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Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	55.707	60.173	3.468	0.000	3.468	0.000	0.000	0.000	0.000	0.000	119.348
674777: <i>E-4B Aircraft Modernization</i>	-	55.707	60.173	3.468	0.000	3.468	0.000	0.000	0.000	0.000	0.000	119.348
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), 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 (SL3CS), 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 Advanced Extremely High Frequency (AEHF) Compatible Terminal/ Presidential National Voice Conferencing (PNVC) Program integrates AEHF Compatible Command Post Terminals and PNVC capability onto the E-4B NAOC platform. This integration is necessary to replace the legacy Military Strategic, Tactical and Relay (MILSTAR) terminal, and provide access to protected wideband AEHF satellite networks. PNVC replaces the Survivable Emergency Conferencing Network (SECN), which will not be supported once the AEHF satellite network is in place.

- The Low Frequency Transmit System (LFTS) program replaces the currently installed Very Low Frequency/Low Frequency (VLF/LF) Transmit system, which is no longer sustainable after over 35 years of operation. In order to meet existing Presidential Policy Directive (PPD)-35 requirements and ensure there is assured connectivity between civilian and military leadership and military forces during real world situations, this system must be replaced. 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 Mobile User Objective System (MUOS) program upgrades the E-4B's Ultra-High Frequency 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 C2 centers and aircraft by replacing the legacy USC-42 UHF SATCOM radios with a MUOS capable radio.

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- Survivable SHF 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 replacement 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 help further define the acquisition strategy of the SSHF modernization program. The program will be acquired in 2 phases: Phase 1 will include technical solutions such as upgrading the existing modems, systems integration lab, and Ka-band system. Phase 2 will include new modem technology, new Ku-band system, common workstation, and upgrades to the X-band system.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver E-4B weapon system capability; furthermore, it may include support funding for emerging modification requirements to support PMA, A&AS, equipment and other government cost.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver E-4B weapon system capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605831F or 0605833F.

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)	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021 Base</u>	<u>FY 2021 OCO</u>	<u>FY 2021 Total</u>
Previous President's Budget	57.758	70.173	3.474	0.000	3.474
Current President's Budget	55.707	60.173	3.468	0.000	3.468
Total Adjustments	-2.051	-10.000	-0.006	0.000	-0.006
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-10.000			
• 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	-2.051	0.000			
• Other Adjustments	0.000	0.000	-0.006	0.000	-0.006

Change Summary Explanation

FY19 -\$2.051M SBIR transfer

FY20 -\$10.000M Congressional mark

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>Title: Advanced Extremely High Frequency (AEHF) Compatible Terminal/Presidential National Voice Capability (PNVC)</p> <p>Description: Integrate AEHF Compatible Terminal/PNVC capability onto the E-4B NAOC platform to replace the existing MILSTAR/SECN system.</p> <p>FY 2020 Plans: Install second prototype kit and conduct flight test, T.O. verification activities leading up to the installation of the first production kit.</p> <p>FY 2021 Plans: N/A</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: Funding decreased as completion of FY20 completes prototype installs/tests. Solely Procurement-funded in FY21.</p>		24.337	15.087	0.000
<p>Title: E-4B Low Frequency Transmit System (LFTS)</p> <p>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.</p> <p>FY 2020 Plans: N/A</p> <p>FY 2021 Plans: N/A</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>		24.575	0.000	0.000
<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 2020 Plans:</p>		4.765	10.000	0.000

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>Completes the development of the MUOS-capable UHF radio transmitters.</p> <p>FY 2021 Plans: N/A</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>			
<p>Title: Survivable SHF</p> <p>Description: SHF Modernization 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. A risk-reduction study was completed in FY19 to help further define the acquisition strategy of the SSHF modernization program. The program will be acquired in 2 phases: Phase 1 will include technical solutions such as upgrading the existing modems, systems integration lab, and Ka-band system. Phase 2 will include new modem technology, new Ku-band system, common workstation, and upgrades to the X-band system.</p> <p>FY 2020 Plans: Conduct design and prototype development activities for SSHF Phase 1.</p> <p>FY 2021 Plans: Continue prototyping activities and begin integration and test activities of SSHF Phase 1.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: RDT&E funding remaining to complete SSHF Phase 1, transitioning to procurement funding (3010).</p>	2.030	35.086	3.468
Accomplishments/Planned Programs Subtotals	55.707	60.173	3.468

D. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2021</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u>	<u>Total Cost</u>
			<u>Base</u>	<u>OCO</u>	<u>Total</u>					<u>Complete</u>	<u>Total Cost</u>
• APAF 05 Line Item E00400: <i>E-4B Nat Airborne Ops Center (NAOC)</i>	67.858	58.477	58.803	-	58.803	52.240	38.817	41.160	41.913	Continuing	Continuing
• APAF 06 Line Item 000999: <i>Initial Spares/Repair Parts</i>	2.033	2.365	2.704	-	2.704	3.050	3.402	3.760	3.760	0.000	21.074

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 was approved as a Section 804 Middle Tier Acquisition in April 2019. Management Strategy: Program management for all aircraft modifications is executed by the Commercial Derivative Aircraft Division at Tinker AFB. The Program Executive Officer (PEO) for Presidential and Executive Airlift provides management oversight. Contracting Strategy: 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 2021 Air Force											Date: February 2020		
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					

Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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			
Product Development	C/CPAF	Not specified. : TBD	-	-		-		-		-		-	Continuing	Continuing	-
AEHF/PNVC Integration	C/CPFF	Raytheon : Largo, FL	-	24.337	Sep 2019	15.087	Apr 2020	-		-		-	0.000	39.424	44.471
LFTS Development	SS/CPIF	Boeing : OKC, OK	-	24.575	Sep 2019	-		-		-		-	0.000	24.575	103.857
MUOS	SS/CPIF	Raytheon : Largo, FL	-	4.765	Nov 2019	10.000	Nov 2019	-		-		-	0.000	14.765	13.000
Survivable SHF	C/CPIF	L-3 : SLC, UT	-	2.030	Apr 2019	35.086	Feb 2020	3.468	Jan 2021	-		3.468	0.000	40.584	120.000
Subtotal			-	55.707		60.173		3.468		-		3.468	Continuing	Continuing	N/A

Project Cost Totals	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	55.707	60.173	3.468	-	3.468	Continuing	Continuing	N/A

Remarks

FY19 & FY20 AEHF funding incrementally funds AEHF EMD and prototype integration efforts under DMEA contract.

FY19 LFTS funding supports integration and test of prototype LFTS system under Boeing's ESS contract.

FY19-20 MUOS funding supports integration and test of prototype MUOS system under Raytheon IDIQ contract.

FY19, FY20 & FY21 SSHF funding supports development, integration, and test of prototype SSHF system under L-3 IDIQ contract.

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
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

	FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
	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
E-4B Aircraft Modernization																												
AEHF Compatible Terminal/PNVC Integration and Testing																												
AEHF Compatible Terminal/PNVC Milestone Decision C																												
LFTS Modification Integration and Testing																												
MUOS Modification Integration and Testing																												
MUOS Modification Milestone Decision C																												
Survivable SHF Rapid Prototype Decision																												
Survivable SHF Risk Reduction Study																												
Survivable SHF Phase 1 Integration and Testing																												
Survivable SHF Phase 1 Prototype Modification Decision																												
Survivable SHF Phase 1 Rapid Fielding Decision																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
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>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>E-4B Aircraft Modernization</i>				
AEHF Compatible Terminal/PNVC Integration and Testing	1	2019	3	2021
AEHF Compatible Terminal/PNVC Milestone Decision C	4	2020	4	2020
LFTS Modification Integration and Testing	1	2019	1	2020
MUOS Modification Integration and Testing	4	2019	1	2021
MUOS Modification Milestone Decision C	2	2021	2	2021
Survivable SHF Rapid Prototype Decision	3	2019	3	2019
Survivable SHF Risk Reduction Study	3	2019	1	2020
Survivable SHF Phase 1 Integration and Testing	2	2020	4	2022
Survivable SHF Phase 1 Prototype Modification Decision	1	2021	1	2021
Survivable SHF Phase 1 Rapid Fielding Decision	1	2022	1	2022