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Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force **Date:** March 2024

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604002SF / <i>Space Force Weather Services Research</i>
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COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	0.816	0.849	0.867	0.000	0.867	0.888	0.906	0.938	0.957	Continuing	Continuing
645353: <i>SF Weather Services Research</i>	-	0.816	0.849	0.867	0.000	0.867	0.888	0.906	0.938	0.957	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This budget activity funds the development necessary to evaluate integrated technologies and models for future operationalization into segments of the Space Force Weather Services (SFWS) in support of the 2022 National Defense Strategy's (NDS) three lines of effort. To improve readiness for a more lethal force, SFWS provides timely, accurate, resilient and relevant environmental information, to include space and terrestrial weather, for global battlespace situational awareness for Air Force (AF), Army, Special Operations Forces (SOF), Space Force (USSF), combatant commands, the Intelligence Community (IC), and other government agencies. SFWS capabilities at home station and deployed provide critical environmental information in support of decision makers to gain the asymmetric advantage during the full spectrum of air and space combat operations. SFWS development enhances the lethality, effectiveness, and survivability of AF & SF weapon systems and precision munitions by modernizing capability and seeking the military advantage to accurately predict friendly and foe environmental impacts to optimize mission execution and planning, targeting, weaponing, battle damage assessment, and space systems operations. To strengthen alliances and partnerships, SFWS development efforts integrate Department of Defense (DoD), government agency, commercial, and international partner environmental data with SFWS information system equipment for processing, storing, exploiting, and disseminating all-domain weather information for analysis, forecasting, mission integration, and greater interoperability. To ensure greater performance and affordability for the AF and SF, SFWS systems are being modernized through improvements to architecture and system efficiency, cybersecurity, joint all-domain command and control (JADC2) and sensing grid integration, migration to cloud computing, and expanding agile software development practices.

SFWS aligns activities under four capability areas: Weather Data Collection, Weather Data Analysis and Dissemination, Weather Forecasting, and Product Tailoring/Warfighter Applications (PTWA). This alignment ensures an integrated and systems-oriented approach to program management decisions. A portion of the Weather Forecasting capability is addressed by RDT&E, BA 04, PE 0604002S, Project 645353 - Space Force Weather Services Research.

Weather Forecasting provides global and regional advanced scientific numerical weather prediction capabilities for automated, high-resolution forecast products for mission planning and execution. Space weather modeling assists in characterizing and forecasting the near-earth environment to the sun and enables space weather anomaly and space weather impact assessments. Weather Forecasting includes activities for Numerical Weather Modeling (NWM) and Space Weather Analysis and Forecast System (SWAFS). SWAFS is a software suite of 47 models and applications to ingest, process, and store space environmental data, run space environmental models to specify and forecast the near-earth environment, and run space effects characterization applications.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver SFWS for weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

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This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because 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 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Previous President's Budget	0.816	0.849	0.865	0.000	0.865
Current President's Budget	0.816	0.849	0.867	0.000	0.867
Total Adjustments	0.000	0.000	0.002	0.000	0.002
• 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	0.002	0.000	0.002

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2023	FY 2024	FY 2025
<p>Title: Space Weather Analysis and Forecast System (SWAFS) Radio Frequency Ionospheric Scintillation Application (RISA version 2) software upgrade</p> <p>Description: SWAFS RISA is an Air Force Research Laboratory (AFRL) Analysis of Alternatives (AoA) to upgrade software allowing use of model algorithms that utilize sensor packages on the Constellation Observing System to monitor Meteorology, Ionosphere, and Climate (COSMIC II) to understand space environment conditions affecting satellites and communications. Johns Hopkins University/Applied Physics Lab (JHU/APL) will perform model upgrades to Ionospheric Data Assimilation - Four Dimensional (IDA4D) to ensure compatibility with a Gov Cloud environment within the SWAFS Space Domain Awareness Environmental Toolkit - for Defense (SET4D) baseline.</p> <p>FY 2024 Plans: AFRL continues development of Radio frequency Ionospheric Scintillation Application v2.0, Solar Forecasting System (SFS), and Ultra High Frequency (UHF) communication prototype AoAs. JHU/APL develops observation support from Super-Darn ground system and Space-Based JHU/APL prototypes to begin initial evaluation of National Defense Authorization Act 2021 Arctic strategy.</p> <p>FY 2025 Plans:</p>	0.816	0.849	0.867

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2023	FY 2024	FY 2025
Continue development of upgrade to the Space Weather High Frequency Model, in conjunction with the AFRL development of the Scintillation Nowcast Forecast Model Update, that identifies space environment impacts to DoD and Intelligence Community communications to and through space.			
Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain, leveraging commercial and international opportunities, if appropriate. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.			
<i>FY 2024 to FY 2025 Increase/Decrease Statement:</i> FY 2025 increased due to increased effort for high frequency model upgrade development.			
Accomplishments/Planned Programs Subtotals	0.816	0.849	0.867

D. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
• RDTE 07 1203940S: <i>Space Situation Awareness Operations</i>	3.144	3.931	3.121	-	3.121	3.222	3.288	3.407	3.474	Continuing	Continuing

Remarks

E. Acquisition Strategy
SWAFS will use individual Federal Acquisition Regulation (FAR) based and rapid acquisition contracting methods, as well as AFRL for development works (Technology Readiness Level (TRL) 6 and below) to develop AoA, design solutions, and prototype code.

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Exhibit R-4A, RDT&E Schedule Details: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 0604002SF / <i>Space Force Weather Services Research</i>	Project (Number/Name) 645353 / <i>SF Weather Services Research</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Scintillation Nowcast Forecast Model Update AoA</i>				
JHU/Ovation prime and IDA4D Modernization	2	2023	4	2024
<i>Space Weather Model Upgrade Development</i>				
Develop RISA v2.0	1	2023	4	2025
High Frequency Communication Tool	1	2025	4	2026
Hi-Latitude communications specifications and forecasts	1	2027	4	2029
Improved solar wind forecasting for satellite health and drag specifications	1	2027	4	2029