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FINAL

Mission Need Statement

AFSPC 001-01,
for
Operationally Responsive Spacelift

ACAT Level I

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FOR
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1. Defense Planning Guidance Element.

1.1. Defense Planning Guidance. This Mission Need Statement (MNS) supports the FY 2003-2007 Defense Planning Guidance (DPG), August 2001, Part II, Strategy Guidance. "The President has directed DoD to achieve progress in transforming the U.S. defense posture to meet the security challenges of the 21st century. The aims of transformation are to maintain a substantial margin of advantage over potential adversaries in key functional areas of military competition (e.g., information warfare, power projection, space, and intelligence) and mitigate the effects of surprise."

1.2. National Guidance. The 14 Sep 96 National Space Policy states, "DoD shall maintain the capability to execute the mission areas of space support, force enhancement, space control, and force application"; and "Consistent with treaty obligations, the U.S. will develop, operate and maintain space control capabilities to ensure freedom of action in space and, if directed, deny such freedom of action to adversaries." US National Security Strategy (NSS) and National Military Strategy (NMS), as well as the current National and DoD space policies, identify uninhibited access to, and use of, space as critical strategic enablers of US military power.

1.3. USSPACE/Joint Guidance. Assured Access [to Space], as described in the 1998 *Long Range Plan* (LRP) "is the "on-demand use" of space lines of communication to enable unimpeded operations in and through space. It's essential to the conduct of space missions." ORS supports both the LRP concepts for Assured Access and the Joint Vision 2020 operational concepts of Dominant Maneuver, Precision Engagement, Focused Logistics, Information Superiority, and Full-Dimension Protection.

1.4. Air Force Guidance. The Air Force's *The Aerospace Force: Defending America in the 21st Century* states, "The country's growing investment in, and reliance on, space-based capabilities that support the national information and commercial infrastructure are creating an economic and military center of gravity--a vulnerability that, if exploited, could adversely affect the nation." ORS provides the ability to enhance and reconstitute our current and future space-based capabilities, such as: intelligence, surveillance, and reconnaissance (ISR); navigation and timing; communications; weather data; future Force Application and Space Control missions that are critical to joint operations.

2. Mission and Threat Analysis.

2.1. Mission Need.

2.1.1. Mission Description. ORS ensures the Air Force has the capability to rapidly put payloads into orbit and maneuver spacecraft to any point in earth-centered space, and to logistically support them on orbit or return them to earth. Once this capability is part of its space force mix, the Air Force will be postured to conduct the full spectrum of military activities required to ensure U.S. freedom of action, or defeat an enemy, in space. The conduct of these activities will be required for the United States to prevail in the increasingly operational medium of space. ORS supports eight of the Aerospace Power Functions listed in AFDD 1; Counterspace, Counterland, Strategic Attack, Counter-information, Spacelift, Intelligence, Surveillance, and Reconnaissance. As operational requirements, cost-effectiveness, and technology allow, migrating military operations to space implements the vision of the *USSPACECOM Long Range Plan*; dominating the space medium through "Control of Space" and "Global Engagement" and integrating space forces into warfighting capabilities through "Full Force Integration" and "Global Partnerships."

2.1.2. Mission Objectives. ORS is the key enabler for conducting the full spectrum of military operations in space and for achieving space superiority. ORS involves two sub-tasks. (1) *Transporting Mission Assets* to, through, and from space. This task encompasses the spacelift missions of delivering payloads to, or from, mission orbit and changing the orbit of existing systems to better satisfy new mission requirements. It also supports emerging missions like space control, missile defense, and force application. ORS must be available on demand, flexible, and cost effective. The second sub-task, (2) *Spacecraft Servicing*, encompasses traditional satellite operations activities, but it could also include resupply, repair, replacement, and upgrade of space assets while in orbit. Mission priority, cost trades, and technological advances will dictate the method for accomplishing these objectives.

2.1.3. National Military Objectives. The Air Force supports national military objectives through a planning structure built on six Core Competencies. ORS is directly related to five of these Core Competencies; Aerospace Superiority, Precision Engagement, Rapid Global Mobility, Information Superiority, and Global Attack.

