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Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Air Force **Date:** March 2023

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203913SF / <i>NUDET Detection System (SPACE)</i>
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COST (\$ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
Total Program Element	-	45.887	60.429	93.391	0.000	93.391	86.481	76.836	78.405	81.239	0.000	522.668
672808: <i>Nuc Detonation Det Sys (sensors)</i>	-	45.887	60.429	93.391	0.000	93.391	86.481	76.836	78.405	81.239	0.000	522.668
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, Treaty Monitoring, and a classified mission.

The USNDS program is jointly sponsored and funded by the Department of Defense (DoD), through the Space Force, 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 to the Space Force's USNDS Program Office, which is responsible for all acquisition and Systems Engineering, Integration and Test 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 USNDS program in Program Element 1203913SF, Research, Development, Test and Evaluation, Space Force (RDT&E, SF), Procurement, Space Force, and Operations and Maintenance.

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 platforms (GPS satellites), and the Space Atmospheric Burst Reporting System (SABRS) payload for Geosynchronous Earth Orbit (GEO) platforms (classified GEO host), and Space Test Platform 3. 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, and the Integrated Correlation and Display System (ICADS), the five deployable mobile ground segment survivable Ground Nuclear Detonation Detection System Terminals (GNTs), and the survivable/endurable Universal Ground NDS Terminals (UGNTs), when operationally accepted. The ground segment provides ground receiving analysis and reporting capabilities to national authorities, commands, and forward users as well as Department of State for the Treaty Monitoring and Verification mission. The ground control segment is being modernized and continuously improved through an incremental, evolutionary acquisition approach.

The upgrades to the GNTs are the survivable/endurable UGNT which are funded with RDT&E in this program. The UGNT provides NUDET Detection Reports to end users through survivable/endurable USNDS communications via MilStar/Future Communication Systems (FCS)/Advanced Extremely High Frequency (AEHF) circuits. The GNT supports ITW/AA and NFM missions. The UGNT program modifies the baseline of the GNT subsystem and deploys as an integral part of the Space Based

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<p>Infrared System Survivable (SBIRS) / Endurable Evolution (S2E2) Mobile Ground System (MGS) (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 NUDET detection capabilities which meet survivable/endurable attack assessment requirements directed by the President, Secretary of Defense, Joint Staff, USSPACECOM, and USSTRATCOM, delivering long-term, cost effective, multi-role, multi-mission space effects to warfighters across the range of military operations.</p> <p>ICADS 7 upgrades the ICADS 6 baseline necessary to process future GPS IIF satellites GBD USNDS messages, address technology obsolescence, and meet updated cybersecurity requirements for system resiliency.</p> <p>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 III and GPS III Follow-on (IIF) are funded in their respective programs.</p> <p>Space acquisition must respond with speed and agility to emerging adversary threats. Space Systems Command (SSC) has transformed the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SSC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.</p> <p>This program 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 is in addition to the civilian pay expenses budgeted in programs 1206392SF and 1206398SF.</p> <p>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.</p>		

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B. Program Change Summary (\$ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	45.887	80.429	93.588	0.000	93.588
Current President's Budget	45.887	60.429	93.391	0.000	93.391
Total Adjustments	0.000	-20.000	-0.197	0.000	-0.197
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-20.000			
• 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	-0.197	0.000	-0.197

Change Summary Explanation

FY 2023: -20.000M Congressional Directed Reduction for ICADS 7 development delay.

FY 2024: -0.615M to realign funding to APPN 3410, PE 1207804SF (SAG 13C), for fiscal policy compliance as Space Systems Command (SSC) establishes Headquarters functions and a Chief Information Office (CIO) for integrated cybersecurity.

FY 2024: +.418M PBD Inflation Rates for Non-pay and Non-fuel Purchases.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2022	FY 2023	FY 2024
Title: Integration with SBIRS S2E2 Mobile Ground Terminals (SMGTs)	8.900	3.800	0.000
Description: Support the Integration and test activities between UGNTs and the SMGTs, which together provide NUDET Detection Reports and missile warning data to end users through survivable/endurable USNDS communications via MilStar/FCS/AEHF circuits. The UGNTs deploy as an integral part of the SMGS units also in support of ITW/AA and NFM. Support program scope analyzation for USNDS receiver and NUDET Decryption Unit (NDU) components. Additional support costs includes such activities as; receiver system engineering support, conceptual hardware and software design, check-out/support, testing, and system engineering.			
FY 2023 Plans: Complete UGNT integration and testing for the survivable and endurable mission necessary for S2E2/SMGT Operational Acceptance planned for 4th Quarter FY 2023. Provide Technical Order support, UGNT shelter maintenance, shipment of UGNT			

