Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Air Force											Date: February 2018	
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 1203913F / *NUDET Detection System (SPACE)*							
COST ($ in Millions)	**Prior Years**	**FY 2017**	**FY 2018**	**FY 2019 Base**	**FY 2019 OCO**	**FY 2019 Total**	**FY 2020**	**FY 2021**	**FY 2022**	**FY 2023**	**Cost To Complete**	**Total Cost**
Total Program Element	-	21.093	31.508	19.778	0.000	19.778	16.972	14.162	14.456	14.719	Continuing	Continuing
672808: *Nuc Detonation Det Sys (sensors)*	-	21.093	31.508	19.778	0.000	19.778	16.972	14.162	14.456	14.719	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 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 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 (SEI&T) 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 Nuclear Detonation (NUDET) Detection System (NDS) program in Program Element (PE) 1203913F with Research, Development, Test and Evaluation (RDT&E), Space Procurement, Air Force (SPAF), and operations and Maintenance (O&M).

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 five deployable mobile ground segment survivable Ground NDS Terminals (GNTs), and the survivable/endurable Universal Ground NDS Terminals (UGNTs), when fielded. 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 UGNT which is funded with RDT&E in this PE. The UGNT provides NUDET Detection Reports to end users through survivable/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 part of the Space Based Infrared System (SBIRS) Survivable / Endurable Evolution

Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Air Force	Date: February 2018
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203913F / *NUDET Detection System (SPACE)*

(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 Mobile Ground System (MGS) mission processing capability, including the integration of UGNT. The intended end state of UGNT integration is delivery of enhanced NUDET detection capabilities which meet survivable/ endurable attack assessment requirements directed by the President, Secretary of Defense (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.

The current and future space domain demands that space systems be responsive to new and changing threats, and can rapidly integrate new capabilities to make our warfighting force more resilient in a contested battlespace. This agility, survivability, and rapid reconstitution must extend through the entire space warfighting enterprise, to include how we learn about the threat; develop solutions; acquire, test, deploy, train, operate and integrate new systems into the greater system of systems; and ensure our space mission force is ready to defeat a thinking adversary in a complex, multi-domain battlespace. The enterprise will use all of its elements to accelerate decision-making, prototype potential solutions, rapidly integrate decision-making tools and sustain a war-winning capability by delivering multi-domain effects in, from, and through space and cyberspace enabling battle management and resilience options to "fight through."

This program element may include necessary civilian pay expenses required to manage, execute, and deliver NUDET Detection System (SPACE) weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

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 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Previous President's Budget	21.093	31.508	19.927	0.000	19.927
Current President's Budget	21.093	31.508	19.778	0.000	19.778
Total Adjustments	0.000	0.000	-0.149	0.000	-0.149
• 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	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-0.149	0.000	-0.149

Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Air Force	Date: February 2018
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203913F / *NUDET Detection System (SPACE)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
Title: UNIVERSAL GROUND NDS TERMINALS (UGNT)	12.902	21.655	11.451
Description: The five UGNT trailers provide NUDET Detection Reports to end users through survivable/endurable USNDS communications via Milstar/Advanced Extremely High Frequency (AEHF) circuits. The UGNT program modifies the baseline of the GNT program and deploys as an integral 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. UGNT delivers 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. ***FY 2018 Plans:*** Deliver, Integrate, and Test two UGNT Trailers. Continue Development on another UGNT trailer. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, etc. ***FY 2019 Plans:*** Deliver the fifth UGNT trailer to the SBIRS S2E2 program for integration into the S2E2 Force Package (FPAK). Conduct integration and testing of UGNT vehicles one through four with S2E2. Continue program office support and other activities that may include, but are not limited to studies, technical analysis, etc. Rapidly respond to implement resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 decreased compared to FY 2018 by $10.204M. Justification for this decrease is described in plans above.			
Title: Systems Engineering/On-Orbit Support & Testing	8.191	9.853	8.327
Description: Support costs included such activities as, on-orbit NDS sensor integration, check-out/support, testing and system engineering. ***FY 2018 Plans:*** Deliver GBD for SV08. Launch activate/checkout NDS payloads on GPS III SV01. ***FY 2019 Plans:*** Launch and checkout of NDS payloads on GPS III SV02. Continue on-orbit system engineering analysis of the USNDS fleet. Provide Systems Engineering & Integration (SE&I), technical support and program technical support for the five NDS mission			

Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Air Force	Date: February 2018
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203913F / *NUDET Detection System (SPACE)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
areas. In addition, with the introduction of Contingency Operations in FY2019, NDS on-orbit support will be required for check-out of all GPS III satellites already on orbit. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 decreased compared to FY 2018 by $1.526M. Justification for this decrease is described in plans above.			
Accomplishments/Planned Programs Subtotals	21.093	31.508	19.778

