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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 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 0305913F / <i>NUDET Detection System (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	-	20.405	14.403	21.093	0.000	21.093	31.418	19.919	17.093	14.268	Continuing	Continuing
672808: <i>Nuc Detonation Det Sys (sensors)</i>	-	20.405	14.403	21.093	0.000	21.093	31.418	19.919	17.093	14.268	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The United States Nuclear Detonation (NUDET) Detection System (USNDS) provides a near real-time worldwide, highly survivable/endurable capability to detect, locate, and report any nuclear detonations in the earth's atmosphere or in near space. USNDS supports NUDET detection requirements across five mission areas: Integrated Tactical Warning and Attack Assessment (ITW/AA), Nuclear Force Management (NFM), Space Control (SC), Treaty Monitoring (TM), and a classified mission.

The USNDS program is jointly sponsored and funded by the Department of Defense (DoD), through the US Air Force (AF), and the Department of Energy (DOE), through the National Nuclear Security Administration (NNSA) and its Nuclear Detonation Detection (NA-22) office, respectively. NNSA/NA-22 supplies, at no cost to DoD, USNDS space sensors as Government Furnished Equipment (GFE) to the AF's USNDS Program Office, which is responsible for all acquisition and systems engineering, integration and test (SEIT) activities on space vehicles (SVs), to include Global Positioning System (GPS) and additional hosts, and their supporting ground control segments. The AF directly funds the development of the USNDS ground segment (described below).

DoD funds their contribution to the NDS program in Program Element (PE) 0305913F with RDT&E, OPAF, SPAF and O&M dollars.

USNDS consists of space sensors and complex ground segments. The space segment sensors, funded by DOE, consists of three nuclear detection sensor payloads: the Radiation Detection Capability (RADEC) payload for Defense Support Program (DSP) satellites, the Global Burst Detection (GBD) payload for Medium Earth Orbit (MEO) platforms (GPS satellites), and the Space Atmospheric Burst Reporting System (SABRS) payload for Geosynchronous Earth Orbit (GEO) platforms (classified GEO host). Together, these sensors and associated communications capability provided by the host satellites comprise the global NUDET space segment detection capability for the USNDS. Space sensors communicate NUDET indications to the fixed ground segment (the RADEC Data Processor (RDP) and the Integrated Correlation and Display System (ICADS)), the deployable mobile ground segment (survivable Ground NDS Terminals (GNTs)), and the survivable/endurable Universal Ground NDS Terminals (UGNTs), when fielded. These ground systems perform data analysis and provide a decision support tool to the Air Force controllers concerning probability of NUDET occurrence. The ground segment provides ground receiving analysis and reporting capabilities to national authorities, commands, and forward users as well as Department of State (DOS) for the Treaty Monitoring and Verification mission. The ground control segment is being modernized and continuously improved through an incremental, evolutionary acquisition approach.

The upgrade to the GNT is the survivable/endurable Universal Ground Nuclear Detonation (NUDET) Detection System (NDS) Terminal which is funded with AF RDT&E in this PE. The UGNT provides NUDET Detection Reports to end users through survivable and endurable USNDS communications via Milstar/Advanced Extremely High Frequency (AEHF) circuits. The GNT supports ITW/AA and NFM missions. The UGNT program modifies the baseline of the GNT program and deploys as an integral

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part of the Space Based Infrared System (SBIRS) Survivable / Endurable Evolution (S2E2) Mobile Ground System (SMGS) units also in support of ITW/AA and NFM. The UGNT, when integrated with the SMGS, will perform NUDET event processing with fused NDS data from GPS and DSP. SMGS capability refers to the result of the S2E2 upgrade program for the MGS mission processing capability, including the integration of UGNT. The intended end state of UGNT integration is delivery of enhanced missile warning and NUDET detection capabilities that meet survivable/endurable ITW/AA requirements directed by the President, SECDEF, Joint Staff, and USSTRATCOM, delivering long-term, cost effective, multi-role, multi-mission space effects to the war fighter across the range of military operations.

