Space Security Programs of Interest

in the FY 2010 Department of Defense Budget Proposal

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This year's Department of Defense (DOD) budget contains a number of projects that are relevant to space security. Of special note: requested spending on the only dedicated, unclassified anti-satellite capability – which utilizes temporary and reversible means of disrupting satellite operations – is set to increase slightly to $31 million. About $175 million is requested for high energy laser research, a lot of which is dual-use in its nature. The request for Operationally Responsive Space satellites fell more than 40 percent to $100 million. Finally, the request for Space Situational Awareness, which was split into a number of different programs, totaled almost $375 million, an increase of approximately $100 million from last year's request. The following chart reproduces actual and planned spending on these projects for the previous, current, and next fiscal years, and the analysis below goes deeper into the budget request justification documentation to provide insight into the goals of this spending.

Project Name	**Organization**	**Budget Document**	**Program Element (Program name)**	**Actual spending in FY 08**	**Estimated spending in FY 09**	**Proposed spending in FY10**
High Energy Laser Research						
High Energy Laser Research Initiatives	US Air Force	RDT&E Vol. 1	0601108F (High Energy Laser Research Initiatives)	12.221	13.389	12.834
Lasers & Imaging Technology	US Air Force	RDT&E Vol. 1	0602605F (Directed Energy Technology)	34.600	36.534	74.139
Lasers and Imaging Development and Integration	US Air Force	RDT&E Vol. 1	0603605F (Advanced Weapons Technology)	19.166	20.513	16.624
High Energy Laser Advanced Technology Program	US Air Force	RDT&E Vol. 1	0603924F (High Energy Laser Advanced Technology Program)	3.688	4.002	3.831
Space Control Technology						
Spacecraft Protection Technology	US Air Force	RDT&E Vol. 1	0602601F (Space Technology)	2.787	7.036	8.026
Space Survivability & Surveillance	US Air Force	RDT&E Vol. 1	0602601F (Space Technology)			48.2
Integrated Space Technology	US Air Force	RDT&E Vol. 1	0603401F (Advanced	32.107	29.208	29.168

Demonstrations			Spacecraft Technology)			
Space Systems Protection	US Air Force	RDT&E Vol. 1	0603401F (Advanced Spacecraft Technology)	4.001	7.841	8.118
Space Systems Survivability	US Air Force	RDT&E Vol. 1	0603401F (Advanced Spacecraft Technology)	4.285	5.158	4.871
2611 Technology Insertion Planning and Analysis: Defensive Counterspace	US Air Force	RDT&E Vol. 2	0603438F (Space Control Technology)	9.927	13.806	13.091
2611 Technology Insertion Planning and Analysis: Space Protection Program	U.S. Air Force	RDT&E Vol. 2	0603438F (Space Control Technology)	3.200	0.000	6.493
2611 Technology Insertion Planning and Analysis: Counterspace C2	US Air Force	RDT&E Vol. 2	0603438F (Space Control Technology)	0.000	1.515	1.124
2611 Technology Insertion Planning and Analysis: Prototyping	U.S. Air Force	RDT&E Vol. 2	0603438F (Space Control Technology)	5.368	5.681	5.942
2611 Technology Insertion Planning and Analysis: Self Awareness Space Situation Awareness (SASSA)	U.S. Air Force	RDT&E Vol. 2	0603438F (Space Control Technology)	25.000	25.000	25.000
2611 Technology Insertion Planning and Analysis: SASSA Risk Reduction	U.S. Air Force	RDT&E Vol. 2	0603438F (Space Control Technology)	0.000	0.000	9.615
2611 Technology Insertion Planning and Analysis: STINGER	U.S. Air Force	RDT&E Vol. 2	0603438F (Space Control Technology)	0.000	0.000	4.432
A007 Space Range	U.S. Air Force	RDT&E Vol. 2	0603438F (Space Control Technology)	6.618	21.467	21.764
A001 Counter Satellite Communications System	U.S. Air Force	RDT&E Vol. 2	0604421F (Counterspace Systems)	15.614	29.662	31.109
A003 Rapid Identification Detection and Reporting System (RAIDRS)	U.S. Air Force	RDT&E Vol. 2	0604421F (Counterspace Systems)	33.692	37.464	25.816
A005 Counterspace C2	U.S. Air Force	RDT&E Vol. 2	0604421F (Counterspace	10.073	9.021	7.323

