



THE DEPUTY SECRETARY OF DEFENSE  
WASHINGTON, D.C. 20301-1000

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23 NOV 1994

MEMORANDUM FOR ASSISTANT TO THE PRESIDENT FOR SCIENCE AND  
TECHNOLOGY

SUBJECT DoD Implementation of National Space Transportation Policy

In accordance with the requirements of PDD/NSTC-4, National Space Transportation Policy, of August 5, 1994, I am pleased to submit the attached DoD Implementation Plan for the National Space Transportation Policy

A key element of the DoD Plan is a new program for an evolved expendable launch vehicle family. Our goal for this new program is that the family of vehicles meet all our future medium and heavy lift launch requirements. This should maintain an affordable and assured access to space for the national security space sector and should also provide benefits for the launch segment of the commercial space sector

This report is also being submitted to the Assistant to the President for National Security Affairs

Attachment

**DOD IMPLEMENTATION PLAN**  
**FOR**  
**NATIONAL SPACE**  
**TRANSPORTATION POLICY**  
**PDD/NSTC-4**



**4 November 1994**

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## OVERVIEW

The Presidential Policy Directive for National Space Transportation Policy (PDD/NSTC-4) tasked the Secretary of Defense to provide an implementation plan for improvement and evolution of the current U S Expendable Launch Vehicle (ELV) fleet. This plan includes current ELV systems, plans to improve and reduce the overall cost of space launch, the relationship of foreign launch systems and technology, the use of excess intercontinental ballistic missiles (ICBMs), and our space launch technology.

The fundamental goal of the DoD is to provide assured, viable, low cost access to space through an adequate U S space launch capability, but it recognizes as an immediate priority the need to reduce the recurring cost of space launch. The DoD plans to make improvements in reliability, operability, and other characteristics of the common requirements set with the intent to reduce the recurring cost of space launch. However, improvements must consider fiscal limits for space launch development. To implement this plan, the DoD will emphasize acquisition streamlining, increase the use of commercial products and practices, and minimize requirements for unique government specifications. This plan also recognizes that the future of space launch is dependent on technology investment and development. The DoD intends to execute a coordinated space launch technology program to enable improvements to an evolved system and to mature DoD- unique requirements for reusable launch systems.

While focused on DoD programs, this plan is consistent with the coordinated Common Requirements Report and Technology Plan as tasked by PDD/NSTC-4.

## IMPLEMENTATION STRATEGY

To sustain current U S space launch capability, the DoD will maintain the current medium launch vehicle (MLV) and heavy launch vehicle (HLV) expendable vehicles and infrastructure of

the U.S. ELV fleet until cost-effective alternatives are available. The DoD believes the small launch vehicle (SLV) industry will mature through commercial activity and market pressures, and does not intend to invest heavily in SLV development programs.

The DoD will immediately begin a program to develop a cost-effective alternative to the current MLV and HLV boosters. This program is desired to allow transition opportunities consistent with payload/satellite block changes with a goal for the MLV in 2001 and the HLV by 2003, but earlier dates may be possible. It must be recognized that fiscal constraints may prevent the development of a completely new vehicle to meet this schedule. The planned program therefore recognizes that the modification of an existing ELV into a family of inter-related vehicles -- to meet the schedule and reduce the cost of procuring and operating current separable MLV and HLV systems -- is highly probable. However, any proposal that meets cost and schedule will be considered. The DoD plan is consistent with the findings and conclusions of the Space Launch Modernization Plan -- a family of launch vehicles evolved from a current system, an evolved expendable launch vehicle (EELV) family. The program plan outlined below is preliminary and may be revised as the Department develops a detailed acquisition strategy for proceeding with the EELV acquisition.

The DoD will maintain a Core Space Launch Technology Program in parallel to the EELV program. DoD investments will focus on technologies common to ELV and reusable space launch. This technology work is intended to lead to improvements in the evolved systems and to ensure DoD unique features are explored in the reusable launch vehicle work being led by NASA.