This budget line includes systems engineering, research and development, on-orbit and field testing and end-to-end verification of USNDS space sensors, ground analysis and reporting systems in support of the five USNDS mission areas. Sensor integration for GPS IIF and GPS III are funded in their respective PEs.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary (\$ in Millions)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Previous President's Budget	20.405	14.447	18.785	0.000	18.785
Current President's Budget	20.405	14.403	21.093	0.000	21.093
Total Adjustments	0.000	-0.044	2.308	0.000	2.308
• Congressional General Reductions	0.000	-0.044			
• 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	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	2.308	0.000	2.308

Change Summary Explanation

FY17: +\$2.308M to fund On-Orbit Support of USNDS Sensors

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2015	FY 2016	FY 2017
Title: ICADS	6.843	-	-
Description: Satellite ground data processing system that reports endo-atmospheric, transition and near-space nuclear detonations (NUDETs) as detected by the NDS sensors aboard the GPS and DSP satellites and SABRS equipped satellites.			
FY 2015 Accomplishments:			

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2015	FY 2016	FY 2017
Completed ITW/AA certification for ICADS Delivery 2. Completed Operational delivery of ICADS Build 6 Delivery 2 to support GPS III SVs 01-08.				
<p>Title: UGNT</p> <p>Description: Delivers enhanced missile warning and NUDET detection capabilities that meet survivable/endurable tactical warning and attack assessment requirements directed by the President, SECDEF, Joint Staff and USSTRATCOM delivering long-term, cost effective, multi-role, multi-mission space effects to the warfighter across the range of military operations.</p> <p>FY 2015 Accomplishments: Completed integration of 2 UGNT shelters. Began contractor DT&E of 2 UGNT shelters for delivery for initial S2E2 integration in 2QFY17.</p> <p>FY 2016 Plans: Complete contractor and Air Force DT&E of UGNTs. Begin final testing and integration of hardware and software into the third UGNT trailer.</p> <p>FY 2017 Plans: Deliver first, second and third UGNT trailer to the SBIRS S2E2 program for integration into the S2E2 Force Package (FPAK).</p>		5.639	8.864	15.091
<p>Title: Systems Engineering/On-Orbit Support & Testing</p> <p>Description: Support costs include such activities as, on-orbit NDS sensor integration, check-out/support, testing and system engineering.</p> <p>FY 2015 Accomplishments: Provided SE&I, technical support and program technical support for the five NDS mission areas. Delivered GBD for GPS III SV03 and support SV integration activities. Supported GPS IIF-8, IIF-9 and IIF-10 integration checkout of NDS sensors during launch and on-orbit activities.</p> <p>FY 2016 Plans: Provide SE&I, technical support and program technical support for the five NDS mission areas. Deliver GBD for GPS III SV04, SV05, and support SV integration activities. Support to GPS IIF-11 and IIF-12, integration checkout of NDS sensors during launch and on-orbit activities.</p> <p>FY 2017 Plans:</p>		7.923	5.539	6.002

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2015	FY 2016	FY 2017
Provide SE&I, technical support and program technical support for the five NDS mission areas. Deliver GBD for GPS III SV06 and SV07.			
Accomplishments/Planned Programs Subtotals	20.405	14.403	21.093

D. Other Program Funding Summary (\$ in Millions)											
Line Item	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
• OPAF: BA03: Line Item # 836750: <i>Nudet Detection Sys Space</i>	4.656	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.656
• SPAF:BA03:Line Item # NUDETS: <i>Nudet Detection Sys Space</i>	0.000	5.095	4.395	0.000	4.395	6.357	6.469	6.583	6.701	Continuing	Continuing

Remarks

E. Acquisition Strategy

The USNDS Acquisition Strategy is to develop, integrate, field and sustain USNDS satellite sensors and USNDS ground data processing and distribution hardware and software as well as mission operational and technical program support to sustain the USNDS capability on GPS and DSP; funding is sent by Military Interdepartmental Purchase Request (MIPR) from DoD and Department of Energy (DOE) to Sandia, Lawrence Livermore, Los Alamos National Laboratories and other agencies on existing DOE/National Nuclear Security Administration (NNSA) contracts.