D. Other Program Funding Summary ($ in Millions)

Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
• SPAF 03 Line Item NUDETS: *Nudet Detection Sys Space*	4.395	6.370	7.705	-	7.705	6.532	6.645	6.780	6.907	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, DSP, and an Alternate Host; 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/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.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Air Force			Date: February 2018
Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 1203913F / *NUDET Detection System (SPACE)*	Project (Number/Name) 672808 / *Nuc Detonation Det Sys (sensors)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
USNDS ICADS and GNT/ UGNT	MIPR	Sandia National Laboratory : Albuquerque, NM	-	12.902	May 2017	21.655	Nov 2017	11.451	Nov 2018	-		11.451	Continuing	Continuing	-
USNDS Technical Mission Analysis	MIPR	Aerospace : El Segundo, CA	-	1.813	May 2017	1.882	Nov 2017	1.942	Nov 2018	-		1.942	Continuing	Continuing	-
USNDS Enterprise SE&I	C/CPAF	TASC : El Segundo, CA	-	1.140	Dec 2016	1.140	Dec 2017	1.140	Dec 2018	-		1.140	Continuing	Continuing	-
		Subtotal	-	15.855		24.677		14.533		-		14.533	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
USNDS Testing	Various	17th Test Squadron, JITC : Schriever AFB, CO	-	0.175	May 2017	0.692	Dec 2017	0.315	Dec 2018	-		0.315	Continuing	Continuing	-
USNDS On-orbit Sensor Testing	MIPR	Various : LANL, SNL, NM	-	2.900	Jun 2017	3.200	Dec 2017	3.100	Dec 2018	-		3.100	Continuing	Continuing	-
		Subtotal	-	3.075		3.892		3.415		-		3.415	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2017 Cost	FY 2017 Award Date	FY 2018 Cost	FY 2018 Award Date	FY 2019 Base Cost	FY 2019 Base Award Date	FY 2019 OCO Cost	FY 2019 OCO Award Date	FY 2019 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
USNDS FFRDC	Various	Aerospace, MITRE : El Segundo, CA	-	0.457	May 2017	0.879	Nov 2017	0.761	Dec 2018	-		0.761	Continuing	Continuing	-
USNDS A&AS	Various	Various : Various	-	1.666	Jun 2017	1.980	Nov 2017	0.989	Nov 2018	-		0.989	Continuing	Continuing	-
USNDS Other Support	C/CPAF	Various : Various	-	0.040	Nov 2016	0.080	Nov 2017	0.080	Nov 2018	-		0.080	Continuing	Continuing	-
		Subtotal	-	2.163		2.939		1.830		-		1.830	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Air Force			Date: February 2018
Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 1203913F / *NUDET Detection System (SPACE)*	Project (Number/Name) 672808 / *Nuc Detonation Det Sys (sensors)*	

	Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	21.093		31.508		19.778		-		19.778	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2019 Air Force		Date: February 2018
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 1203913F / *NUDET Detection System (SPACE)*	**Project (Number/Name)** 672808 / *Nuc Detonation Det Sys (sensors)*

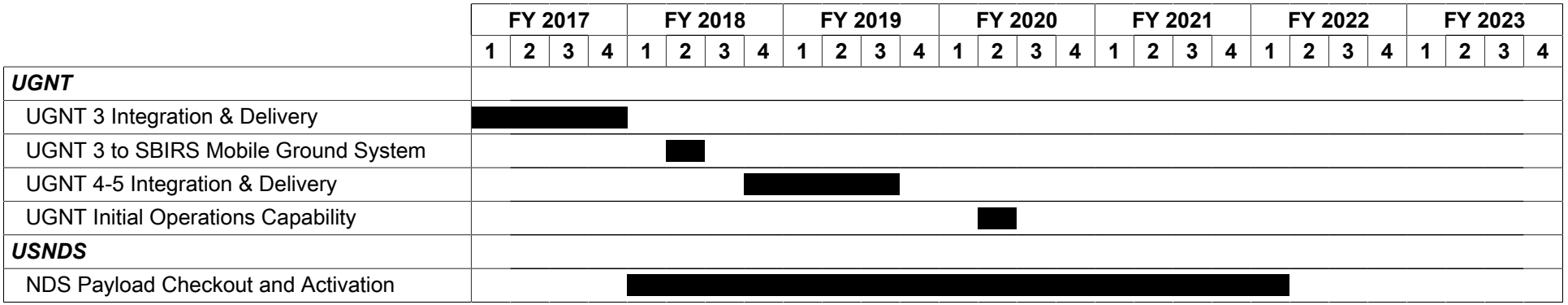

Exhibit R-4A, RDT&E Schedule Details: PB 2019 Air Force		Date: February 2018
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 1203913F / *NUDET Detection System (SPACE)*	**Project (Number/Name)** 672808 / *Nuc Detonation Det Sys (sensors)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
UGNT				
UGNT 3 Integration & Delivery	1	2017	4	2017
UGNT 3 to SBIRS Mobile Ground System	2	2018	2	2018
UGNT 4-5 Integration & Delivery	4	2018	3	2019
UGNT Initial Operations Capability	2	2020	2	2020
USNDS				
NDS Payload Checkout and Activation	1	2018	1	2022