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Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Air Force **Date:** April 2022

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 0302015F / <i>E-4B National Airborne Operations Center (NAOC)</i>
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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	-	3.940	26.331	25.701	0.000	25.701	21.212	3.579	0.000	0.000	0.000	80.763
674777: <i>E-4B Aircraft Modernization</i>	-	3.940	26.331	25.701	0.000	25.701	21.212	3.579	0.000	0.000	0.000	80.763
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

The four (4) aircraft E-4B National Airborne Operations Center (NAOC) fleet satisfies the military need for an airborne operations center with communications capabilities permitting military and civilian leadership to monitor and control military and civil national assets during all phases of conflict (nuclear and non-nuclear) or natural disaster. The E-4B NAOC fleet also satisfies the military requirement to provide a highly survivable node of the National Military Command System (NMCS).

This program's developmental modifications include, but are not limited to, upgrades and enhancements to aircraft structures, propulsion system, fuel system, environmental control system, electrical generation and distribution systems, flight safety and navigation systems (with their associated communications equipment), Flight deck simulator, and Systems Integration Lab. Additionally, modifications may enhance the aircraft's operations center facilities, to include but not limited to those necessary for the Senior Leadership Command, Control and Communications System (SLC3S), National Leadership Command Capability (NLCC), Nuclear Command, Control, and Communications (NC3) and other communications necessary for the E-4B fleet to execute its mission. Funds may also be used to explore and develop modifications, upgrades, and future systems required to meet evolving mission requirements. This budget supports the following developmental modifications and studies/projects currently underway or planned for accomplishment:

- The Mobile User Objective System (MUOS) program upgrades the E-4B's Ultra-High Frequency (UHF) Radio transmitters to be MUOS capable to meet E-4B Capability Development Document (CDD) and CJCSI 6250.01F requirements. MUOS provides securable data and full duplex voice communications while simultaneously monitoring a second frequency. The MUOS upgrade will provide interoperability with MUOS waveforms for voice and data communications and with other nuclear and national command and control (C2) centers and aircraft by replacing the legacy USC-42 UHF SATCOM radios with a MUOS capable radio. FY22 was the last year of funding for this program.

- Survivable Super High Frequency (SSHF) will upgrade and replace portions of the E-4B's Jam-Resistant Secure Communications (JRSC) system to meet existing Presidential Policy Directive (PPD)-35 and National Security Presidential Directive (NSPD)-51/Homeland Security Presidential Directive (HSPD)-20 requirements and to ensure continued connectivity and interoperability as satellite and communications infrastructure evolves. Expected modifications include, but are not limited to, component and sub-system upgrades and replaces of portions of the current SHF system that are obsolete or near end of service life. A replacement to the SHF system is required as secure, survivable communications capability transitions from the Defense Satellite Communications System (DSCS). A risk-reduction study was completed in FY19 to further define the acquisition strategy of the SSHF program. The program will be acquired in 2 increments: Increment 1 will include technical solutions such as upgrading the existing modems, systems integration lab, and Ka-band system. Increment 2 will include new modem technology, new Ku-band system, common workstation, and upgrades to the X-band system.

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<p>- E-4B Full Motion Flight Deck Simulator program will develop an E-4B full motion 747-200 flight crew simulator, configured to represent the E-4B cockpit configuration for the pilot and flight engineer stations and be representative of day and night aerial refueling with simulation of fuel on-load characteristics. This capability will fill a critical training gap for pilots and flight engineers once the already limited current training options are decommissioned (Sep 24). This training capability shortfall will directly impact E-4B flight operations and aircraft availability as use of the aircraft for this purpose reduces already limited aircraft availability required for operational missions resulting in insufficient flight time for pilots to maintain certifications. FY20 new start approved in Sep 20. FY22 was the last year of funding for this program.</p> <p>- The Low Frequency Transmit System (LFTS) program replaces the E-4B's legacy Very Low Frequency/Low Frequency (VLF/LF) Transmit System, which is over 35 years old and is past its useful life. This capability is required to comply with Presidential Policy Directive (PPD)-35 to ensure there is assured connectivity between civilian and military leadership and military forces during all stages of conflict and/or national emergencies. The transmit system consists of three primary equipment groups: a Control/Monitor group, a Power Amplifier/Coupler (PA/C) group, and a Trailing Wire Antenna (TWA) group. The LFTS System requires a trainer to allow the users to become proficient in operating the system and to certify all operators. FY22 was the last year of funding for this program.</p> <p>The total cost of the E-4B SSHF Inc 2 Rapid Prototyping Middle Tier of Acquisition effort is \$172.5 million, including RDT&E and procurement of prototype units. E-4B SSHF Inc 2 Rapid Prototyping is not fully funded across the Future Years Defense Program. The Department of the Air Force is assessing all options to address the funding shortfalls for MTA programs including additional funding in a future budget request, performance trades based on technical maturity, or transition to alternative pathways.</p> <p>This program element may include necessary emergent or unanticipated civilian pay expenses required to manage, execute, and deliver E-4B weapon system capability for emergent or unanticipated weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program element 0605831F. In FY21 \$0.0M was expended for civilian pay expenses in this program element, and in FY22 \$0.0M is forecasted for civilian pay expenses in this program element.</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 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	3.462	26.331	0.000	0.000	0.000
Current President's Budget	3.940	26.331	25.701	0.000	25.701
Total Adjustments	0.478	0.000	25.701	0.000	25.701
• 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	0.600	0.000			
• SBIR/STTR Transfer	-0.122	0.000			
• Other Adjustments	0.000	0.000	25.701	0.000	25.701

