

## Space Security Programs of Interest

### in the Fiscal Year (FY) 2011 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. All projects are, unless otherwise noted, funded through the U.S. Air Force's Research, Development, Test & Evaluation (RDT&E) budget request for Fiscal Year (FY) 2011. The Missile Defense Agency (MDA) and Defense Advanced Research Projects Agency (DARPA) projects included are also supported by RDT&E funding. The budget contained several notable items and trends. A new program element on Space Protection is present for the first time in this budget request. The Air Force budget requests for several programs dedicated to improving space situation awareness add up to almost \$900 million, an increase of roughly 70 percent from the estimated FY 10 budget of \$530 million. Meanwhile, budgets for Counterspace and Space Control programs are projected to fall by roughly 50 percent each between FY 2010 and FY 2015. Missile defense spending on space will also fall over the next several years if the Space Based Infrared System, a constellation of early warning satellites, winds down successfully.

PE	FY 2009 Actual	FY 2010 Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost to Complete	Total Cost
<i>Organization</i>									
0101313F: Strategic war planning system – USSTRATCOM Project 675282: Joint Navigation Warfare Center (JNWC)	6.399	8.267	9.529	9.583	9.729	9.924	10.092	Continuing	Continuing
0305173F: Space & Missile Test & Evaluation Center	1.920	3.593	4.572	1.658	1.680	1.704	1.729	Continuing	Continuing
0305614F: JSpOC Mission System	0	136.271	132.706	121.764	106.408	158.135	150.862	Continuing	Continuing
<i>Space Technology</i>									
0602601F: Space Technology Total	136.072	119.125	111.857	117.238	117.382	122.143	128.614	Continuing	Continuing
621010: Space Survivability & Surveillance	48.855	52.983	48.216	46.479	43.864	44.915	45.815	Continuing	Continuing

624846: Spacecraft Payload Technologies	26.837	15.797	20.299	20.251	19.990	20.188	18.343	Continuing	Continuing
625018: Spacecraft Protection Technology	6.687	7.992	7.556	9.006	13.287	13.338	13.156	Continuing	Continuing
628809: Spacecraft Vehicle Technologies	53.693	42.353	35.786	41.502	40.241	43.702	51.300	Continuing	Continuing
<i>Space Control Technology</i>									
0603438F: Space Control Technology Total	86.110	100.951	61.012	45.907	46.370	46.831	47.160	Continuing	Continuing
642611: Technology Insertion Planning and Analysis	64.643	79.187	42.038	26.804	26.975	27.141	27.167	Continuing	Continuing
64A007: Space Range	21.467	21.764	18.974	19.103	19.395	19.690	19.993	Continuing	Continuing
<i>Counterspace</i>									
0604421F Counterspace Systems Total	64.318	63.838	40.276	34.119	33.161	33.665	34.181	Continuing	Continuing
65A001: Counter Satellite Communications Systems	28.062	30.699	21.035	21.321	20.331	20.641	20.957	Continuing	Continuing
65A003: Rapid Identification Detection and Reporting System (RAIDRS)	27.284	25.816	11.875	5.339	5.257	5.336	5.419	Continuing	Continuing
65A005: Counterspace C2	8.972	7.323	7.366	7.459	7.573	7.688	7.805	Continuing	Continuing
<i>Space Protection</i>									
0603830F Space Protection Program 64A025: Space Protection Program Assessment and Analysis	0	0	8.349	9.852	10.456	11.517	12.479	Continuing	Continuing
0301400F: Space Superiority Intelligence	0	0	10.006	11.906	12.070	12.238	12.416	Continuing	Continuing
<i>Space Situation Awareness Systems</i>									
0604425F Space Situation Awareness Systems Total	211.266	238.377	426.525	508.529	496.975	405.509	232.199	Continuing	Continuing
65A006: Space-Based Space Surveillance	143.139	144.242	185.915	210.011	186.282	127.520	7.337	Continuing	Continuing
65A008: Integrated Space Situation	42.620	0	0	0	0	0	0	Continuing	Continuing

