Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Defense Advanced Research Projects Agency	**Date:** February 2016
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603287E / *SPACE PROGRAMS AND TECHNOLOGY*

COST ($ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
Total Program Element	-	172.504	126.692	175.240	-	175.240	237.435	271.971	252.726	227.726	-	-
SPC-01: *SPACE PROGRAMS AND TECHNOLOGY*	-	172.504	126.692	175.240	-	175.240	237.435	271.971	252.726	227.726	-	-

A. Mission Description and Budget Item Justification

The Space Programs and Technology program element is budgeted in the Advanced Technology Development budget activity because it addresses high payoff opportunities to dramatically reduce costs associated with advanced space systems and provides revolutionary new system capabilities for satisfying current and projected military missions.

A space force structure that is robust against attack represents a stabilizing deterrent against adversary attacks on space assets. The keys to a secure space environment are situational awareness to detect and characterize potential threats, a proliferation of assets to provide robustness against attack, ready access to space, and a flexible infrastructure for maintaining the capabilities of on-orbit assets. Ready access to space requires the delivery of capabilities, replenishment of supplies into orbit, and rapid manufacturing of affordable space capabilities. Developing space access and spacecraft servicing technologies will lead to reduced ownership costs of space systems and new opportunities for introducing technologies for the exploitation of space.

Systems development is also required to increase the interactivity of space systems, space-derived information and services with terrestrial users. Studies under this project include technologies and systems that will enable satellites and microsatellites to operate more effectively by increasing maneuverability, survivability, and situational awareness; enabling concepts include novel power/propulsion/propellants, unique manufacturing or assembly processes; and precision control of multi-payload systems.

B. Program Change Summary ($ in Millions)

	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Previous President's Budget	179.883	126.692	130.091	-	130.091
Current President's Budget	172.504	126.692	175.240	-	175.240
Total Adjustments	-7.379	0.000	45.149	-	45.149
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	-1.900	0.000			
• SBIR/STTR Transfer	-5.479	0.000			
• TotalOtherAdjustments	-	-	45.149	-	45.149

Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Defense Advanced Research Projects Agency	Date: February 2016
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603287E / *SPACE PROGRAMS AND TECHNOLOGY*

Change Summary Explanation

FY 2015: Decrease reflects reprogrammings and the SBIR/STTR transfer.
FY 2016: N/A
FY 2017: Increase reflects expanded requirements in the Experimental Spaceplane One (XS-1), Robotic Servicing of Geostationary Satellites (RSGS), and Radar Net programs.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: Experimental Spaceplane One (XS-1)	25.000	30.000	50.500
Description: The XS-1 program will mature the technologies and operations for low cost, persistent and responsive space access and global reach. Past efforts have identified and demonstrated critical enabling technologies including composite or light weight structures, propellant tanks, thermal protection systems, rocket propulsion and advanced avionics/software. A critically important technology gap is integration into a flight demonstration able to deliver aircraft-like operability. The program will validate key technologies on the ground, and then fabricate an X-Plane to demonstrate: 1) 10 flights in 10 days, 2) up to Mach 10+ flight, and 3) design capable of a 10X lower cost space access for cargos from 3,000-5,000 lbs to low earth orbit. A key goal is validating the critical technologies for a wide range of next generation high speed aircraft enabling new military capabilities including worldwide reconnaissance, global transport, small responsive space access aircraft and affordable spacelift. The anticipated transition partners are the Air Force, Navy and commercial sector. ***FY 2015 Accomplishments:*** - Conducted risk reduction studies for propulsion, thermal protection systems, guidance/avionics, composite materials, propellant tanks and space based communications. - Conducted a mid-phase Conceptual Design and Systems Requirements Review. - Conducted component, wind tunnel, propulsion, cryogenic propellant tank, thermal protection, aero-elasticity testing, ground operations and subsystem testing and verification. - Continued to develop detailed XS-1 designs including mass properties, configuration, aerodynamic, trajectory and thermal protection data. - Conducted a Preliminary Design Review and selected design for technology risk reduction. ***FY 2016 Plans:*** - Develop detailed finite element model structural and thermal analysis for the XS-1 design. - Perform aerodynamic Computational Fluid Dynamics analysis and initiate hypersonic wind tunnel and upper stage separation testing for the XS-1 design to verify aerodynamic models. - Conduct component demonstration and validation ground tests for cryogenic propellant tanks, thermal protection, wing tip aero-elasticity, and additive manufacture of propulsion components and flight demonstrations for take-off and landing operations.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Defense Advanced Research Projects Agency	Date: February 2016
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603287E / *SPACE PROGRAMS AND TECHNOLOGY*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Validate recurring operational costs via discrete event simulations for ground operations and upper stage unit cost analysis and integration costs. - Complete the system and subsystem designs, mass properties and configuration required to support the integrated vehicle design. - Finalize the concept of operation including the maintenance concept, performance, trajectories and design reference missions. - Develop initial plan to accomplish ground operations, facility modifications and flight demonstration. - Coordinate with the Federal Aviation Administration (FAA), DoD ranges and spaceports to accomplish preliminary flight test planning. ***FY 2017 Plans:*** - Complete hypersonic wind tunnel and upper stage separation testing for the XS-1 and incorporate in the flight vehicle design. - Complete structure, thermal protection, and cryogenic tank demonstration and validation testing and incorporate results in the flight vehicle design. - Complete propulsion component demonstration and validation testing. - Complete airframe/propulsion integration for incorporation in the XS-1 flight vehicle design. - Mature the XS-1 concept through critical design review including complete configuration, aero-thermodynamics, six degree of freedom trajectory calculations, mass properties and associated ground systems. - Conduct Critical Design Review to approve XS-1 vehicle design for component acquisition, fabrication, assembly, and integration. - Complete design for all launch facilities/modifications and mature range planning including ground and flight test operations, and submittal of range documentation supporting operational requirements. - Coordinate with the FAA, DoD ranges and commercial spaceports. - Begin fabrication of flight and ground system hardware.			
Title: Phoenix ***Description:*** To date, servicing operations have never been conducted on spacecraft beyond low earth orbit (LEO). A large number of national security and commercial space systems operate at geosynchronous earth orbit (GEO) altitudes; furthermore, many end-of-life or failed spacecraft drift without control through portions of the GEO belt, creating a growing hazard to operational spacecraft. Technologies for servicing of spacecraft with the expectation that such servicing would involve a mix of highly autonomous and remotely (i.e., ground-based) tele-operated robotic systems have been previously pursued. The Phoenix program will build upon these legacy technologies, tackling the more complex GEO environment and expanding beyond pure traditional servicing functions. The program will examine utilization of a new commercial ride-along system to GEO called Payload Orbital Delivery (POD) system, supporting hardware delivery for upgrading, repairing, assembling, and reconfiguring satellites. In addition, the program will include a LEO flight experiment focused on satlets, modular building blocks for space systems, as	55.000	19.000	8.740

