Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Air Force											Date: April 2022	
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604002F / *Air Force Weather Services Research*							
COST ($ in Millions)	**Prior Years**	**FY 2021**	**FY 2022**	**FY 2023 Base**	**FY 2023 OCO**	**FY 2023 Total**	**FY 2024**	**FY 2025**	**FY 2026**	**FY 2027**	**Cost To Complete**	**Total Cost**
Total Program Element	-	2.151	3.855	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
643560: *AF Weather Services Research*	-	2.151	3.855	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2023, PE 0604002F Air Force Weather Services Research, Project 643560, AF Weather Services Research efforts were transferred to PE 0604002S, Space Force Weather Services Research, Project 645353, SF Weather Services Research in order to align four current AFWS programs to the USSF.

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 Air Force Weather Services (AFWS) in support of the 2018 National Defense Strategy's (NDS) three lines of effort. To improve readiness for a more lethal force, AFWS provides timely, accurate, resilient and relevant environmental information, to include space and terrestrial weather, for global battlespace situational awareness for the Air Force (AF), Army, Special Operations Forces (SOF), Space Force (USSF), combatant commands, the Intelligence Community (IC), and other government agencies. AFWS 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. AFWS development enhances the lethality, effectiveness, and survivability of AF 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, weaponeering, battle damage assessment, and space systems operations. To strengthen alliances and partnerships, AFWS development efforts integrate Department of Defense (DoD), government agency, commercial, and international partner environmental data with AFWS 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, AFWS 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.

AFWS 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 0604002F, Project 643560 - Air Force Weather Services Research.

1. 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.

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This program element may include necessary civilian pay expenses required to manage, execute, and deliver weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program element 0605827F, 0605828F, 0605829F, 0605831F, 0605832F, 0605833F, 0605898F, 0606398F. In FY21, 0M was expended for civilian pay expenses in this program element, and in FY22 $0M is forecasted for civilian pay expenses in this program element.

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 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	2.234	0.986	0.000	0.000	0.000
Current President's Budget	2.151	3.855	0.000	0.000	0.000
Total Adjustments	-0.083	2.869	0.000	0.000	0.000
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	2.869			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-0.083	0.000			
• Other Adjustments	0.000	0.000	0.000	0.000	0.000

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2021	FY 2022
Project: 643560: *AF Weather Services Research*		
Congressional Add: *Drought Warning System*	1.286	2.869
Congressional Add Subtotals for Project: 643560	1.286	2.869
Congressional Add Totals for all Projects	1.286	2.869

C. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Space Weather Analysis and Forecast System (SWAFS) magnetospheric Energetic Charged Particle Hazard Assessment (SWAFS-ECP HAS)	0.288	0.000	0.000
Description: The SWAFS legacy baseline is currently being redesigned and upgraded under the Space Domain Awareness Environmental Toolkit for Defense (SET4D) program to satisfy Space Domain Awareness (SDA) goals for a modern cloud hosted infrastructure that is cyber resilient and integrated with the Unified Data Library (UDL). The Energetic Charged Particle			

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C. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Hazard Assessment System (ECP HAS) is one of several models and applications within the SET4D environment designed to inform satellite operators of hazards and the impacts of those hazards to their spacecraft that will provide warfighters with the environmental awareness to safely sustain their respective orbits and missions. ***FY 2022 Plans:*** N/A ***FY 2023 Plans:*** Air Force Weather PE 0604002F will transfer to the United States Space Force PE 0604002S under organizational realignment from AF/ACC to SSC/ECZG. This is not a new start. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Program Will transfer to United States Space Force.			
Title: Space Weather Analysis and Forecast System (SWAFS) Scintillation Nowcast and Forecast Technology (SNFT) software upgrade ***Description:*** SWAFS SNFT AFRL 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. ***FY 2022 Plans:*** - Continue the AFRL AoA upgraded scintillation software. - Assess the maturity and readiness of scintillation software for integration into the SWAFS cloud environment. - Develop software prototypes based on the previous development of physics-based algorithms to rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. ***FY 2023 Plans:*** Air Force Weather PE 0604002F will transfer to the United States Space Force PE 0604002S under organizational realignment from AF/ACC to SSC/ECZG. This is not a new start. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Program will transfer to United States Space Force	0.577	0.986	0.000
Accomplishments/Planned Programs Subtotals	0.865	0.986	0.000