Awareness									
65A009: Space Fence	25.507	60.228	164.790	242.023	264.949	334.928	204.202	Continuing	Continuing
65A012: Net-centric Sensors and Data Sources	0	18.357	24.435	10.447	12.982	12.424	7.217	Continuing	Continuing
65A037: Space Surveillance Telescope	0	0	1.947	0	0	0	0	Continuing	Continuing
65A038: SSA Environmental Monitoring	0	15.550	49.438	45.778	32.762	20.637	13.443	Continuing	Continuing
0305940F Space Situation Awareness Operations Project 67A017: Sensor Service Life Extension Programs (is entirety of PE)	15.579	53.805	43.838	26.744	31.486	81.568	69.969	Continuing	Continuing
<i>Operationally Responsive Space</i>									
0604857F: Operationally Responsive Space	228.540	124.308	93.978	88.019	78.103	54.382	125.611	Continuing	Continuing
64A015: ORS Common Services	12.749	10.815	19.450	69.958	66.306	33.776	10.075	Continuing	Continuing
64A020: AF-funded ORSSats	215.791	113.493	74.528	18.061	11.797	20.606	115.536	Continuing	Continuing
<i>Missile Defense</i>									
0604441F: Space Based Infrared Systems (SBIRS) High EMD Total	542.404	521.156	530.047	504.409	389.243	313.347	179.896	Continuing	Continuing
653616: SBIRS High Element EMD	542.404	521.156	511.847	487.609	389.243	313.347	179.896	Continuing	Continuing
65A040: Commercially Hosted Infrared Payload (CHIRP)	0	0	18.200	16.800	0	0	0	Continuing	Continuing
0604443F: Third Generation Infrared Surveillance (3GIRS)	.953	73.369	0	0	0	0	0	Continuing	Continuing
0603893C: Space Tracking & Surveillance System Total	209.831	161.609	112.678	98.500	56.424	52.928	34.661	Continuing	Continuing
WX12: Space Tracking and Surveillance System (STSS) Capability Development	203.343	161.609	0.000	0.000	0.000	0.000	0.000	0	364.952
MD12: Space	0.000	0.000	108.842	94.738	54.331	50.990	33.070	Continuing	Continuing

Tracking and Surveillance System (STSS)									
ZX40: Program-Wide Support	6.488	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
MD40: Program-Wide Support	0.000	0.000	3.836	3.762	2.093	1.938	1.591	Continuing	Continuing
<b>DARPA</b>									
0603287E : Space Programs and Technology [eds. – In DARPA budget]	226.329	183.477	98.130	97.395	129.704	164.360	164.186	Continuing	Continuing
<b>Miscellaneous</b>									
0603845F Transformational SATCOM (TSAT) 644944: Advanced Wideband System	428.618	0	0	0	0	0	0	0	3,383.300
0603791F : International Space Cooperative R&D	.603	.632	.635	.644	.654	.664	.673	Continuing	Continuing
<b>Directed Energy</b>									
0602605F : Directed Energy Technology Total	60.233	105.231	103.596	112.629	119.405	123.200	126.394	Continuing	Continuing
PE 0602890F: High Energy Laser Research	47.939	53.229	53.384	54.059	52.297	54.174	55.038	Continuing	Continuing
0603924F: High Energy Laser Advanced Technology Program	3.899	3.794	1.847	1.122	1.237	1.569	2.382	Continuing	Continuing
<b>Classified Programs</b>									
0603891C: Special Programs – MDA [eds. – In MDA budget]	182.998	250.185	270.189	269.040	450.645	517.486	601.315	0	2,541.858
0603906C: Regarding Trench [eds. – In MDA budget]	3.159	6.130	7.529	8.295	8.286	8.479	8.675	0	50.553
0603765E Classified DARPA programs [eds. – In DARPA budget]	193.690	177.582	167.008	314.719	239.335	225.567	238.565	Continuing	Continuing

All figures are in millions of dollars

The above projects relevant to space security are, in the opinion of the authors, worthy of interest for various reasons. They fall into a few categories: Space Technology, Space Control Technology, Counterspace Systems, Space Protection, Space Situation Awareness, Operationally Responsive Space, Missile Defense, and Miscellaneous & Classified Programs.

## **Space Technology**

Four mission areas are given for the Space Technology Program Element (PE): space environmental protection (seeing how the space environment affects systems), research on spacecraft payload technologies, spacecraft vehicles, and spacecraft protection. This last mission area is described as creating “technologies for protecting U.S. space assets in potential hostile settings,” as it “focuses on identifying and assessing spacecraft system vulnerabilities, developing threat warning technologies, and developing technologies to mitigate the effects of both intentional and unintentional threats.” An FY 09 accomplishment listed was the development of a sensor that could detect threats coming at or co-orbiting a space craft. Work on defensive subsystems was furthered in FY 10, and a FY 11 plan is to “[t]ransition dual usage sensor technology to multiple satellite systems.” This PE received a Congressional add in FY 09 of \$798,000 for research on a Defensive Counterspace Testbed; no other money is apparent for this project, and the budget does not give further information about what the “Testbed” project included.