## SUSTAINING CURRENT SPACE LAUNCH CAPABILITY

The current space launch capability must meet mission requirements established in the Department of Defense National Mission Model. This model includes space launch mission

requirements for national security, civil and commercial missions. The DoD plans to continue use of the Titan II, Delta II, Atlas II and Titan IV space launch vehicles and to complete ongoing development programs for these vehicles. The Delta launch vehicle flight safety and avionics upgrades will be completed in FY96. A reliability improvement program on the Atlas II propulsion systems is ongoing, with an expected completion in FY98. The Titan IV program is executing high-pay-off, near-term initiatives to improve reliability and schedule dependability, and to reduce life cycle costs. Titan IV projects include facility repairs, modifications to the Centaur Upper Stage ignition system, corrosion control, and hardware surveillance for shelf-life aging. All of the current launch vehicles have continuing programs on safety, environmental protection, parts obsolescence, and preventative maintenance. The DoD will maintain a launch capability for the Delta, Atlas, and Titan IV space launch systems at Cape Canaveral and will also maintain the infrastructure and range resources that support these launch programs. At Vandenberg Air Force Base, the Titan IV and Titan II capability will be sustained. Construction of the new Atlas II Space Launch Complex at Vandenberg will continue. Systems check-out and pathfinder activities will prepare this facility to support NASA and national security missions beginning in FY98. Support of the Delta launch complex at Vandenberg AFB will continue to be shared by NASA and DoD in accordance with the applicable Memoranda of Agreement.

The flight tracking, safety, and other supporting infrastructure of the Eastern and Western Space Launch Ranges must also be upgraded and sustained to support these launch programs. This includes the completion of Range Standardization and Automation (RSA) and other investments in the space launch infrastructure. These projects are critical to reduce the operating costs of the ranges and to modernize operations for the long term. The RSA includes computer and electronics upgrades to completely overhaul operations at both ranges. Other infrastructure investments include industrial utilities modernization and repairs to facilities and roads. Over one billion dollars is being invested, and completion is expected by FY 04.

Currently the industrial base that supports MLV and HLV expendable space launch includes eleven launch pads, five launch teams, three launch vehicle production and processing industries, two launch ranges, and various support resources. This industry has already begun to consolidate the infrastructure on its own, but because of the reduced launch demands in the foreseeable future, the DoD must begin to downsize the infrastructure. Increasing industrial efficiency and reducing procurement and operating costs are essential to ELV development plans.

### EVOLVED EXPENDABLE LAUNCH VEHICLE

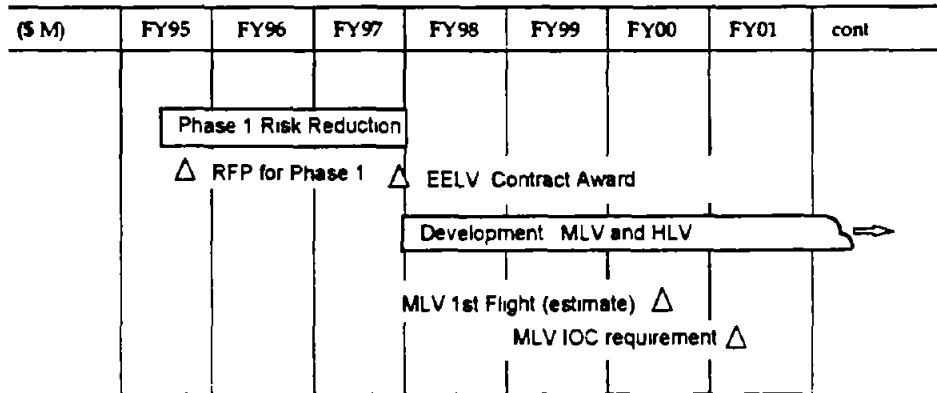
The objective of the EELV program is to reduce total cost for MLV and HLV space launch. The envisioned EELV must be capable of launching the missions currently flown on Titan II, Delta II, Atlas IIA/IIA-S, and Titan IV. In general this defines the payload weight, volume, environment, and desired orbits for the EELV family.