2.1.4. Required Capabilities. ORS requires four key capabilities: (1) *On-demand satellite deployment* to augment and quickly replenish constellations to support crises and combat operations; (2) *Launch to sustain required constellations for peacetime operations*; (3) *Recoverable, rapid-response transport to, through, and from space;* and (4) *Integrated space operations mission planning* to provide near real-time automated planning to enable on-demand execution of space operations. Space systems providing ORS must possess the following characteristics:

2.1.4.1. Responsive. ORS systems must be ready to launch within hours of call-up, and to conduct military operations within hours of reaching orbit. Spacelift, and the supported space assets, must be able to quickly respond to a dynamic threat environment, changing mission requirements, and increased operational tempos and utilization rates. It is recognized that responsive payloads must be developed concurrently with ORS to provide maximum benefit to the warfighter.

2.1.4.2. Maneuverable. Once on orbit, ORS systems must have the maneuverability to rapidly achieve any earth-centered orbit (usually with an orbital period of 24 hours or less) to deliver, operate, recover, or service mission assets. In the far term, these spacecraft will require the ability to maneuver from one orbit to any other orbit in less than 48 hours from call-up.

2.1.4.3 Operable. ORS systems must be available and dependable to support mission needs. They must also be reliable, supportable, maintainable, and robust enough to generate required mission rates. If reusable launch vehicles are used, they must be capable of meeting required turnaround-times. Operational restrictions, due to weather, ranges, and the space environment, must be minimized.

2.1.4.4. Economical. ORS systems must provide a cost-effective means of executing DoD missions.

2.1.4.5. Survivable. ORS systems must execute their mission in spite of threats posed by adversaries (see para 2.2.). In some cases, they must also survive repeated and/or long-term exposure to the space environment and descent through the atmosphere.

2.1.4.6. Interoperable. Components of ORS systems will, to the maximum extent practical, be interoperable with joint and allied; operations concepts, command and control concepts, equipment, and facilities. Interoperability with NASA and commercial space facilities and equipment should also be maximized. At a minimum, these systems must meet Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) Joint Technical Architecture (JTA) standards to allow the total integration of all intelligence, deterrence, and warfighting capabilities available to the CINCs, National Command Authority, and other users.

2.1.4.7. Flexible. ORS systems must possess the capability to orbit a variety of payloads to support multiple theaters, with possibly conflicting and simultaneous requirements.

2.2. Threat Environment. The primary threats to ORS are physical and information collection threats. An overview of threats against this mission area can be found in; "National Intelligence Estimate 99-15, (U) Threats to US Space Systems and Operations", dated October 1999 (S//NF). DIA validated threat documents include: "NAIC-1574-0210-00, (U) Automated Information Systems Threat Environment Description", dated September 2000 (S//NF//MR); and "NAIC-1574-0727-01, (U) Space Systems Threat Environment Description", dated January 2001 (S//NF//MR)."

2.2.1. Counterspace Forces: Physical threats to space systems and operations include directed energy, kinetic energy, and nuclear weapons, jamming (EMI), and sabotage against ground stations.

2.2.2. Espionage: Information collection efforts will target national security assets and/or space systems operations, technologies, manufacturing processes, and logistical networks.

2.2.3. Sabotage: Physical threats exist to space systems payloads, fuels, spacecraft production facilities, transportation, ground operations, software, and command and control facilities. The threat of a chemical, biological, radiological, or nuclear attack must be considered.

2.2.4. Information Warfare: The threat of Information Attack exists for military space systems communications links and relays; including command and control networks, as well as worldwide communication and tracking networks.

2.2.5. Nuclear Forces: A threat to space systems from nuclear forces exists. This includes prompt effects from nuclear weapons detonated in orbit as well as an increase in background radiation in the Van Allen belts as a result of such detonations.