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				R-1 Program Element (Number/Name)						Project (Number/Name)					
3600 / 7				PE 0305913F / NUDET Detection System (SPACE)						672808 / Nuc Detonation Det Sys (sensors)					
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
USNDS ICADS and GNT/UGNT	MIPR	Sandia National Laboratory : Albuquerque, NM	-	12.292	Nov 2014	8.864	Jan 2016	15.091	Nov 2016	0.000		15.091	Continuing	Continuing	-
USNDS Technical Mission Analysis	MIPR	Aerospace : El Segundo, CA	-	0.834	Nov 2014	1.757	Nov 2015	1.867	Nov 2016	0.000		1.867	Continuing	Continuing	-
USNDS Enterprise SE&I	C/CPAF	TASC : El Segundo, CA	-	1.410	Dec 2014	1.460	Dec 2015	1.140	Dec 2016	0.000		1.140	Continuing	Continuing	-
USNDS Associated Product Development	Various	Various : Various, CA	-	0.190	Jul 2015	0.000		0.000		0.000		0.000	Continuing	Continuing	-
Subtotal			-	14.726		12.081		18.098		0.000		18.098	-	-	-
Support (\$ 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
Subtotal			-	-		-		-		-		-	-	-	-
Test and Evaluation (\$ 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
USNDS Testing	Various	17th Test Squadron, JITC : Schriever AFB, CO	-	0.051	Dec 2014	0.329	Dec 2015	0.253	Dec 2016	0.000		0.253	Continuing	Continuing	-
USNDS On-orbit Sensor Testing	MIPR	Various : LANL, SNL, NM	-	2.532	Mar 2015	0.000		0.000		0.000		0.000	Continuing	Continuing	-
Subtotal			-	2.583		0.329		0.253		0.000		0.253	-	-	-

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Exhibit R-4, RDT&E Schedule Profile: PB 2017 Air Force		Date: February 2016
Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0305913F / NUDET Detection System (SPACE)	Project (Number/Name) 672808 / Nuc Detonation Det Sys (sensors)

	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
UGNT 1 Integration & Delivery	██████████																											
UGNT Maintenance/Training System Delivery	██████████																											
ICADS GPS III & LCS/OCX Delivery			██████████																									
UGNT 2 Integration & Delivery				██████████																								
UGNT Test Readiness Review			██████████																									
UGNT 1&2 to SBIRS Mobile Ground System								██████████																				
UGNT 3 Integration & Delivery				██████████																								
UGNT 3 to SBIRS Mobile Ground System											██████████																	
UGNT 4-5 Integration & Delivery												██████████																
UGNT Initial Operations Capability																██████████												

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Exhibit R-4A, RDT&E Schedule Details: PB 2017 Air Force		Date: February 2016
Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0305913F / NUDET Detection System (SPACE)	Project (Number/Name) 672808 / Nuc Detonation Det Sys (sensors)

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
UGNT 1 Integration & Delivery	1	2015	1	2016
UGNT Maintenance/Training System Delivery	1	2015	3	2015
ICADS GPS III & LCS/OCX Delivery	3	2015	4	2015
UGNT 2 Integration & Delivery	4	2015	2	2016
UGNT Test Readiness Review	4	2015	1	2016
UGNT 1&2 to SBIRS Mobile Ground System	1	2017	1	2017
UGNT 3 Integration & Delivery	1	2016	1	2017
UGNT 3 to SBIRS Mobile Ground System	4	2017	4	2017
UGNT 4-5 Integration & Delivery	3	2018	4	2018
UGNT Initial Operations Capability	1	2019	1	2019