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2022	FY 2023	FY 2024
systems to operational locations, Installation and Checkout, and system testing at Continental United States (CONUS) and Outside CONUS locations. FY 2024 Plans: N/A FY 2023 to FY 2024 Increase/Decrease Statement: FY 2024 decreased due to completion of UGNT integration and testing for S2E2/SMGT Operational Acceptance.				
Title: GEO Payload Integration Description: Classified Integration efforts of the GEO payload. This effort is not a new start. It changed title from SABRS Integration to GEO Payload Integration to accurately describe the effort. FY 2023 Plans: N/A FY 2024 Plans: N/A FY 2023 to FY 2024 Increase/Decrease Statement: N/A		3.000	0.000	0.000
Title: ICADS 7 Description: ICADS 7 consists of satellite ground data processing systems that accommodate the new NDS payload on GPS III F SVs and is an upgrade to the current ICADS 6 system. ICADS 7 includes new software, hardware and cybersecurity capabilities and NDS Analysis Package Ground Station (NAPGS) ground systems. The effort includes, but not limited to, the upgrade of two new ICADS 7 test beds, the replacement of the NDU, Enhanced Receiver Subsystems (ERS), and Automated Data Processors (ADP). A non-recurring Engineering effort is required to design the replacements for the NDUs, ERSs and ADPs currently on USNDS tests beds and fielded systems. The ICADS upgrade includes data processing changes to support the new USNDS optical sensor, known as Spectral Imaging Geolocation Hyper-Temporal Sensor (SIGHTS), that will be hosted on the GPS III F SVs. FY 2023 Plans: Continue to ramp up ICADS 7 development post SRR/Integrated Baseline Review including NDU, ERS, and software and hardware to support the USNDS payloads on GPS III F SVs. Continue systems engineering and test planning for GPS III F MRC, GPS III F Early Integration to include signal verification/data processing, on-orbit USNDS sensor integration, and FCA/PCA. Support next generation USNDS receiver development to include collaboration with National Security Agency (NSA) for crypto		33.987	56.629	93.391

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2022	FY 2023	FY 2024
<p>enclosure framework/algorithms and upgrade ICADS testbeds to include tech refresh/hardware, initiate ground modifications to USNDS sensor payload command plans to meet more resilient GPS IIIIF command and telemetry specifications, and begin NAPGS integration and testing. Complete long lead development of decryption unit, ICADS 7 ADP and SIGHTS ADP. Complete design through Preliminary Design Review (PDR) in 4th Quarter FY 2023 and prepare for Milestone B in 2nd Quarter FY 2024. Rapidly implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but not limited to, program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2024 Plans: Continue to ramp up ICADS 7 preparation for Milestone B decision and Engineering & Manufacturing Development (EMD) phase leading up to Critical Design Review (CDR). Continue system development, including NDU, ERS, and software and hardware to support the USNDS payloads on GPS IIIIF SVs. Continue systems engineering and test planning for GPS IIIIF Mission Readiness Campaign, GPS IIIIF Early Integration to include signal verification/data processing, on-orbit USNDS sensor integration, and Functional Configuration Audit/Physical Configuration Audit. Support next generation USNDS receiver development in collaboration with National Security Agency for crypto enclosure framework/algorithms. Continue upgrade of ICADS testbeds, ground modifications to USNDS sensor payload command plans for GPS IIIIF, and NAPGS integration and testing. Rapidly implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but not limited to, program office support, studies, technical analysis, experimentation, prototyping, etc.</p> <p>FY 2023 to FY 2024 Increase/Decrease Statement: FY 2024 increase is due to significant ramp up of effort to transition from design to development phase of major software architecture, preparing for NSA review and certification of new cryptographic devices, Milestone B decision and CDR.</p>			
Accomplishments/Planned Programs Subtotals	45.887	60.429	93.391

D. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u> <u>Base</u>	<u>FY 2024</u> <u>OCO</u>	<u>FY 2024</u> <u>Total</u>	<u>FY 2025</u>	<u>FY 2026</u>	<u>FY 2027</u>	<u>FY 2028</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• SPSF 01 01 Space Force NUDETS: <i>Nudet Detection Space</i>	6.690	7.062	0.000	-	0.000	0.000	0.000	-	-	0.000	13.752

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, Alternate Host, and SBIRS; funding is sent by Military Interdepartmental Purchase Request (MIPR) from DoD and DOE to Sandia, Los Alamos National Laboratories and other agencies on existing DOE/NNSA