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Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603287E / *SPACE PROGRAMS AND TECHNOLOGY*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
a path of risk reduction for modular assembly on orbit. The anticipated transition partners are the Air Force and the commercial spacecraft servicing providers. ***FY 2015 Accomplishments:*** - Completed delta critical design of satlets and of communications system for early LEO experiment. - Completed delta critical design of POD for first GEO flight. - Validated specific servicing mission types that maximize value for commercial and DoD satellite operators. - Began fabrication of robotic hardware and software. ***FY 2016 Plans:*** - Deliver early LEO satlet experiment equipment to launch integrator. - Launch early LEO satlet experiment and conduct experiment operations. - Complete delta critical design of satlets per lessons learned from LEO experiment. - Develop PODs payload hardware for launch. ***FY 2017 Plans:*** - Launch POD and conduct on-orbit testing.			
Title: Robotic Servicing of Geostationary Satellites (RSGS) ***Description:*** A large number of national security and commercial space systems operate at geosynchronous earth orbit (GEO), providing persistence and enabling ground station antennas to point in a fixed direction. Technologies for servicing of GEO spacecraft would involve a mix of highly automated and remotely operated (from Earth) robotic systems. The Robotic Servicing of Geostationary Satellites (RSGS) program, an outgrowth of the Phoenix program budgeted within this Project, seeks to establish the capability to acquire robotic services in GEO suitable for a variety of potential servicing tasks, in full collaboration and cooperation with existing satellite owners, and with sufficient propellant for several years of follow-on capability. Key RSGS challenges include robotic tool/end effector requirements, efficient orbital maneuvering of a servicing vehicle, robotic arm systems, automation of certain spacecraft operations, and development of the infrastructure for coordinated control between the servicer and client spacecraft operations teams. The anticipated transition is to a commercial partner who will provide the satellite to carry the robotic payload and who will operate the robotic servicer. ***FY 2015 Accomplishments:*** - Developed detailed requirements developed from mission description and commercial operator needs. - Completed system requirements review of robotic servicing system including robotic arms and tool docking system. ***FY 2016 Plans:*** - Continue development of servicer robotic payload initiated under the Phoenix program.	4.000	12.000	33.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Defense Advanced Research Projects Agency	Date: February 2016
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603287E / *SPACE PROGRAMS AND TECHNOLOGY*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Conduct studies of suitable satellites to carry the robotic payload. - Establish system requirements for the robotic payload in accordance with primary missions. ***FY 2017 Plans:*** - Select provider for satellite to carry robotic payload. - Develop interface definition between robotic payload and satellite. - Begin flight software coding. - Begin development of operator workstations. - Begin procurement of long-life space hardware for robotic payload and instrumentation.			
Title: Space Surveillance Telescope (SST) ***Description:*** The Space Surveillance Telescope (SST) program has developed and demonstrated an advanced ground-based optical system to enable detection and tracking of faint objects in space, while providing rapid, wide-area search capability. A major goal of the SST program, to develop the technology for large curved focal surface array sensors to enable an innovative telescope design combining high detection sensitivity, short focal length, wide field of view, and rapid step-and-settle to provide orders of magnitude improvements in space surveillance has been achieved. This capability enables ground-based detection of un-cued objects in deep space for purposes such as asteroid detection and space defense missions. The initial program is transitioning to Air Force Space Command. The SST Australia effort will provide a further operational demonstration of the SST at the Naval Communication Station Harold E. Holt near Exmouth, Western Australia. Such a location presents a more operationally relevant demonstration, with a richer and more interesting population of SSA targets in geosynchronous orbit. A demonstration in New Mexico will validate telescope performance comparable to the requirement in Australia. In addition, the demonstration will generate data for analysis and fusion efforts, which will be used to further refine and evaluate data processing techniques, such as those developed under the data fusion effort. This program will address technical challenges which may arise from an Australian site, including adaptations to a different telescope environment, and the logistical and communications challenges presented by a site significantly more remote than the current SST location. ***FY 2015 Accomplishments:*** - Continued to refine SST relocation plan jointly with Air Force Space Command (AFSPC) and the Australian Department of Defense partners. - Conducted SST sustainment studies.	9.000	9.000	10.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Defense Advanced Research Projects Agency	Date: February 2016
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603287E / *SPACE PROGRAMS AND TECHNOLOGY*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Developed capability to deliver SST data to Joint Space Operations Center (JSpOC) through Non-Traditional Data Pre-Processor (NDPP). ***FY 2016 Plans:*** - Make improvements to Wide Field Camera (WFC) #2 for improved SST capability. - Install and characterize WFC #2 at White Sands Missile Range (WSMR) site and demonstrate performance improvement. - Support Joint Space Operations Center (JsPOC) data delivery. - Develop plan to transition SST to AFSPC. ***FY 2017 Plans:*** - Complete required documentation for Australian facility. - Support transition to the Air Force.			
Title: Radar Net ***Description:*** The Radar Net program will develop lightweight, low power, wideband capability for radio frequency (RF) communications and remote sensing for a space based platform. The enabling technologies of interest are extremely lightweight and space capable deployable antenna structures. Current deployable antenna options have not been sufficiently developed to be dependable on small payload launches, leaving current capabilities trending to large and more costly launch systems. These launch systems are expected to have long operational lifetimes, which can leave them behind the pace of state of the art technical developments. The technologies developed under Radar Net will enable small, low-cost sensor launches on short timescales with rapid technology refresh capabilities. ***FY 2016 Plans:*** - Develop a detailed system architecture assessment. - Begin cubesat deployable antenna risk reduction. - Commence thermal cycling, power availability, and electrical system analysis. - Conduct pathfinder spacecraft Critical Design Review (CDR). - Conduct prototype Preliminary Design Review (PDR). ***FY 2017 Plans:*** - Conduct prototype CDR. - Conduct pathfinder laboratory and ground tests. - Conduct pathfinder flight qualification. - Launch and conduct pathfinder on-orbit demonstration of multiple deployable antenna technologies. - Demonstrate software defined radio RF capability on appropriate platform. - Perform risk reduction signal processing demonstration.	-	15.000	45.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Defense Advanced Research Projects Agency	**Date:** February 2016
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603287E / *SPACE PROGRAMS AND TECHNOLOGY*