## **Space Control Technology**

The four mission areas that make up Space Control are Space Situation Awareness (SSA), Offensive Counterspace (OCS), Defense Counterspace (DCS), and Command and Control Battle Management. OCS is defined as those activities that “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 effects of this program currently focus on negation technologies which have temporary, localized, and reversible effects.” DCS, on the other hand, includes activities that are intended to “protect U.S. and friendly space-system 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.”

This PE includes the Self Awareness Space Situational Awareness (SASSA) technology demonstration program that came from an FY 08 Congressional add. This program is intended to build a payload that can provide SSA on its host satellite. SASSA’s launch and on-orbit demonstration are currently planned to be held in FY 12 and FY 13. Also included in the Space Control PE is the Spacetrack Integration Node Global Enhanced Reporting (STINGER) project, which is striving to use missile warning radar to collect SSA information. Also falling under this PE is the SSA Tactical Component Network (TCN) Demonstration, a Congressional add of \$3 million in FY 09 that is attempting to bring in some missile defense sensors into the Air Force’s SSA efforts.

The OCO requested \$16 million in FY 11 for replacing/upgrading equipment left with Air Force and Army counterspace units in Operation Iraqi Freedom. According to the Air Force, “This technology was developed by the Rapid Reaction Squadron in response to numerous warfighter Urgent Operational Needs (UONs) and Joint Urgent Operational Needs (JUONs) for OIF.”

## **Counterspace Systems**

Funding in the Counterspace PE works to develop and acquire counterspace assets, largely building off of technology demonstration programs done through the Space Control Technology PE. The Counter Satellite Communications Systems (CSCS) program works to create mobile counter satellite capabilities; its technology demonstration program originates in the Offensive Counterspace program of the Space Control Technology PE. Rapid Identification Detection and Reporting System (RAIDRS) is intended to track down the cause of attacks (if any) on U.S.-related space systems and determine the extent of whatever damage has been caused by the attack.

## **Space Protection**

There is a new Space Protection PE in FY 11, created with funding taken out of the Space Control Technology and Space Situation Awareness programs. The Air Force and the National Reconnaissance Office (NRO) drew upon resources from the Department of Defense and the Office of the Director of National Intelligence (ODNI) to create a Space Protection Program (SPP) in March 2008, a “joint, enduring program to develop an integrated approach for the nation covering all defense, intelligence, civil, commercial and allied space systems.” The SPP is intended “to preserve national security space effects through an integrated strategy to articulate vulnerabilities, assess threat impacts, identify options and recommend solutions leading to comprehensive space protection capabilities.” Its three tasks are to do analytical justification for the SPP, identify capabilities and interdependencies, and create alternate futures to be shared with senior space leaders. This last task also calls for the development of “protection policy and strategy recommendations to include the development and implementation of the SECDEF and DNI approved National Space Protection Strategy for the nation. This strategy must be updated every 2 years.”

The Air Force is also requesting \$10 million for Space Superiority Intelligence. This PE would provide “Electronic Support (ES) for key find, fix, track, target, engage and assess (F2T2EA) requirements supporting Space Superiority activities.” The justification information indicates that much of this support will come in the form of space situation awareness. For example, the program “provides intelligence support systems for Space Situational Awareness activities that provide the requisite current and predictive knowledge of space events and threat conditions and intelligence support to Space Protection Programs by providing architectural survivability analysis of critical mission assets for mission assurance.”

## **Space Situation Awareness (SSA)**

Called by the Air Force (in the budget justification documents) the “foundation for space control,” this PE brings together many of the efforts the United States is making to increase its knowledge of all space activities and objects. SSA includes the Space-Based Space Surveillance (SBSS) system, which is working toward a satellite constellation that can monitor other space objects. The Integrated Space Situation Awareness (ISSA) program was largely transferred to the Joint Space Operations Center PE in FY 10 and has since been replaced by the JSPOC

Mission System (JMS). The Space Fence program is intended to replace the Air Force Space Surveillance System (AFSSS) (which is nearly 50 years old) in monitoring space objects, with the goal of improving SSA particularly of those objects in Low Earth Orbit (LEO) and of increasing the number of objects that the Space Surveillance Network can track to 100,000.