2.3. Deficiencies and Shortfalls of Existing Capabilities. Today, space activities are constrained by a lack of operational flexibility and responsiveness, high costs, and a limited on-orbit maneuver capability. Current launch systems require months of preparation time. As a consequence, the DoD was unable to orbit any new payloads in time to affect the outcome of Desert Storm. At about $10,000/lb to low-earth orbit, high launch costs substantially limit the number of payloads we can afford to put into space. Current systems also lack substantial maneuver capability, which limits our ability to conduct military operations in space. The 1999 AFSPC Mission Area Plan identified the following top *needs*, which relate directly to Operationally Responsive Spacelift. In priority order, they are; On-demand Space Asset Launch and Initialization, Increase Launch Throw-Weight, Rapid Transportation Through Space, Increase Launch Rate, Recover On-Orbit Space Assets, Service On-Orbit Space Assets, and Rapid Space Asset Repositioning. USCINCSPACE identified the lack of recoverable, rapid transport to, through, and from space as a critical capability needed by 2012.

2.4. Timing and Priority of Need. ORS is a high priority. The DoD's ability to execute space missions, as defined in National Space Policy, depends on the Air Force to promptly deliver mission assets to, through, and from space. The immediacy of this need is highlighted by the growing threat to US space-based capabilities, the increasing dependence on space capabilities for military operations, and the nation's overall growing reliance on services provided by the space infrastructure. A timeline for developing new military space systems is described below.

2.4.1. The need exists today to assure prompt delivery of mission assets to, through, in, and from space. A single satellite failure, natural or induced, may significantly degrade or entirely eliminate critical force enhancement (e.g., warning, reconnaissance, communications, weather, navigation, and timing) to a wide range of users. These users include warfighters, as they engage enemy forces, and the National Command Authority as they contemplate alternative courses of action. The time required to replace these capabilities is currently measured in months or years. ORS systems are essential for reducing the time required to augment or reconstitute these vital space-based capabilities from months to days or, in a best case, hours.

2.4.2. In the near-term (2-9 years), demand for more timely and precise space force enhancement (e.g., C4ISR) and the deployment of space control systems to space will lead to an increased variety of mission profiles for space assets. Specifically, future missions will include a wide range of payload

functions, orbit types, times over target, mission duration, users, and self-protection capabilities. Operationally Responsive Spacelift, particularly in terms of maneuverability and responsiveness, is required to meet these emerging mission demands.

2.4.3. In the mid-term (10-15 years), protecting and sustaining space capabilities will be instrumental in protecting national security and commercial interests. The success of U.S. military forces will depend heavily on our ability to control space and to provide space-based capabilities for navigation, intelligence, surveillance and reconnaissance (ISR), Meteorology and Oceanography (METOC) predictions that support targeting and delivery of precision munitions, and Theater/National Missile Defense. As such, ORS will be an essential element in satisfying critical and evolving military requirements for prompt operations to, through, in, and from space. Current National Space Policy (14 Sep 96) states that space superiority **must** be maintained through all levels of conflict. An ORS capability is also required to satisfy the space support needs of; on-demand space asset launch and initialization, increased launch rate, on-orbit servicing, and rapid asset repositioning.

3. Non-Materiel Alternatives. There are no changes to doctrine, organization, training, leadership, or personnel that will fully meet the need.

4. Potential Materiel Alternatives. Materiel solutions that may satisfy the need for Operationally Responsive Spacelift fall into three broad categories. These categories are; (1) a new system, specifically designed for ORS, (2) evolution of current expendable launch systems into an ORS system, or (3) commercially provided launch services.

4.1. A multi-purpose military space system, specifically designed for ORS, is one potential materiel alternative. The key elements of this system are reusable components, launch-on-demand, and enhanced orbital maneuverability to allow spacecraft to perform large changes in inclination and altitude. The Air Force, NASA, and commercial companies are exploring various concepts and approaches. Air Force concepts include the Space Operations Vehicle (SOV), the Space Maneuver Vehicle (SMV), and Orbit Transfer Vehicle (OTV). NASA's Space Launch Initiative may achieve substantial advances towards an ORS vehicle. Commercial concepts include Single Stage and Two Stage to Orbit reusable launch systems and Air Launch concepts that use large transport aircraft as a first stage.