C. Accomplishments/Planned Programs ($ in Millions)	**FY 2015**	**FY 2016**	**FY 2017**
- Integrate results from applications study and pathfinder/risk reduction into prototype design. - Perform early system design reviews.			
Title: Hallmark	-	10.000	28.000
Description: The Hallmark program seeks to demonstrate a space Battle Management Command and Control (BMC2) capability to provide U.S. senior leadership the tools needed to effectively manage space assets in real time. The program will develop command and control decision tools for full-spectrum space operations, management, and control from peace to potential conflict. Hallmark will demonstrate the ability to increase space threat awareness via use of multi-data fusion and time-relevant sensor tasking. The program will also improve the ability to protect against threats by use of modeling and simulation tools for both natural and adversary intent determination and course of action development. The program will employ comprehension and visualization techniques to increase commander and operator awareness to transform information to knowledge and effectively communicate and facilitate time-critical decision making. The anticipated transition partner is the Air Force. ***FY 2016 Plans:*** - Initiate space BMC2 interactive simulation environment development. - Conduct demonstration of integrated Government Furnished Equipment (GFE) space BMC2 tools. - Perform demonstration of space BMC2 interactive simulation environment. - Develop a research and development test bed to facilitate the rapid injection of new technologies into the Joint Space Operations Center (JSpOC) and Joint Interagency Coalition Space Operations Center (JICSpOC). - Initiate the cognitive evaluation of operators and decision makers in a demonstration environment to maximize comprehension. - Complete preliminary system design. - Initiate real-time decision tools design development. - Develop sensor data fusion algorithms. - Define course of action data scheme. - Develop intuitive applications and adaptive understanding capabilities for the next-generation space information fusion center. - Define integration of space BMC2 interactive simulation environment with tools, fusion algorithms and data schemes. ***FY 2017 Plans:*** - Perform existing tool integration. - Develop modeling and simulation infrastructure. - Complete algorithm prototypes. - Complete study of extensible framework. - Commence integration of existing space situational awareness, indications and warning, course of action, and decision support tools.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Defense Advanced Research Projects Agency	Date: February 2016
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* I BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603287E I *SPACE PROGRAMS AND TECHNOLOGY*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Demonstrate and document integrated tools, algorithms and data schemes.			
Title: Airborne Launch Assist Space Access (ALASA) ***Description:*** The ALASA program seeks to make access to space more affordable by reducing the cost per launch to under one million dollars per flight for 100 lb payloads to low earth orbit. In addition, the program seeks to improve the responsiveness of space access by reducing the interval from call-up to launch to a single day. This enables rapid delivery of spacecraft in response to evolving situations, such as a humanitarian crisis or unexpected conflict, and is accomplished by developing rapid mission planning tools which streamline existing range processes, and automated flight safety systems which reduce reliance on expensive and fragile range infrastructure. These tools enable the program's third goal: to escape the limitations of fixed launch sites by achieving a greater flexibility in the direction and location of launch. Challenges include, but are not limited to: development of a high-energy, low cost monopropellant, development of alternatives to current range processes, and achieving a cost per flight of one million dollars, including range support costs, to deploy satellites on the order of one hundred pounds. The anticipated transition partners are the Air Force and the emerging commercial space launch industry. ***FY 2015 Accomplishments:*** - Conducted propellant production, handling activities, and propellant ignition testing. - Conducted analysis of launch performance metrics and identified opportunities for system design and integration optimization. - Investigated and developed alternative propulsion approach. - Performed system redesign to simplify interfaces and improve payload capacity. ***FY 2016 Plans:*** - Complete propellant characterization to determine operating envelope. - Conduct engine testing to determine constraints and obtain thermal management and performance measurements. - Develop risk assessment and perform modeling and testing of spaced based telemetry, planning tools, and flight termination technology which could decrease impact of launch on commercial air traffic. - Assess alternative propellants and launch systems.	60.000	20.000	-
Title: Optical Aperture Self-Assembly in Space (OASIS) ***Description:*** The Optical Apertures Self-assembling in Space program seeks to demonstrate the feasibility of constructing large optical apertures in orbit from a number of smaller modular components that self-organize in space. The program will demonstrate the technologies needed to assemble a large (>5m) and near-diffraction limited optical aperture from modular components that are launched as separate payloads. The program will include a scalable zero-g demonstration of a functional optical system that maintains the precision and large-scale physical stability required, and utilizes at least one segmented optical surface. This program will address technical challenges of precision mechanical assembly from modular components, multiple object rendezvous and coupling in space, and active surface measurement, compensation and control. Modular construction	2.000	6.000	-

Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Defense Advanced Research Projects Agency	Date: February 2016
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603287E *I SPACE PROGRAMS AND TECHNOLOGY*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
in space is intrinsically more challenging than ground-based assembly in that there is not necessarily any measurement and support infrastructure and equipment available, such as interferometer test towers. Therefore, the modular pieces and system design must include self-contained measurement and alignment capabilities to be employed after or during assembly. The OASIS program will demonstrate the feasibility of assembling complex and highly precise structures in space which, in assembled form, are larger than the capacity of any existing or planned space launch vehicle. This capability could enable a number of surveillance and communications instruments in orbit that are not possible today or in the near future under the current paradigm. The anticipated transition partners are the Air Force, Navy and commercial sector. ***FY 2015 Accomplishments:*** - Investigated essential technologies to facilitate self-organizing robotic construction in space. - Developed improved piezopolymer controlled deformable mirrors which can be deployed in a self-assembling orbital optical aperture. - Developed a Photonic Integrated Circuit (PIC) for a proof of concept interferometry demonstration, to enable simultaneous wide angle and zoom capabilities from a single device with no moving parts. - Performed risk reduction activities on strain-deployed, piezo-aligned, lightweight sparse aperture optical concept to support orbital Intelligence, Surveillance, and Reconnaissance (ISR). ***FY 2016 Plans:*** - Continue risk reduction activities on strain-deployed, piezo-aligned, lightweight sparse aperture optical concept to support orbital Intelligence, Surveillance, and Reconnaissance (ISR). - Conduct laboratory demonstration of high resolution capability with light weight optics by leveraging a precision interferometric approach combined with novel image reconstruction algorithm and PIC, which will provide both simultaneous wide angle and zoom capabilities on the same device with no moving parts. - Construct improved piezopolymer controlled deformable mirrors.			
Title: Space Domain Awareness (SDA) ***Description:*** The goal of the Space Domain Awareness (SDA) program is to develop and demonstrate an operational framework and responsive defense application to enhance the availability of vulnerable space-based resources. Current space surveillance sensors cannot detect, track, or determine the future location and threat potential of small advanced technology spacecraft in deep space orbits, where a majority of DoD spacecraft are located. Additionally, servicing missions to geosynchronous earth (GEO) orbits will require exquisite situational awareness, from ultra-high-accuracy debris tracking for mission assurance at GEO orbits to high resolution imaging of GEO spacecraft for service mission planning. SDA will investigate revolutionary technologies in two areas: 1) advanced space surveillance sensors to better detect, track, and characterize space objects, with an emphasis on deep space objects, and 2) space surveillance data collection, data archival,	17.504	5.692	-

Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Defense Advanced Research Projects Agency	Date: February 2016
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* I BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603287E I *SPACE PROGRAMS AND TECHNOLOGY*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
and data processing/fusion to provide automated data synergy. The resulting increase in space domain awareness will enhance overall space safety of flight, and allow space operators to make informed, timely decisions. The SDA program will leverage data fusion and advanced algorithms developed under the Space Surveillance Telescope (SST) program, as well as seek to exploit new ground-breaking technologies across the electromagnetic spectrum and utilize already existing sensor technology in nontraditional or exotic ways, to bring advanced capabilities to the space domain. SDA will demonstrate new approaches to collection of data utilizing a variety of collection modalities, ranging from fusion of observations from non-traditional sources, such as amateur astronomers, to evaluation of sparse aperture imaging techniques. ***FY 2015 Accomplishments:*** - Expanded the SpaceView amateur network to additional nodes including Australia locations. - Incorporated international data sources into SDA database. - Initiated data ingest from the StellarView network of academic astronomy data providers. - Commenced Phase 1 of an un-cued low inclined LEO object detection capability. - Performed database verification on collected data; demonstrated metric and radiometric accuracy. - Studied the application of coherent and quantum detectors to Space Domain Awareness challenges of object detection and imaging. - Initiated Real-Time Space Domain Awareness design development. - Completed development and took delivery of bias estimation, bias aware, bias-aware track generation software, received initial value assessment of data containing biases provided to enhance SDA. ***FY 2016 Plans:*** - Complete an initial capability demonstration of a collaborative network of distributed sensors and users to generate timely, accurate and actionable space indications and warnings. - Integrate all data providers and first generation algorithms on the SDA database to autonomously detect biases, estimate uncertainties, and leverage non-accredited information for real time SDA. - Continue value assessment of data containing biases provided to SDA database. - Expand the portfolio of modalities contributing to SDA to include RADAR data providers. - Integrate SDA database with the US Space Command non-traditional data preprocessor. - Conduct capability demonstration of collaborative network of distributed sensors and users. - Perform and document analysis of algorithm performance.			
Accomplishments/Planned Programs Subtotals	172.504	126.692	175.240

D. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Defense Advanced Research Projects Agency	Date: February 2016
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603287E / *SPACE PROGRAMS AND TECHNOLOGY*

D. Other Program Funding Summary ($ in Millions)

Remarks

E. Acquisition Strategy

N/A

F. Performance Metrics

Specific programmatic performance metrics are listed above in the program accomplishments and plans section.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Defense Advanced Research Projects Agency			Date: February 2016
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603287E / *SPACE PROGRAMS AND TECHNOLOGY*	Project (Number/Name) SPC-01 / *SPACE PROGRAMS AND TECHNOLOGY*	

Product Development ($ in Millions)

				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Airborne Launch Assist Space Access (ALASA)	C/CPFF	The Boeing Company : CA	-	53.964	Oct 2014	0.000		0.000		-		0.000	0	53.964	0
Airborne Launch Assist Space Access (ALASA)	C/Various	Various : Various	-	0.000		14.750		0.000		-		0.000	0	14.750	0
Experimental Spaceplane One (XS-1)	C/Various	The Boeing Company : CA	-	5.857	Oct 2014	2.504		0.000		-		0.000	Continuing	Continuing	Continuing
Experimental Spaceplane One (XS-1)	C/CPFF	Northrop Grumman : CA	-	5.427	Dec 2014	2.120		0.000		-		0.000	Continuing	Continuing	Continuing
Experimental Spaceplane One (XS-1)	C/Various	Various : Various	-	11.466		5.376		0.000		-		0.000	Continuing	Continuing	Continuing
Experimental Spaceplane One (XS-1)	C/TBD	TBD : TBD	-	0.000		17.163		44.455		-		44.455	Continuing	Continuing	Continuing
Phoenix	MIPR	Naval Research Laboratory : Various	-	15.766	Nov 2014	15.375		5.900		-		5.900	Continuing	Continuing	Continuing
Phoenix	C/Various	Various : Various	-	34.284		1.915		2.053		-		2.053	Continuing	Continuing	Continuing
Robotic Servicing of Geostationary Satellites (RSGS)	MIPR	Naval Research Laboratory : Various	-	2.000	Nov 2014	4.000		15.000		-		15.000	Continuing	Continuing	Continuing
Robotic Servicing of Geostationary Satellites (RSGS)	C/Various	Various : Various	-	1.640		1.500		5.350		-		5.350	Continuing	Continuing	Continuing
Robotic Servicing of Geostationary Satellites (RSGS)	C/TBD	TBD : TBD	-	0.000		5.420		10.180		-		10.180	Continuing	Continuing	Continuing
Space Surveillance Telescope (SST)	SS/CPFF	Massachusetts Institute of Technology : MA	-	8.190	Nov 2014	8.190		9.100		-		9.100	Continuing	Continuing	Continuing
Radar Net	C/TBD	Various : Various	-	0.000		14.100		36.950		-		36.950	Continuing	Continuing	Continuing
Hallmark	C/TBD	Various : Various	-	0.000		9.100		20.480		-		20.480	Continuing	Continuing	Continuing
Optical Aperture Self-Assembly in Space (OASIS)	C/Various	Various : Various	-	1.820		5.460		0.000		-		0.000	0	7.280	0

Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Defense Advanced Research Projects Agency			**Date:** February 2016
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603287E / *SPACE PROGRAMS AND TECHNOLOGY*	**Project (Number/Name)** SPC-01 / *SPACE PROGRAMS AND TECHNOLOGY*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Space Domain Awareness (SDA)	C/Various	Various : Various	-	15.929		5.180		0.000		-		0.000	0	21.109	0
		Subtotal	-	156.343		112.153		149.468		-		149.468	-	-	-

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Support	MIPR	Various : Various	-	6.900		5.068		7.010		-		7.010	Continuing	Continuing	Continuing
		Subtotal	-	6.900		5.068		7.010		-		7.010	-	-	-

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Airborne Launch Assist Space Access (ALASA)	C/Various	Various : Various	-	0.636		3.000		0.000		-		0.000	0	3.636	0
Experimental Spaceplane One (XS-1)	C/Various	Various : Various	-	0.000		0.136		1.500		-		1.500	Continuing	Continuing	Continuing
Robotic Servicing of Geostationary Satellites (RSGS)	C/TBD	Various : Various	-	0.000		0.000		0.500		-		0.500	Continuing	Continuing	Continuing
Radar Net	C/TBD	Various : Various	-	0.000		0.000		3.000		-		3.000	Continuing	Continuing	Continuing
Hallmark	C/TBD	Various : Various	-	0.000		0.000		5.000		-		5.000	Continuing	Continuing	Continuing
		Subtotal	-	0.636		3.136		10.000		-		10.000	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Defense Advanced Research Projects Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603287E / *SPACE PROGRAMS AND TECHNOLOGY*	**Project (Number/Name)** SPC-01 / *SPACE PROGRAMS AND TECHNOLOGY*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Management Support	C/Various	Various : Various	-	8.625		6.335		8.762		-		8.762	Continuing	Continuing	Continuing
		Subtotal	-	8.625		6.335		8.762		-		8.762	-	-	-

	Prior Years	FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	172.504		126.692		175.240		-		175.240	-	-	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2017 Defense Advanced Research Projects Agency		**Date:** February 2016
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603287E / *SPACE PROGRAMS AND TECHNOLOGY*	**Project (Number/Name)** SPC-01 / *SPACE PROGRAMS AND TECHNOLOGY*

