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Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Air Force **Date:** February 2016

Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604857F / <i>Operationally Responsive Space</i>
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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	-	20.000	18.437	7.921	0.000	7.921	8.253	8.402	8.559	8.711	Continuing	Continuing
64A020: <i>AF Funded ORSSats</i>	-	20.000	18.437	7.921	0.000	7.921	8.253	8.402	8.559	8.711	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The successful integration of space-based capabilities into the core of U.S. national security operations has resulted in dramatically increased demand for and dependence upon space capabilities. As a result, 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 "continuity of operations" capability; 3) to rapidly exploit and infuse space technological or operational innovations to increase U.S. advantage. Operationally Responsive Space projects were optimized for prioritized theater use and/or surge, augmentation and replenishment of traditional space capabilities. The ORS Concept of Operations (CONOPS) drives the need for satellites featuring high degrees of modularity, standard interface vehicles, and the use of plug and play payloads and buses.

The Air Force will continue to maintain ORS-1, launched 29 Jun 2011 to respond to U.S. Central Command's (USCENTCOM's) urgent need, validated by USSTRATCOM, to provide intelligence, surveillance, and reconnaissance (ISR) for theater warfighters. The additional ORS Office efforts of maturing enabling elements will be transitioned as appropriate to other space programs including Global Positioning System, Advanced EHF Milsatcom, Space Based Infrared System, Space Control Technology, and the rest of the space architecture.

ORS projects provide a broad range of capabilities directly supporting warfighter needs. Potential missions include communications; data exfiltration; blue/friendly force situational awareness; maritime domain awareness; positioning, navigation, and timing; weather; missile warning; and battlefield ISR. The highest priorities of the ORS Office are development and launch of the ORS-5 space situational awareness mission, development and launch of the Compact Ocean Wind Vector Radiometer (COWVR) technology demonstration, the low cost automated manufacturing initiative, and concluding the ORS-4 Super Strypi launch campaign. The remaining priorities for the ORS office are to satisfy the high priority needs for augmentation and reconstitution, such as Missile Warning, Wideband Protected Communication, Narrowband Communication, Space Situational Awareness, and Electro-Optical/Infrared (EO/IR) imagery.

Capabilities are being developed to systematically mature the ORS enabling elements to meet the USSTRATCOM specified responsiveness timelines and the 2007 NDAA cost target (\$40M satellites/\$20M launches). This includes authenticating commercial space parts, confirming automated assembly lines, validating digital mission assurance processes, developing a modular open system architecture employing plug and play standards, and providing assembly, integration & test in the Rapid Response Space Works. It also includes integrating with the Multi-Mission Satellite Operations Center (MMSOC) to proliferate common satellite command and control.

ORS is working with the University of Hawaii's (U of H) Hawaii Space Flight Laboratory and Sandia National Laboratory to complete the Super Strypi mission, documenting the results and the mishap investigation.

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Appropriation/Budget Activity	R-1 Program Element (Number/Name)
3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	PE 0604857F / <i>Operationally Responsive Space</i>

This program is in Budget Activity 04, Advanced Component Development and Prototypes, because the efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

B. Program Change Summary (\$ in Millions)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Previous President's Budget	20.000	6.457	0.000	0.000	0.000
Current President's Budget	20.000	18.437	7.921	0.000	7.921
Total Adjustments	0.000	11.980	7.921	0.000	7.921
• Congressional General Reductions	0.000	-0.020			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	12.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	7.921	0.000	7.921

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 64A020: *AF Funded ORSSats*

- Congressional Add: *Operational Capabilities, Development, and Integration*
- Congressional Add: *Rapid Assembly, Integration, & Test (Tier-2)*
- Congressional Add: *ORS Development (1)*
- Congressional Add: *ORS: Cross Cutting*

Congressional Add Subtotals for Project: 64A020

Congressional Add Totals for all Projects

	FY 2015	FY 2016
	0.700	0.274
	0.200	0.909
	12.900	8.735
	6.200	2.082
Congressional Add Subtotals for Project: 64A020	20.000	12.000
Congressional Add Totals for all Projects	20.000	12.000