			Systems)			
Satellite Program for Instant Depletion of Energetic Radiation (SPIDER)	DARPA	RDT&E	0603287E (Space Programs and Technology)	12.710	17.000	31.800
Operationally Responsive Space						
A015 ORS COMMON SERVICES	U.S. Air Force	RDT&E Vol. 2	0604857F (Operationally Responsive Space)	85.180	12.749	10.815
A016 Operationally Responsive Lift	U.S. Air Force	RDT&E Vol. 2	0604857F (Operationally Responsive Space)	1.805	0.000	0.000
A020 AF-funded ORSSats	U.S. Air Force	RDT&E Vol. 2	0604857F (Operationally Responsive Space)	0.000	183.812	102.046
Microsatellite and Rendezvous Technology						
Microsatellite Demonstration Science and Technology Experiment Program (MiDSTEP)*	DARPA	RDT&E	0603287E (Space Programs and Technology)	8.875	5.750	3.312
System F6	DARPA	RDT&E	0603287E (Space Programs and Technology)	21.095	44.675	92.700
Front-end Robotics Enabling Near-term Demonstration (FREND)*	DARPA	RDT&E	0603287E (Space Programs and Technology)	9.100	11.950	7.000
Space Situational Awareness						
2611 Technology Insertion Planning and Analysis: Space Situational Awareness	U.S. Air Force	RDT&E Vol. 2	0603438F (Space Control Technology)	4.899	13.120	4.526
A006 Space-Based Space Surveillance	U.S. Air Force	RDT&E Vol. 2	0604425F (Space Situation Awareness Systems)	169.167	120.039	177.104
A008 Integrated Space Situation Awareness	U.S. Air Force	RDT&E Vol. 2	0604425F (Space Situation Awareness Systems)	23.347	44.220	0.000
A009 Space Fence	U.S. Air Force	RDT&E Vol. 2	0604425F (Space Situation Awareness Systems	13.848	45.007	90.228
A012 Net-centric Sensors and Data Sources	U.S. Air Force	RDT&E Vol. 2	0604425F Space Situation Awareness Systems)	0.000	0.000	18.357
A037 Space Surveillance	U.S. Air Force	RDT&E	0604425F (Space	0.000	0.000	6.895

Telescope		Vol. 2	Situation Awareness Systems)			
A038 SSA Environmental Monitoring	U.S. Air Force	RDT&E Vol. 2	0604425F (Space Situation Awareness Systems)	0.000	0.000	15.550
A017 Sensor Service Life Extension Programs	U.S. Air Force	RDT&E Vol. 3	0305940F (Space Situation Awareness Operations)	38.679	15.579	54.648
Maui Space Surveillance System	US Air Force	RDT&E Vol. 1	0603444F (Maui Space Surveillance System)	41.357	36.339	5.813
Joint Space Operations Center (JSPoC)						
A030 Infrastructure	U.S. Air Force	RDT&E Vol. 3	0305614F (JSpOC Mission System)	0.000	0.000	29.469
A031 Mission Applications	U.S. Air Force	RDT&E Vol. 3	0305614F (JSpOC Mission System)	0.000	0.000	87.520
A032 Command & Control	U.S. Air Force	RDT&E Vol. 3	0305614F (JSpOC Mission System)	0.000	0.000	8.085
A033 Data Integration	U.S. Air Force	RDT&E Vol. 3	0305614F (JSpOC Mission System)	0.000	0.000	6.197
Missile Defense						
Ballistic Missile Defense Space Interceptor Study	MDA	RDT&E	0603895C (System Space)	0.00	5.00	0.00
Near Field Infra Red Experiment (NFIRE)	MDA	RDT&E	00603895C (System Space)	11.550	8.855	0.00
Special Programs	MDA	RDT&E	0603891C	193.157	175.712	301.5
Miscellaneous						
Falcon	DARPA	RDT&E	0603287E (Space Programs and Technology)	25.000	25.000	14.000
Regarding Trench	MDA	RDT&E	0603906C			None given: "Program Elements Not Providing R Exhibits Due to Classification"
Defense Space Reconnaissance Program	U.S. Air Force	Procurement, Other	N/A	19.1	15.8	30.00

All figures are in millions of dollars

This year's Department of Defense (DOD) budget contains a number of projects that are relevant to space security. The above projects, in the opinion of the authors, are worthy of interest for various reasons. They fall under a few broad categories: high-energy laser (HEL) research, space control (offensive and defensive), operationally responsive space, microsatellite

and rendezvous technology, space situational awareness, missile defense-related research, and other miscellaneous programs.

High Energy Laser Research

Overall, the Department of Defense plans to spend at least $175 million in Fiscal Year 2010 (FY10) on high-energy laser research.[1] The HEL projects included above are: "High Energy Laser Research Initiatives," "Lasers & Imaging Technology," "Lasers and Imaging Development and Integration," and the "High Energy Laser Advanced Technology Program." The funding requested for these projects in FY10 amounts to some $107 million, the bulk of which is devoted to "Lasers and Imaging Technology."