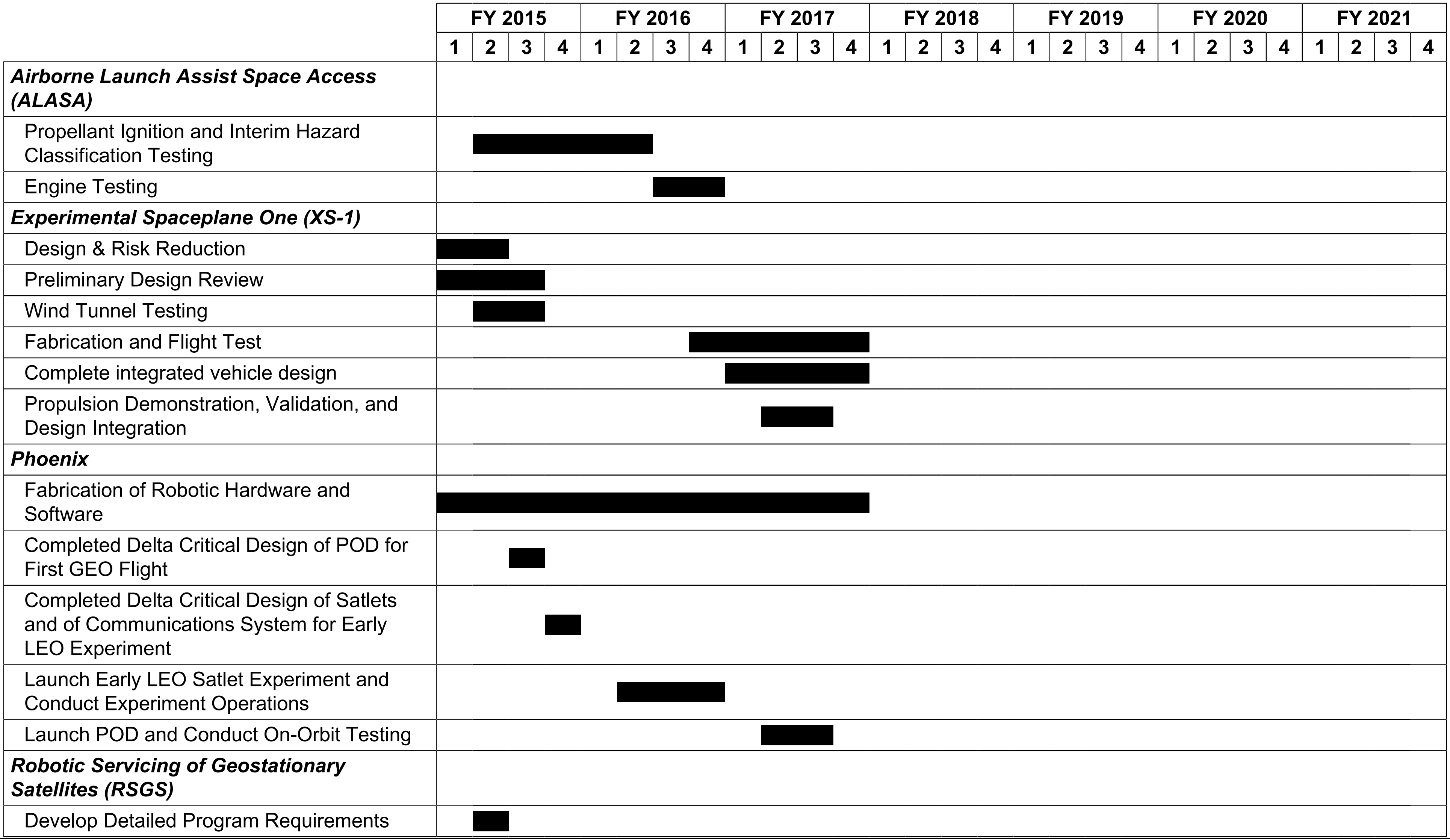

Exhibit R-4, RDT&E Schedule Profile: PB 2017 Defense Advanced Research Projects Agency		**Date:** February 2016
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603287E / *SPACE PROGRAMS AND TECHNOLOGY*	**Project (Number/Name)** SPC-01 / *SPACE PROGRAMS AND TECHNOLOGY*