Change Summary Explanation

FY2016: +\$12.0M Program increase; -\$0.02M for FFRDC
 FY2017: +\$7.9M to continue the ORS program.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2015	FY 2016	FY 2017
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Title: ORS Development	-	-	2.000
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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2015	FY 2016	FY 2017
Description: Rapidly exploit and infuse space technological or operational innovations to increase U.S. advantage.				
FY 2017 Plans: Prepare ORS-5 ground support in readiness for FY17 launch.				
Title: ORS: Cross Cutting		-	6.437	5.921
Description: Provide systems engineering and program management support across all the ORS activities. Perform modeling, simulation, analysis, and assess alternative concepts and requirements.				
FY 2016 Plans: Continue ORS-1 Mission Operations and Lessons Learned studies. Continue ongoing systems engineering support of future mission development. Refine ORS CONOPS, Enterprise and Architecture, and Systems Engineering Processes. Lead, participate in, and support, as appropriate, the solidification of space doctrine.				
FY 2017 Plans: Continue ongoing systems engineering support of future mission development. Refine ORS CONOPS, Enterprise and Architecture, and Systems Engineering Processes. Lead, participate in, and support, as appropriate, the solidification of space doctrine.				
Accomplishments/Planned Programs Subtotals		-	6.437	7.921
		FY 2015	FY 2016	
Congressional Add: Operational Capabilities, Development, and Integration		0.700	0.274	
FY 2015 Accomplishments: Incorporated ORS Resilient Space Layer (RSL) in three wargames: Advanced Concept Event-15 (ACE-15), Futures Wargame-15, and the Space Futures Wargame-15. Demonstrated the Commercial Integration of Global Android-based Relay System for Force Tracking (CIGARS-FT) project during the Army's Technical Support and Operational Analysis (TSOA).				
FY 2016 Plans: Execute urgent needs as identified by USSTRATCOM. Continue to support Service war games; re-start support to CCMD exercises. Support the integration of MMSOC compatibility with the Naval Research Lab's Neptune Common Ground Architecture, and demonstrate using the Army's Kestrel Eye Satellite program. Integrate ORS capabilities and concepts, including resiliency, into operations plans of the combatant commands, TTP of the military departments, and exercises, demonstrations, and war games. Support the				

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	FY 2015	FY 2016	
Space and Naval Warfare Systems Command (SPAWAR) program with small satellite capabilities to satisfy naval weather requirements.			
Congressional Add: Rapid Assembly, Integration, & Test (Tier-2) FY 2015 Accomplishments: Continued developing the Rapid Response Space Works and its capability for rapid assembly integration and test, using the modular space vehicle bus. FY 2016 Plans: Reconfigure the delivered Modular Space Vehicle (MSV) bus to accommodate the Compact Ocean Surface Wind Vector Radiometer (COWVR) technology demonstration. Execute the Open Manufacturing program to develop four 6U sized cubesats--Responsive Space Satellites (RSPSats), and the Space Effect Deployable Responsive Space Testbed (RSTB) program to conduct three stratospheric flight missions.	0.200	0.909	
Congressional Add: ORS Development (1) FY 2015 Accomplishments: Performed ORS-5 System Capability Demonstrations 1 and 2, and Preliminary Design Review (PDR) and Critical Design Review (CDR) milestones. Awarded the ORS-5 Minotaur IV launch vehicle contract. ORS-4 launch date was originally scheduled for Jan 2015, but first stage motor complications caused a delay to Nov 2015. Defined open manufacturing requirements, factory environment, integration with Digital Assurance architecture, transportation and factory flow requirements, standard, high-definition, and machine readable camera requirements. Responsive Space Parts/Spacecraft Design to include Next Generation Space Hot Shot Design. Digital Assurance integration to Spacecraft object build and flight software iteration. FY 2016 Plans: Continue ORS-5 space vehicle system integration and testing. Continue open manufacturing development including factory environment, integration with Digital Assurance architecture, transportation and factory flow requirements, standard, high-definition, and machine readable camera requirements. Continue responsive Space Parts/Spacecraft Design to include Next Generation Space Hot Shot Design. Continue Digital Assurance integration to Spacecraft object build and flight software iteration. Close out the demonstration of the ORS-4/Super Strypi mission. ORS-4 was the first flight demonstration launch of the Super Strypi launch system and demonstrated the rail launcher and horizontal launch processing.	12.900	8.735	
Congressional Add: ORS: Cross Cutting FY 2015 Accomplishments: Continued systems engineering and program management Independent Verification & Validation (IV&V) for ORS rapid Assembly, Integration and Test (AI&T) capability and the MSV. Continued ongoing systems engineering support of future mission development. Continued ORS-1 Mission Operations and Lessons Learned studies. Conducted Modeling and Simulations for Mission Evaluations. Refine	6.200	2.082	