Lasers can play a number of roles consistent with the peaceful uses of outer space – range-finding, for example. Depending on the power levels involved, however, lasers can also be used to disrupt, damage, or destroy satellites. The unclassified projects discussed here do not explicitly list such aggressive functions among the goals of the programs. However, the justifications for several of the projects include a desire for "scalability," which might lead to an ability to carry out aggressive as well as peaceful missions.

Of particular interest are the projects such as "Lasers & Imaging Technology," for which $32 million is requested for FY10. This project explores both "the technical feasibility of moderate to high power lasers, including beam control, for applications such as aircraft protection, force protection, precision engagement, and Global War On Terrorism" and "the technical feasibility of long-range optical imaging for space situational awareness." It seems reasonable to enquire as to whether the project would support the targeting of satellites.

Space Control Technology

This program includes a wide variety of technologies, including "Situational Awareness (SSA), Defensive Counterspace (DCS), Offensive Counterspace (OCS) and Command and Control and Battle Management." In its budget justification documents, the Air Force defines DCS as including "defensive activities to protect U.S. and friendly space-systems assets, resources, and operations from enemy attempts to negate or interfere and prevention activities that limit or eliminate an adversary's ability to use U.S. space systems and services for purposes hostile to U.S. national security interests," while OCS activities are defined as those that may "disrupt, deny, degrade or destroy space systems, or the information they provide, which may be used for purposes hostile to U.S. national security interests. Consistent with DOD policy, the negation efforts of this program currently focus on negation technologies which have temporary, localized, and reversible effects."

The Self Awareness Space Situation Awareness (SASSA) is located under Technology Insertion Planning and Analysis, in the program element of "Space Control Technology." SASSA is intended to generate "a payload to provide tactical SSA around a host satellite."

RAIDRS strives "to provide attack detection, threat identification and characterization, and support rapid mission impact assessments of U.S. space systems. This effort will investigate and implement the technical architecture, operational concept, support concept, training,

[1] This figure is the sum total of Line Items 3, 14, 17, and 33. The estimate is rough because these line items may contain funding complementary to, but not directly devoted to, high-energy lasers. Furthermore, funding in other line items and the classified budget request may have applications to high-energy laser programs.

verification (test), and deployment of a Rapid Attack Identification Detection and Reporting System (RAIDRS). Incremental capability deliveries are planned." Its initial operational capability is intended to be in the summer of FY 2010. RAIDRS, while designated a "Space Control" technology, actually does much to decrease the amount of opacity clogging up the United States' ability to monitor its space assets and could feasibly serve as a confidence-building measure. Also of note is that the previously-planned RAIDRS Block 20 has received no unclassified funding in the FY10 budget.

Operationally Responsive Space

Operationally Responsive Space (ORS) is of interest because it is intended to respond quickly to warfighters' need for space capabilities, whether by filling an unanticipated gap in coverage or replacing a satellite that does not work for whatever reason – attack from an anti-satellite weapon, flaws during the building process, a problem with the launch, etc. There are several tiers being sought: "Tier 1 involves employing existing, fielded space capabilities in a new and novel fashion within hours to days. Tier 1 solutions will not typically involve the design, engineering, or fabrication of new materiel items. Tier 2 involves deploying field-ready capabilities within days to weeks through rapid assembly, integration, testing, and deployment of small, low-cost satellites. Tier 3 involves developing new capabilities within a months-to-one-year timeframe."

Microsatellite and Rendezvous Technology

Projects investigating microsatellite and rendezvous technology are of interest because they often exhibit the classic multipurpose problem which complicates space security: some technologies are useful for both peaceful and aggressive purposes. The FY10 budget request contains funding for several such projects.

One example is DARPA's "Front-end Robotics Enabling Near-term Demonstration (FREND) project, for which $7 million is requested in FY10. The project aims to "develop, demonstrate and fly robotic manipulator technologies designed to allow interaction with geosynchronous orbit (GEO)-based military and commercial spacecraft." This technology could, as the request states, facilitate "extending [satellites'] service lives and permitting satellite repositioning or retirement." However, FREND also includes an effort to combine "detailed photogrammetric and laser imaging with robotic multi-degree-of-freedom manipulators to autonomously grapple space objects not outfitted with custom interfaces." Most spacecraft, including those operated by foreign governments, are not outfitted with custom interfaces, and thus FREND could serve both as a platform for accomplishing the benign goals outlined in the request and for interfering with satellites operated by hostile foreign governments.