4.2. A second materiel alternative is to evolve an ORS system from current and projected expendable launch vehicles, including retired ICBMs. The Evolved Expendable Launch Vehicle (EELV) promises a significant reduction in launch costs and preparation time. Other advances in expendable launch vehicle technology may provide further reductions in launch cost and preparation time. These advances, combined with responsive payloads, may provide a means of achieving a launch-on-demand capability. Alternatively, a portion of this capability might be achieved through the application of those ICBM alert procedures that keep a booster continuously ready to launch. A combination of expendable launchers, along with the SMV and OTV concepts, may provide the necessary spacelift and on-orbit maneuver capability.

4.3. Another possibility is the use of commercially provided launch services. Under this concept, the DoD would contract for the required launch services. The prime contractor would be responsible for acquiring boosters and delivering payloads to orbit. The user would buy the launch upon checkout of the asset in its operational orbit. Whereas this concept has been successfully used in the past for routine launch operations, its limitations in responsiveness, security, and flexibility make it unsuitable for spacelift roles supporting inherently military missions such as space control and force applications. However, commercial launch operations may be a viable option for routine (i.e., scheduled) satellite launches where applicable security, cost, and timeliness criteria are met.

5. Constraints.

5.1 Key Boundary Conditions.

5.1.1. National Policy. ORS must comply with US law, national and DoD space policy, military doctrine, as well as applicable arms control agreements. For example, ORS must comply with the 1967 Outer Space Treaty, which prohibits placing nuclear weapons and other weapons of mass destruction in earth orbit, installing them on celestial bodies, or otherwise stationing them in outer space.

5.1.2. Logistics Support. ORS must be completely supportable within DoD maintenance principles and emphasize lean, responsive, and economical support systems. The systems must employ appropriate logistics support and maintenance procedures to provide responsive mission integration, preparations, and operations. Reliability, maintainability, supportability, and disposal considerations must be emphasized to meet readiness and life cycle cost objectives.

5.1.3. Transportation. Transportation support processes and procedures must be considered throughout. Provisions may be necessary for the unique requirements associated with the handling, control, and security of the systems.

5.1.4. Manpower, Personnel, and Training. Military space systems may be operated by trained contractor personnel, military personnel, or a military-contractor combination. The user will determine operations, maintenance, logistics support manning, and critical mission tasks. ORS systems will utilize automation, simulators, and robotics, as appropriate, to minimize manpower requirements. Training and training systems, such as simulators, must be integrated with the ORS systems architecture.

5.1.5. Security. Program protection plans will be applied throughout the life cycle to maintain technical superiority, system integrity, and availability. The system security must safeguard critical system elements, technologies and information through employment of physical, communications, computer, personnel, information and operations security measures and prevent inadvertent or malicious technology transfer to unauthorized users.

5.1.6. Standardization and Interoperability. The system must have Command, Control, Communications, Computers and Intelligence (C4I) capabilities which ensure, as a minimum, complete integration with existing and programmed C4I systems. System design must support the interoperability goals established in the C4I for The Warrior (C4IFTW) concept tenets. System managers must conform to governing Interoperability and Standardization (I&S) directives. C4I supportability and sustainability must be maximized in the design, operation, and modification of the system, throughout its life cycle.

5.2. Operational Environment. ORS operations must not be substantially degraded by environmental conditions, either in space or in the Earth's atmosphere. Some operations must continue despite adverse environmental conditions such as radiation, solar flares, debris, atmospheric friction, rain, freezing precipitation, or high winds. The systems must be able to operate successfully in the following hostile environments; Information Warfare (IW), Command and Control Warfare (C2W), Electronic Warfare (EW), and GPS jamming. Forward-deployed ground segments must be capable of operating in an environment contaminated by chemical, and/or biological agents. Systems safety, ground safety and space safety programs are required and will comply with the latest DoD policies.

6. Joint Potential Designator. ORS systems are Joint Interest programs with USSPACECOM as their ultimate user. They support the following Joint Warfighting Capability Assessment (JWCA) categories; Dominant Maneuver, Precision Engagement, Focused Logistics, Full Dimensional Protection, Information Superiority, Intelligence, Surveillance & Reconnaissance (ISR), Communications/Computer Environment, and Strategic Deterrence.