Change Summary Explanation

The FY 2022 President's Budget submittal did not reflect FY 2023 through FY 2026 funding. Therefore, an explanation of the change between the two budget positions for FY2023 cannot be made in a relevant manner.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p>Title: E-4B Mobile User Objective System (MUOS)</p> <p>Description: The MUOS program upgrades E-4B Ultra-High Frequency (UHF) Radio transmitters to be MUOS capable to meet the E-4B CDD and CJCSI 6250.01F. MUOS provides securable data and full duplex voice communications while simultaneously monitoring a second frequency. The MUOS upgrade will provide interoperability with MUOS waveforms for voice and data communications and with other nuclear and national C2 centers and aircraft by replacing the legacy USC-42 UHF Satellite Communication (SATCOM) radio system.</p> <p>FY 2022 Plans: Includes PMA/Travel. Complete development and test efforts in support of first prototype installation.</p> <p>FY 2023 Plans: No FY23 efforts</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: FY22 is the final year of funding for this program.</p>	0.000	0.050	0.000
Title: Survivable SHF	3.940	25.581	25.701

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Description: Survivable Super High Frequency (SSHF) will upgrade and replace portions of the E-4B's Jam-Resistant Secure Communications (JRSC) system to meet existing Presidential Policy Directive (PPD)-35 and National Security Presidential Directive (NSPD)-51/Homeland Security Presidential Directive (HSPD)-20 requirements and to ensure continued connectivity and interoperability as satellite and communications infrastructure evolves. Expected modifications include, but are not limited to, component and sub-system upgrades and replaces of portions of the current SHF system that are obsolete or near end of service life. A replacement to the SHF system is required as secure, survivable communications capability transitions from the Defense Satellite Communications System (DSCS). A risk-reduction study was completed in FY19 to further define the acquisition strategy of the SSHF program. The program will be acquired in 2 increments: Increment 1 will include technical solutions such as upgrading the existing modems, systems integration lab, and Ka-band system. Increment 2 will include new modem technology, new Ku-band system, common workstation, and upgrades to the X-band system.</p> <p>FY 2022 Plans:</p> <ul style="list-style-type: none"> - Begin Increment 2 development activities. - Start design of new common workstation. - Initiate development of new modem technology. <p>FY 2023 Plans:</p> <ul style="list-style-type: none"> - Continue Increment 2 development activities. - Continue design common workstation. - Continue development of new modem technology. <p>FY 2022 to FY 2023 Increase/Decrease Statement: FY22 to FY23 increase continues work from previous year.</p>				
<p>Title: E-4B Full Motion Flight Deck Simulator</p> <p>Description: E-4B Full Motion Flight Deck Simulator program will develop an E-4B full motion 747-200 flight crew simulator, configured to represent the E-4B cockpit configuration for the pilot and flight engineer stations and be representative of day and night aerial refueling with simulation of fuel on-load characteristics. The Simulator is necessary to meet operational flight training requirements and fill a critical training gap for pilots and flight engineers once the already limited current training options are decommissioned. This training capability shortfall will directly impact E-4B flight operations and aircraft availability as use of the aircraft for this purpose reduces already limited aircraft availability required for operational missions resulting in insufficient flight time for pilots to maintain certifications.</p> <p>FY 2022 Plans:</p>		0.000	0.450	0.000

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Delivery of Flight Simulator			
FY 2023 Plans: No FY23 efforts			
FY 2022 to FY 2023 Increase/Decrease Statement: FY22 is the final year of funding for this program.			
Title: Low Frequency Transmit System (LFTS)	0.000	0.250	0.000
Description: Replaces the E-4B's legacy Very Low Frequency/Low Frequency (VLF/LF) Transmit System, which is over 35 years old and is past its useful life. This capability is required to comply with Presidential Policy Directive (PPD)-35 to ensure there is assured connectivity between civilian and military leadership and military forces during all stages of conflict and/or national emergencies.			
FY 2022 Plans: -Complete data analysis of LFTS testing/certification to meet IOC requirement and other contract closeout actions. -Initiate design and development of LFTS Trainer.			
FY 2023 Plans: No FY23 efforts			
FY 2022 to FY 2023 Increase/Decrease Statement: FY22 is the final year of funding for this program.			
Accomplishments/Planned Programs Subtotals	3.940	26.331	25.701

D. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2023</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>FY 2026</u>	<u>FY 2027</u>	<u>Cost To</u>	<u>Total Cost</u>
			<u>Base</u>	<u>OCO</u>	<u>Total</u>					<u>Complete</u>	
• APAF 05 Line Item E00400: <i>E-4B Nat Airborne Ops Center (NAOC)</i>	44.140	19.081	5.973	-	5.973	20.618	38.828	43.063	43.996	Continuing	Continuing
• APAF 06 Line Item 000999: <i>Initial Spares/Repair Parts</i>	0.339	0.339	5.000	-	5.000	0.363	0.369	0.375	0.383	0.000	7.168
Remarks											

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E. Acquisition Strategy Acquisition Strategy: The acquisition strategy for each specific modification differs based on the urgency of the requirement, definition of the capability, and technology readiness level of the components. The Acquisition Strategy for Survivable SHF is a Section 804 Middle Tier Acquisition (MTA). Increment 1 Rapid Prototype MTA was approved in April 2019. Increment 2 Rapid Prototype MTA was approved in December 2021. Management Strategy: Program management for all aircraft modifications is executed by the Commercial Derivative Aircraft Division at Tinker AFB, Oklahoma. The Program Executive Officer (PEO) for Presidential and Executive Airlift, at Wright Patterson, Ohio provides management oversight. Contracting Strategy: The contracting strategy differs for each individual modification, but normally includes an initial engineering study contract followed by a development contract. Production installations and sustainment are typically accomplished with the E-4B Contractor Logistics Support (CLS) contract.		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Air Force **Date:** April 2022

Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0302015F / E-4B National Airborne Operations Center (NAOC)	Project (Number/Name) 674777 / E-4B Aircraft Modernization
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Product Development (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 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			
MUOS	SS/CPIF	Raytheon : Largo, FL	-	-		0.050	Sep 2022	-		-		-	0.000	0.050	13.000
E-4B Full Motion Flight Deck Simulator	SS/FFP	CymSTAR : Broken Arrow, OK	-	-		0.450	Dec 2021	-		-		-	0.000	0.450	9.450
Survivable SHF	C/CPFF	L-3 : SLC, UT	-	3.940	Dec 2021	25.581	Apr 2022	25.701	Jan 2023	-		25.701	0.000	55.222	120.000
LFTS Development	SS/CPIF	Boeing : OKC, OK	-	-		0.250	Mar 2022	-		-		-	0.000	0.250	0.250
Subtotal			-	3.940		26.331		25.701		-		25.701	0.000	55.972	N/A
Project Cost Totals			-	3.940		26.331		25.701		-		25.701	0.000	55.972	N/A

Remarks
 FY21, FY22, & FY23 SSHF funding supports development, integration, and test of prototype SSHF system under L-3Harris contract.
 FY22 LFTS funding supported contract closeout of integration and test of prototype LFTS system under Boeing's ESS contract.

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Exhibit R-4, RDT&E Schedule Profile: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 0302015F / <i>E-4B National Airborne Operations Center (NAOC)</i>	Project (Number/Name) 674777 / <i>E-4B Aircraft Modernization</i>

FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026				FY 2027			
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

<i>E-4B Aircraft Modernization</i>	
MUOS Modification Integration and Testing	
MUOS Modification Milestone Decision C	
Survivable SHF Rapid Prototype Decision Inc 1	
Survivable SHF Inc 1 Integration and Testing	
Survivable SHF Inc 1 Prototype Modification Decision	
Survivable SHF Inc 1 Rapid Fielding Decision	
Survivable SHF Rapid Prototype Decision Inc 2	
Survivable SHF Inc 2 Integration and Testing	
Survivable SHF Inc 2 Prototype Modification Decision	
Survivable SHF Inc 2 Rapid Fielding Decision	
E-4B Full Motion Flight Deck Simulator Ready For Training	

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Exhibit R-4A, RDT&E Schedule Details: PB 2023 Air Force		Date: April 2022
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>E-4B Aircraft Modernization</i>				
MUOS Modification Integration and Testing	1	2021	4	2022
MUOS Modification Milestone Decision C	1	2023	1	2023
Survivable SHF Rapid Prototype Decision Inc 1	2	2021	2	2021
Survivable SHF Inc 1 Integration and Testing	1	2021	4	2022
Survivable SHF Inc 1 Prototype Modification Decision	3	2022	3	2022
Survivable SHF Inc 1 Rapid Fielding Decision	1	2023	1	2023
Survivable SHF Rapid Prototype Decision Inc 2	1	2022	1	2022
Survivable SHF Inc 2 Integration and Testing	1	2022	4	2024
Survivable SHF Inc 2 Prototype Modification Decision	1	2024	1	2024
Survivable SHF Inc 2 Rapid Fielding Decision	4	2024	4	2024
E-4B Full Motion Flight Deck Simulator Ready For Training	3	2022	3	2022