The EELV acquisition will be based on full and open competition in the U.S. industry. The EELV program strategy is to conduct an industrial competition that will result in the downsizing of the space launch industry to a single provider for the EELV family. It is intended to reduce procurement costs by maximizing the commonality within the EELV family. Common systems and components will enhance production rates by capturing a large range of payloads, thereby improving the efficiency of production and processing. Operating costs will be reduced by decreasing the number of launch complexes, launch support crews, and support requirements. Foreign launch vehicles will not be considered for the EELV program. EELV will be allowed to use foreign launch technology or components, but sole dependence on foreign sources for supply will not be permitted. Domestic U.S. alternatives to the foreign sources must be available in a reasonable period of time. The EELV competition will encourage commercial innovation to expedite development and encourage cost savings. Performance and commercial specifications

and standards will be used in lieu of military specifications and standards, unless no practical alternative exists. Industry will be encouraged to offer alternative solutions to the total USG mission model requirements, rather than to meet detailed government specifications. The competition is tentatively planned to begin with a risk-reduction phase, and that the subsequent phase(s) will ultimately result in selection of a single prime contractor for production and operation. The first phase supports concept refinement and demonstration of key components or technologies to reduce program risk. At the end of this phase, the USG must be convinced the program is executable and that improvement in the recurring costs of production, operation, and support will be achieved. Several contractors will be funded to further develop their concept in this phase. Proposals for Phase 1 will be requested in FY95. The final down-selection will occur in late FY97, with a demonstration MLV launch planned in FY2000. Competitors will include transition plans from current MLV and HLV systems and infrastructure. Planned DoD transition windows for MLV occur in 2001. The HLV transition window will depend on the cost of payload integration to the EELV and the contractor's proposed schedule, but it should begin between 2003 and 2005. DoD is looking to fund the EELV development program at \$0.7 billion through FY 2001 and at a total program development cost of approximately \$2.0 billion. Commercial investment will be encouraged. If investment is included, bidders must identify how they intend to recover their investment in the EELV recurring cost.



*Evolved Expendable Launch Vehicle Schedule*



*Note*

*1 This supports the vehicle family design, infrastructure development and 1st article demonstration flights for the MLV and HLV*

Figure 1 EELV Planned Schedule

COMMERCIAL PROGRAMS

By maintaining a viable space launch capability, the DoD supports U S commercial programs The DoD will not financially support development of products for uniquely commercial requirements The EELV program will develop a lower-cost space launch capability, and the EELV producer will be able to offer the EELV family to the commercial market The streamlined acquisition and the use of performance standards and commercial specifications will facilitate the EELV family's competitiveness in commercial markets Current DoT policies and practices for commercial space launch will continue with EELV

## FOREIGN LAUNCH VEHICLES

In accordance with the policy, the Department of Defense does not plan to launch DoD payloads on foreign space launch systems. In accordance with Congressional tasking, a formal DoD policy on the use of foreign components and technology in space launch systems used by the Department of Defense is being developed and will be submitted to Congress. This policy will apply to the pending procurement of the EELV. Subject to certain restrictions, this policy will allow use of foreign components and technology in space launch systems developed and used by the Department of Defense. In particular, use of foreign components and technology in DoD space launch systems will be carried out so that DoD access to space cannot be denied by foreign suppliers of launch system components and technology. This can be accomplished by such measures as stockpiling critical foreign components and assuring that alternative sources for critical components could be developed in a timely fashion should foreign sources cease to be available.

The DoD intends to allow industry freedom to define optimum solutions in proposing EELV. For example, if the DoD engages in Russian engine testing as part of our technology effort, the information learned will be available to all contractors.

## EXCESS ICBMs

The DoD does not currently plan to use ICBM assets made excess by START agreements in orbital applications. We will consider on a case-by-case basis requests from other government agencies to develop this capability, and we will preserve the option to meet future DoD requirements with these systems, if cost-effective. It is important to note that Titan II is considered a space launch vehicle, and refurbishment of existing assets to satisfy government mission requirements will continue to be an option in launch vehicle procurements. Additionally,

several contractors use ICBM heritage designs and tooling to produce new hardware similar or identical in design. New production of launch vehicle systems using ICBM technology and design will be allowed for either EELV competition or commercial application, but new productions must comply with existing policies of proliferation control of missile technology, as well as START provisions.

