement provides for the joint launching of rockets and satellites--apparently from China. This, too, will be a first for the Chinese. (S NF NC)

In China, the very ambitious satellite programs of the late 1970's have been scaled down to where even the military is conducting only one launch per year, leaving excess launch capacity. (S NF NC)

Production figures for CSL-3 third stages are difficult to calculate; however, a rate of about one per year from 1979-1984 is indicated. China has used two and may intend to use another in 1984, leaving an immediate surplus of three. From 1985 until 1989, the CIA anticipates five additional CSL-3 launches, but expects third-stage production rates to go up as China learns more about the system. (S NF NC)

While launch facilities and ELVs are available to sustain launch rates of at least four per year to probably a high of one per month--as more vehicles are produced--there is evidence that the Chinese do not have the technical personnel to handle more than one launch every two months and may lack key permanent electronics at some launch sites to sustain more than six per year. (S NF NC)

Although China has approached Western countries and offered to become the launch service for the Third World, China has little or no experience in international space competition. In mid-1984, during negotiations for purchase of a direct broadcast satellite system from the West, China recognized that they were inexperienced and hired a U.S. consultant to help them write their request for proposals. (S NF NC)

25X1 [redacted]

Another problem could be insuring payloads on a Chinese ELV. Because Western companies know very little about China's space program, they may refuse to insure payloads or set extremely high rates, making launch insurance prohibitive. In such a case, the Chinese could decide to insure the payload themselves. (S NF NC)

Soviet ELVs

25X1

In view of these problems, Moscow could decide to seek an entry into the commercial launch service market by offering to both manufacture and launch satellites for its clients in the Third World. Although there is no evidence of Soviet intentions to manufacture satellites for foreign countries or firms, the USSR is capable of doing so, particularly in the field of communications satellites. (S NF)

The Soviet decision to make the first pictures of the Proton available on December 15, 1984, may mark a more open attitude about the Proton. Such a move would help the Soviet efforts to commercialize the Proton. (U)

China's announcement of its intentions to enter the space launch market, moreover, may motivate Moscow to increase its efforts to establish itself as a launch service for Third World satellites before the Chinese can do so. The Soviet Union and China, however, are likely to offer launch services to those states where they already have close ties, thus, for the most part, avoiding direct competition. (S NF)

Page Denied

Declassified in Part - Sanitized Copy Approved for Release 2012/03/23 : CIA-RDP92B00181R001701630002-1

Payload Classes (U)

Class	Weight to Geosynchronous Orbit (pounds)	Shuttle Charge Factor
PAM-D	1200-1400	0.21
PAM-D II	1401-2050	0.29
Atlas/Centaur	2051-2600	0.39
Large	2600-5100	0.80

NOTE: Shuttle Charge Factor represents the percentage of the Shuttle bay payload by weight or volume, whichever is greater, including upper stage and support equipment, divided by 0.75. The division by 0.75 acknowledges and compensates for the reality that Shuttle flights will average about 75 percent full, when compared to an absolute theoretical 65,000-pound load-carrying capability of a Shuttle orbiter.

For these computations, the Shuttle Charge Factor is based on the larger of the payload weight ranges. (U)

STAT

Page Denied