In all, the FY 11 Air Force budget request for programs dedicated to improving SSA appears to sum to almost \$900 million, an increase of roughly 70 percent from the estimated FY 10 budget of \$530 million. The estimated FY 10 budget is about \$155 million more than the Air Force requested, and that request was more than \$100 higher than the Air Force requested in FY 09. It is fair to say that both Air Force requests and Congressional appropriations for SSA have been growing dramatically over the past few years. In our judgment, SSA is critical for protecting the large U.S. investments in satellites over the past decades and is a necessary part of ensuring that space can be sustainably used over the long term.

### **Operationally Responsive Space (ORS)**

The Air Force's budget justification documents noted that "U.S. Strategic Command (USSTRATCOM) identified three needs: 1) to rapidly augment existing space capabilities when needed to expand operational capability; 2) to rapidly reconstitute/replenish critical space capabilities to preserve operational capability; 3) to rapidly exploit and infuse space technological or operational innovations to increase U.S. advantage." ORS is intended to make space launch more responsive to needs and also to develop technologies that can be quickly launched as needed. Three tiers of capabilities are sought after. Tier 1 anticipates being able to use "existing, fielded space capabilities in a new and novel fashion within hours to days;" Tier 2 wishes to field capabilities within several months to one year; Tier 3 will "typically involve hardware and software design, engineering, fabrication, and integration," and does not have a specific timeframe linked to it. According to the Air Force, "ORS program funds (along with other Service and Agency funds) are programmed to systematically mature ORS enabling elements to meet the responsiveness timelines required by the USSTRATCOM CONOPS (hours, days, weeks, months...not years) and the price points established in the 2007 NDAA (\$40m satellite vehicles, \$20m launches)." Work continues on Low Earth Orbit Nanosatellite Integrated Defense Autonomous Systems (LEONIDAS), which are meant "to design, fabricate, launch, and perform on-orbit operation of small- and micro-satellites for early detection of missile launches by hostile forces."

### **Missile Defense**

The space-related missile defense funding in the FY 11 budget request focuses on missile early warning and detection systems. The Space Test Bed, which had been in previous fiscal year budget requests, is not present. The Space-based Infrared System (SBIRS) is intended to provide an early ballistic missile warning capability. The Third Generation Infrared System (3GIRS) has been cancelled with this budget request; it had started off life as a possible alternate to SBIRS and then was intended to be a follow-on effort. The Commercially Hosted Infrared Payload (CHIRP) will, according to the Air Force, "provide risk reduction and evaluation of Wide-Field-of-View (WFOV) IR staring and data processing technology to potentially evolve future SBIRS staring sensors and processing algorithms." The Near Field Infrared Experiment (NFIRE), which

in an earlier iteration included a warhead on the space vehicle but in recent years has focused entirely on data collection, is also being stopped in FY 11. According to the Missile Defense Agency (MDA), the Space Tracking and Surveillance System (STSS) program “launched two demonstration satellites on 25 September 2009 and has completed 50% of its system functionality testing,” and that “Data from STSS testing planned for FY 2010 and FY 2011 will validate the ability to track cold, midcourse objects and close the fire control loop with BMDS [ballistic missile defense system] interceptors from space.”

### **Miscellaneous & Classified Programs**

The Transformational Satellite Communications System (TSAT) was cancelled in FY 10 due to what the Air Force called “fiscal constraints.” The International Cooperative R&D PE is intended to spur space research between the United States and a few allies (countries listed include the United Kingdom, France, and Australia) on space-related issues. The budget request also includes line items for a number of classified programs which may be space-related. The three programs for which budget numbers were included – two of them in the MDA budget and one in the DARPA budget – would receive a little more than \$444 million in FY 2011 if funded in full. The Air Force budget listed three classified projects with no justification information or budget numbers than may or may not be space-related: NIGHT FIST- USSTRATCOM (PE 0101314F), Advanced Strategic Program (PE 0101815F), and Advanced Geospatial Intelligence (PE 0304348F). The Falcon program, a past program of concern, has been transitioned from DARPA to the Air Force, but may now reside in the classified part of the Air Force budget.

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