## DOD TECHNOLOGY PLAN

The National Space Transportation Policy (PDD/NSTC-4) identifies the DoD as lead agency for expendable launch vehicle development, including technology, and NASA as lead agency for reusable technology development. Within DoD, the Air Force is the lead agency for space launch technology development. In complying with this policy, the Air Force's Science and Technology Program will continue to develop space launch technologies which support improvements to current expendable launch vehicles, DoD-unique interests in reusable launch vehicles, and development of future expendable launch systems.

A finding within the DoD's Space Launch Modernization Plan identified that the DoD core space launch technology program is significantly underfunded and externally constrained. Technology development must co-exist with the need to improve the current launch fleet, begin the EELV Program, and develop reusable launch systems. Subsequent to a review by Air Force Space Command, the Air Force increased space launch technology funding. The changes in the technology programs are based on coordinated military needs to ensure our investments support our future needs.

The DoD requirements generation process is the foundation for coordinating technology programs and military needs. Mission Area Analysis and Mission Need Statements define the

deficiencies and capabilities needed by the operating commands in the execution of their missions. Representatives of the operating commands, laboratories, and acquisition program offices participate in Technology Planning Integrated Product Teams (TPIPT) to prioritize and focus technology projects. The DoD, in conjunction with NASA and industry, has established the Integrated High Payoff Rocket Propulsion Technology (IHRPT) initiative to focus on the immediate priority of rocket propulsion. The DoD also supports other working groups between NASA and industry to promote coordinated planning activities instrumental in building successful cooperative relationships, eliminating duplication, and making maximum use of limited resources.

Technology development will support product improvement to the EELV system. Since EELV is envisioned as an evolutionary process, numerous technology insertion opportunities are anticipated. The DoD will maintain an interest in reusable space launch technology, and will coordinate with NASA's reusable technology programs.

The DoD program will continue to enhance our technology base, while pursuing national strategy goals. DoD has a strong exploratory technology effort with application to space launch. Current applicable exploratory development technologies are in the areas of high-energy-density material, advanced environmentally safe propellants and manufacturing methods, and advanced materials. The Advanced Development Technology programs are the most promising technologies identified in exploratory development. These programs are matured to demonstrate the technology at the subsystem or system level. The Air Force initiated the Integrated Powerhead Demonstration in FY94, a critical experiment to demonstrate high pressure, high speed turbopumps and gas generators which incorporate hydrostatic bearing technology providing reduced cost and improved reliability. This technology is expected to be available in FY 98 for technology transition. In FY 95 the Air Force will initiate the Robust Thrust Chamber Demonstration which is focused on thrust chamber and injector technology with reduced

manufacturing costs and increased component reliability and operability. This technology is expected to be available for transition in FY 99 and provide a 15 percent reduction in hardware and support costs. An integrated modular engine (thrust cell) demonstration is expected to transition in FY 00.

Through the TPIPT and IHRPT initiative, DoD technology will continue to focus on development of new technology which meets military needs while addressing technology goals of reduced stage failure rates, increased mass fraction, increased specific impulse, reduced support and hardware costs, and increased thrust-to-weight ratio by the year 2010. These goals, if fully realized and implemented, will increase payload capability and reliability, and significantly reduce overall costs.

## CONCLUSION

This implementation plan responds to the tasking of the President's Policy on National Space Transportation (PDD/NSTC-4). The DoD plan establishes the strategy to sustain and improve U.S. space launch capability. In the near term, the current space launch systems and infrastructure must be sustained to meet national security, civil, and commercial requirements. The DoD will establish a program to develop a family of vehicles to replace current medium and heavy lift expendable space launch vehicles. The primary objective of the Evolved Expendable Launch Vehicle family is to produce a cost-effective alternative to current expendable systems. Restrictions on the use of excess ICBMs and foreign launch vehicle technology and components are defined in this plan. The DoD's space launch technology programs will also support the modernization of current U.S. space launch programs. DoD will invest in programs that support the improvement of expendable launch vehicle systems and in programs that support DoD-unique interests in reusable systems.