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	FY 2015	FY 2016
ORS CONOPS, Enterprise and Architecture, and Systems Engineering Processes. Supported the solidification of space doctrine.		
FY 2016 Plans: Continue ORS-1 Mission Operations and Lessons Learned studies. Continue ongoing systems engineering support of future mission development. Refine ORS CONOPS, Enterprise and Architecture, and Systems Engineering Processes. Lead, participate in, and support, as appropriate, the solidification of space doctrine.		
Congressional Adds Subtotals	20.000	12.000

D. Other Program Funding Summary (\$ in Millions)

<u>Line Item</u>	<u>FY 2015</u>	<u>FY 2016</u>	<u>FY 2017</u> <u>Base</u>	<u>FY 2017</u> <u>OCO</u>	<u>FY 2017</u> <u>Total</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• RDTE: BA04: 0604422F: <i>Weather System Follow-On</i>	30.890	56.044	118.953	0.000	118.953	151.650	153.330	61.893	36.903	Continuing	Continuing

Remarks

E. Acquisition Strategy

Expediently award contracts through ORS Office or partner organizations.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Air Force **Date:** February 2016

Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0604857F / <i>Operationally Responsive Space</i>	Project (Number/Name) 64A020 / <i>AF Funded ORSSats</i>
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Product Development (\$ in Millions)				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Operational Capabilities, Development, and Integration	Various	Various : Various	-	0.700	Mar 2015	0.275	Dec 2015	0.000		0.000		0.000	Continuing	Continuing	TBD
Rapid AI&T (Tier-2, RRSW)	C/CPFF	Millennium Engineering : Albuquerque, NM	-	0.200	Mar 2015	0.910	Dec 2015	0.000		0.000		0.000	Continuing	Continuing	TBD
ORS-5 (Tier 3)	SS/CPFF	MIT/LL : Boston, MA	-	4.800	Mar 2015	2.080	Feb 2016	2.000	Oct 2016	0.000		2.000	Continuing	Continuing	TBD
ORS-5 Launch	C/FPIF	Orbital : Chandler, AZ	-	0.500	Jul 2015	3.000	Dec 2015	0.000		0.000		0.000	Continuing	Continuing	TBD
MSV Modular Bus/Open Manufacturing (Tier 3)	C/CPFF	Raytheon : Tucson, AZ	-	1.900	Dec 2014	3.409	Mar 2016	0.000		0.000		0.000	Continuing	Continuing	500.000
Responsive Launch Capability (ORS-4)(Tier-3)	SS/CPFF	U. of HI : Honolulu, HI	-	5.700	Mar 2015	0.250	Oct 2015	0.000		0.000		0.000	Continuing	Continuing	47.000
Enterprise System Engineering and Integration	C/T&M	GSA : San Antonio, TX	-	0.000	Oct 2015	0.000	Jun 2016	0.000	Dec 2016	0.000		0.000	Continuing	Continuing	TBD
Technical Mission Analysis	PO	Aerospace : Albuquerque, NM	-	0.500	Jan 2015	0.000	Oct 2015	0.000	Oct 2016	0.000		0.000	Continuing	Continuing	TBD
Subtotal			-	14.300		9.924		2.000		0.000		2.000	-	-	-

Support (\$ in Millions)				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Subtotal			-	-		-		-		-		-	-	-	-

Test and Evaluation (\$ in Millions)				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Subtotal			-	-		-		-		-		-	-	-	-

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Exhibit R-4A, RDT&E Schedule Details: PB 2017 Air Force		Date: February 2016
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Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Operational Capabilities Development and Integration	1	2015	4	2016
ORS-1 (CENTCOM Urgent Need)	1	2015	2	2016
Rapid AI&T (Tier-2, RRSW)	1	2015	4	2016
ORS-5 Space Situational Awareness	1	2015	3	2020
ORS-5 Launch	4	2015	3	2017
MSV Modular Bus/Open Manufacturing	1	2015	4	2016
ORS-4 Super Strypi	1	2015	2	2016
Cross-Cutting Activities: Modeling, Sim, Analysis; JFC Needs	1	2015	4	2021

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