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Appropriation/Budget Activity
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R-1 Program Element (Number/Name)
PE 1203913SF / *NUDET Detection System (SPACE)*

contracts. The ICADS 7 Acquisition Strategy was approved in September 2021 and the sole source prime contract awarded in June 2022. USNDS ICS funding for Ground Technology Program System of Systems will continue until UGNT is delivered at the end of FY 2023. USNDS requirements are defined in the Operational Requirements Document dated January 21, 2004.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2024 Air Force **Date:** March 2023

Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203913SF / NUDET Detection System (SPACE)	Project (Number/Name) 672808 / Nuc Detonation Det Sys (sensors)
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Product Development (\$ in Millions)				FY 2022		FY 2023		FY 2024 Base		FY 2024 OCO		FY 2024 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			
USNDS ICADS, GNT/UGNT, and Integration Support	MIPR	Sandia National Laboratory : Albuquerque, NM	-	8.100	Nov 2021	3.800	Nov 2022	0.000	Nov 2023	-		0.000	Continuing	Continuing	-
USNDS Technical Mission Analysis	RO	Aerospace : El Segundo, CA	-	0.730	Nov 2021	0.913	Nov 2022	1.085	Nov 2023	-		1.085	Continuing	Continuing	-
USNDS Enterprise SE&I	Various	TASC : El Segundo, CA	-	0.918	Nov 2021	2.557	Nov 2022	4.322	Nov 2023	-		4.322	Continuing	Continuing	-
Classified Development	TBD	Classified : Classified	-	3.000	Nov 2021	-		-		-		-	Continuing	Continuing	-
ICADS 7	MIPR	Sandia National Laboratory : Albuquerque, NM	-	21.108	May 2022	45.061	Nov 2022	75.970	Nov 2023	-		75.970	Continuing	Continuing	-
Subtotal			-	33.856		52.331		81.377		-		81.377	Continuing	Continuing	N/A

Test and Evaluation (\$ in Millions)				FY 2022		FY 2023		FY 2024 Base		FY 2024 OCO		FY 2024 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			
USNDS On-orbit Sensor Testing	MIPR	Various : LANL, SNL, NM	-	4.157	Dec 2021	3.747	Nov 2022	4.464	Nov 2023	-		4.464	Continuing	Continuing	-
Subtotal			-	4.157		3.747		4.464		-		4.464	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2022		FY 2023		FY 2024 Base		FY 2024 OCO		FY 2024 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			
USNDS FFRDC	RO	Aerospace, MITRE : El Segundo, CA	-	1.477	Nov 2021	1.853	Nov 2022	3.735	Nov 2023	-		3.735	Continuing	Continuing	-
USNDS A&AS	Various	Various : Various	-	6.329	Nov 2021	2.418	Nov 2022	3.735	Nov 2023	-		3.735	Continuing	Continuing	-
USNDS Other Support	Various	Various : Various	-	0.068	Nov 2021	0.080	Nov 2022	0.080	Nov 2023	-		0.080	Continuing	Continuing	-
Subtotal			-	7.874		4.351		7.550		-		7.550	Continuing	Continuing	N/A

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Exhibit R-4, RDT&E Schedule Profile: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203913SF / <i>NUDET Detection System (SPACE)</i>	Project (Number/Name) 672808 / <i>Nuc Detonation Det Sys (sensors)</i>

	FY 2022				FY 2023				FY 2024				FY 2025				FY 2026				FY 2027				FY 2028			
	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																												
Integration between UGNTs and the S2E2 SMGTs																												
Geosynchronous Earth Orbit (GEO) Payload																												
GEO Payload Integration																												
ICADS 7																												
ICADS 7 Development																												
System Requirements Review (SRR)																												
Preliminary Design Review (PDR)																												
Milestone B																												
Critical Design Review (CDR)																												
Test Readiness Review (TRR)																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2024 Air Force		Date: March 2023
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
UGNT				
Integration between UGNTs and the S2E2 SMGTs	1	2022	4	2023
Geosynchronous Earth Orbit (GEO) Payload				
GEO Payload Integration	1	2022	4	2022
ICADS 7				
ICADS 7 Development	3	2022	4	2028
System Requirements Review (SRR)	4	2022	1	2023
Preliminary Design Review (PDR)	4	2023	4	2023
Milestone B	2	2024	2	2024
Critical Design Review (CDR)	4	2024	4	2024
Test Readiness Review (TRR)	2	2027	3	2027