Space Situational Awareness

Space Situation Awareness (SSA) is called by the Air Force the "foundation for space control." It cuts a wide swath: it is hoped to include "intelligence on adversary space operations; surveillance of all space objects and activities; detailed reconnaissance of specific space assets; monitoring space environmental conditions; monitoring cooperative space assets; and conducting integrated command, control, communications, processing, analysis, dissemination, and

archiving activities." The Air Force explains that program element 0305940F, Space Situation Awareness Operations, "fields, upgrades, operates, and sustains sensors and information integration capabilities within that network."

The Space Fence strives to develop a series of ground-based sensors that would replace the rickety Air Force Space Surveillance System (AFSSS), which has been operational since 1961. The Air Force hopes that the Space Fence will have a better capability in detecting small objects around the planet, particularly those in low earth orbit (LEO). The budget request documents state that the Space Fence is meant to "expand the uncued detection and tracking capacity of the Space Surveillance Network by an order of magnitude, from 10,000 to 100,000 objects, while working in concert with other network sensors."

The Space Situation Awareness Environmental Monitoring (SSAEM), a new project in FY10, includes "a space-based sensing capability to acquire space environment measurement data, ground processing software to generate required products and development/modifications of environmental models/databases and application algorithms to assimilate the SSAEM sensor data."

Finally, the Sensor Service Life Extension Programs (SLEP) program is intended to "include, but are not limited to, programs which, when combined with routine technological renewal, extend the serviceable life of assets and maintain critical capability by replacing aging and increasingly unsustainable components with modern equipment." Listed as "representative" of systems that would be upgraded in the SLEP program are "Eglin, Haystack, GEODDS, and GLOBUS II."

Joint Space Operations Center (JSPoC)

The program element for the Joint Space Operations Center (JSpOC) Mission System is new this year. It is intended to bring together efforts from "PE 64425F (Integrated Space Situational Awareness (ISSA), PE 64421F (RAIDRS Block 20), and PE 27410F (Space Command and Control) into a single program element as the programs were consolidated into a single program. This program will also develop improved, responsive, and accurate orbital collision predictions for commercial and international space systems." This PE's mission application is defined as providing "a high accuracy space catalog (knowledge of space objects), increased observation verification and sensor tasking processing capabilities, and improved event processing," and its activities are supposed to include "maneuver processing, sensor calibration, conjunction analysis/collision prediction, high accuracy element set generation, re-entry/decay prediction/processing, threat processing, look angles, and web services interface." The Air Force hopes that this will enhance the office's capacity so that it can "provide high accuracy orbital predictions for up to 1300 tracked space objects." The Air Force already has 19,000 objects in its high accuracy catalog; presumably what is meant by this is that it intends to do collision analyses for 1300 tracked space objects.

Missile Defense

No new funding is being requested for the Space Test Bed. There is still $5 million to be spent on a space-based interceptor study out of FY 09 funding. The Near-Field Infrared Experiment (NFIRE) has been shifted back to the Space Tracking and Surveillance System (STSS) of the Missile Defense Agency; actual numbers for the NFIRE program are not stated.

However, of interest: "The NFIRE satellite containing the Tracking Sensor Payload and the Laser Communications Terminal (LCT) has survived beyond the expected life span of the satellite. Because of the performance of these elements, we will fund the NFIRE operations on the ground to continue experiments and data gathering for the BMDS." Note that the amount in MDA's classified Special Programs PE is similar to the total amount requested for Space Situational Awareness, bringing into question of exactly how high a priority is placed in SSA capabilities.

Miscellaneous

These programs do not fit neatly into any of the above categories. Falcon has in the past been associated with fears of the weaponization of space[2], but FY10 budget documents indicate that the program is planned for transition to the Air Force in FY10 as part of the Department of Defense's effort to establish a prompt global strike capability. "Regarding Trench" is a mysterious MDA project that little is known about, outside of its name. "Defense Space Reconnaissance Program" used to be affiliated with the National Reconnaissance Organization. It must be noted that when the budget justification documents were first released, there was an additional subsection under the Air Force's Missile Procurement justification books for line no. 29, listed there as "Defense Space Reconn Program," and indicating that $105 million was being requested for it. However, in the interim, that line item has disappeared from the documentation.

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[2] See, for example: Theresa Hitchens, Michael Katz-Hyman, and Victoria Samson, "Space Weapons Spending in the FY 2007 Defense Budget," March 8, 2006, http://www.stimson.org/space/pdf/FY07SpaceWeapons.pdf.