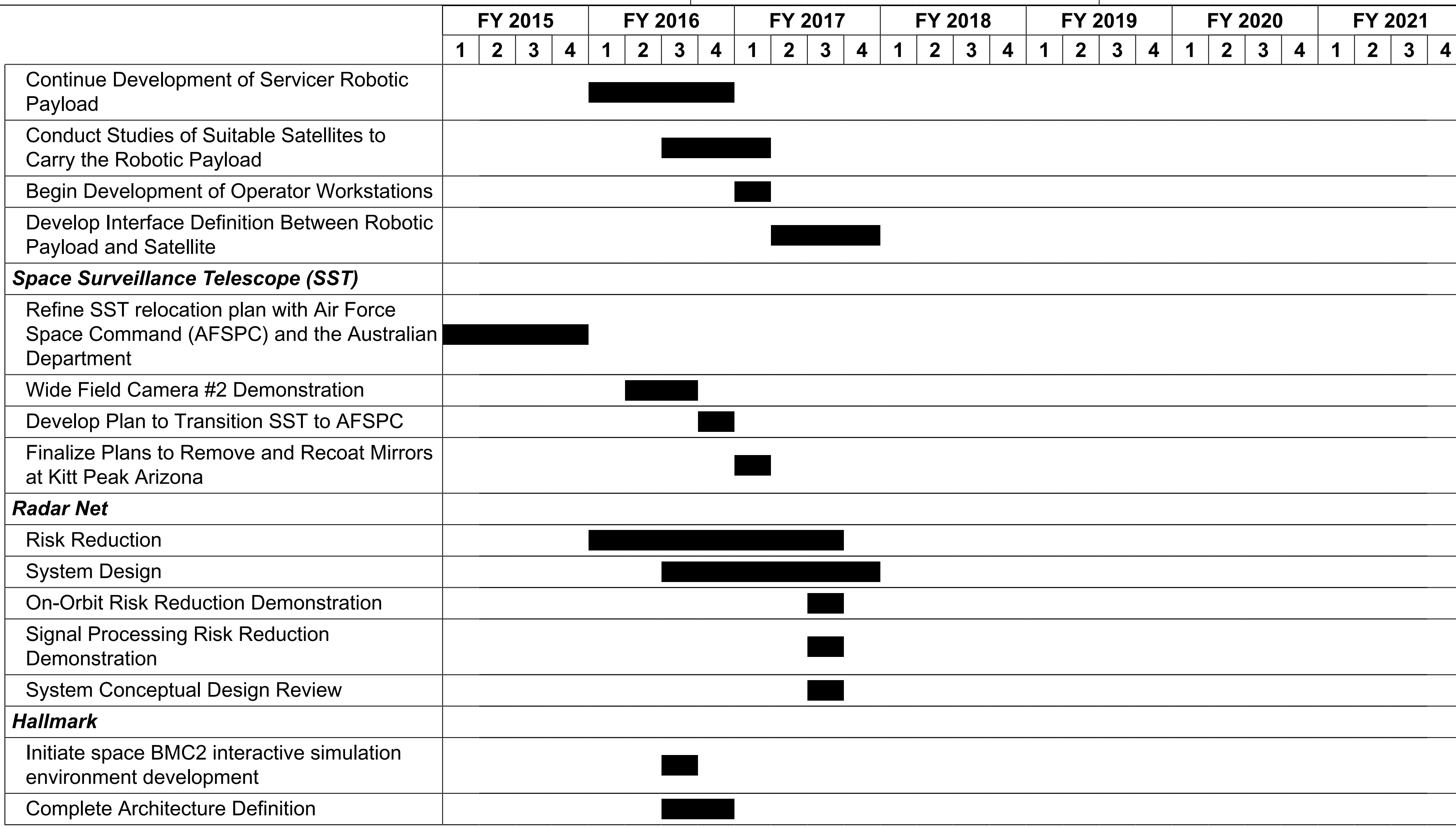

Exhibit R-4, **RDT&E Schedule Profile:** PB 2017 Defense Advanced Research Projects Agency		**Date:** February 2016
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603287E / *SPACE PROGRAMS AND TECHNOLOGY*	**Project (Number/Name)** SPC-01 / *SPACE PROGRAMS AND TECHNOLOGY*

	FY 2015				FY 2016				FY 2017				FY 2018				FY 2019				FY 2020				FY 2021			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Demonstrate and document integrated tools, algorithms and data schemes										X																		
Develop modeling and simulation infrastructure										X	X	X																
Optical Aperture Self-Assembly in Space (OASIS)																												
Developed Improved Piezopolymer Controlled Deformable Mirrors		X																										
Conduct final demonstration of Image Quality Refinement						X																						
Space Domain Awareness (SDA)																												
Identify Advanced Collection Technique Need			X																									
Second Data Buy Option			X																									
Advanced Collection Technique First Collect						X																						
Complete initial capability demonstration								X																				

Exhibit R-4A, RDT&E Schedule Details: PB 2017 Defense Advanced Research Projects Agency		**Date:** February 2016
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603287E / *SPACE PROGRAMS AND TECHNOLOGY*	**Project (Number/Name)** SPC-01 / *SPACE PROGRAMS AND TECHNOLOGY*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Airborne Launch Assist Space Access (ALASA)				
Propellant Ignition and Interim Hazard Classification Testing	2	2015	2	2016
Engine Testing	3	2016	4	2016
Experimental Spaceplane One (XS-1)				
Design & Risk Reduction	1	2015	2	2015
Preliminary Design Review	1	2015	3	2015
Wind Tunnel Testing	2	2015	3	2015
Fabrication and Flight Test	4	2016	4	2017
Complete integrated vehicle design	1	2017	4	2017
Propulsion Demonstration, Validation, and Design Integration	2	2017	3	2017
Phoenix				
Fabrication of Robotic Hardware and Software	1	2015	4	2017
Completed Delta Critical Design of POD for First GEO Flight	3	2015	3	2015
Completed Delta Critical Design of Satlets and of Communications System for Early LEO Experiment	4	2015	4	2015
Launch Early LEO Satlet Experiment and Conduct Experiment Operations	2	2016	4	2016
Launch POD and Conduct On-Orbit Testing	2	2017	3	2017
Robotic Servicing of Geostationary Satellites (RSGS)				
Develop Detailed Program Requirements	2	2015	2	2015
Continue Development of Servicer Robotic Payload	1	2016	4	2016
Conduct Studies of Suitable Satellites to Carry the Robotic Payload	3	2016	1	2017
Begin Development of Operator Workstations	1	2017	1	2017

Exhibit R-4A, RDT&E Schedule Details: PB 2017 Defense Advanced Research Projects Agency		Date: February 2016
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603287E / *SPACE PROGRAMS AND TECHNOLOGY*	**Project (Number/Name)** SPC-01 / *SPACE PROGRAMS AND TECHNOLOGY*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Develop Interface Definition Between Robotic Payload and Satellite	2	2017	4	2017
Space Surveillance Telescope (SST)				
Refine SST relocation plan with Air Force Space Command (AFSPC) and the Australian Department	1	2015	4	2015
Wide Field Camera #2 Demonstration	2	2016	3	2016
Develop Plan to Transition SST to AFSPC	4	2016	4	2016
Finalize Plans to Remove and Recoat Mirrors at Kitt Peak Arizona	1	2017	1	2017
Radar Net				
Risk Reduction	1	2016	3	2017
System Design	3	2016	4	2017
On-Orbit Risk Reduction Demonstration	3	2017	3	2017
Signal Processing Risk Reduction Demonstration	3	2017	3	2017
System Conceptual Design Review	3	2017	3	2017
Hallmark				
Initiate space BMC2 interactive simulation environment development	3	2016	3	2016
Complete Architecture Definition	3	2016	4	2016
Demonstrate and document integrated tools, algorithms and data schemes	2	2017	2	2017
Develop modeling and simulation infrastructure	2	2017	4	2017
Optical Aperture Self-Assembly in Space (OASIS)				
Developed Improved Piezopolymer Controlled Deformable Mirrors	2	2015	2	2015
Conduct final demonstration of Image Quality Refinement	2	2016	2	2016
Space Domain Awareness (SDA)				
Identify Advanced Collection Technique Need	3	2015	3	2015
Second Data Buy Option	3	2015	3	2015
Advanced Collection Technique First Collect	2	2016	2	2016
Complete initial capability demonstration	4	2016	4	2016

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