	FY 2021	FY 2022
Congressional Add: Drought Warning System	1.286	2.869

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	FY 2021	FY 2022
FY 2021 Accomplishments: - Review all new Broad Agency Announcement (BAA) white papers and request proposals. - Award 1 to 2 new contracts from new BAA, subject to change based on number of white paper submissions - and will look for efforts that will help to build upon previous AF Weather Service drought research efforts. - Research & prototype development will center on global drought research warning and mitigation, with emphasis/applications on extreme weather event forecasting, drought climate studies and regional destabilization analysis, effects to strategic basing and DoD installation environmental resiliency, and possible efforts for flood mitigation. ***FY 2022 Plans:*** Will develop an initial Global Composite Drought Indicator (GCDI) capability that utilizes operational, publicly available global data sets related to precipitation, soil moisture, evapotranspiration, and vegetation health to produce a beta version of the GCDI for global, drought 'hot spot' detection.		
Congressional Adds Subtotals	1.286	2.869

D. Other Program Funding Summary ($ in Millions)

Line Item	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
• RDTE 07 0305111F: *WEATHER SERVICE*	4.099	4.362	-	-	-	-	-	-	-	0.000	8.461
• RDTE 07 1203940S: *Space Situation Awareness Operations*	-	-	3.051	-	3.051	3.816	3.022	3.113	3.175	Continuing	Continuing

Remarks

0305111F BPAC 672738 3600 funds on Air Force PE located in IDECS.

PEM update: C. Accomplishments section FY23 will be zeroed and not equal 0.792 due to the PE transfer to USSF.

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.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 4	**R-1 Program Element (Number/Name)** PE 0604002F / *Air Force Weather Services Research*	**Project (Number/Name)** 643560 / *AF Weather Services Research*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2021 Cost	FY 2021 Award Date	FY 2022 Cost	FY 2022 Award Date	FY 2023 Base Cost	FY 2023 Base Award Date	FY 2023 OCO Cost	FY 2023 OCO Award Date	FY 2023 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SWAFS ECP HAS Analysis of Alternatives	PO	AFRL : Kirtland AFB, NM	-	0.288	Oct 2020	-		-		-		-	0.000	0.288	-
SWAFS Scintillation Nowcast Forecast Model Update AoA	PO	AFRL : Kirtland AFB, NM	-	0.577	Oct 2020	3.855	Jan 2022	-		-		-	0.000	4.432	-
Drought Warning System R&D	Various	Various : Various	-	1.286	Jul 2021	-		-		-		-	Continuing	Continuing	-
		Subtotal	-	2.151		3.855		-		-		-	Continuing	Continuing	N/A

	Prior Years	FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	2.151		3.855		-		-		-	Continuing	Continuing	N/A

Remarks

PEM Update: R-3 category for FY23 will be 0 not 0.792 due to PE transfer to USSF.

Exhibit R-4, RDT&E Schedule Profile: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 4	**R-1 Program Element (Number/Name)** PE 0604002F / *Air Force Weather Services Research*	**Project (Number/Name)** 643560 / *AF Weather Services Research*

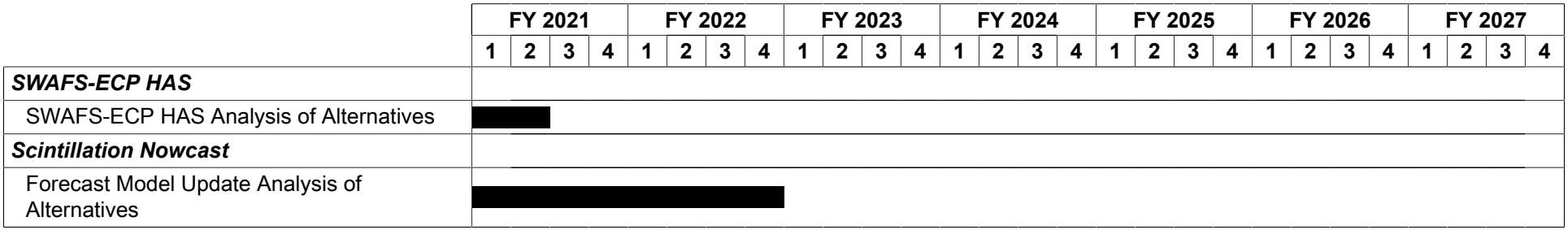

Exhibit R-4A, RDT&E Schedule Details: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 4	**R-1 Program Element (Number/Name)** PE 0604002F / *Air Force Weather Services Research*	**Project (Number/Name)** 643560 / *AF Weather Services Research*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
SWAFS-ECP HAS				
SWAFS-ECP HAS Analysis of Alternatives	1	2021	2	2021
Scintillation Nowcast				
Forecast Model Update Analysis of Alternatives	1	2021	4	2022