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Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Air Force										Date: February 2018		
Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force I BA 7: Operational Systems Development					R-1 Program Element (Number/Name) PE 0302015F I E-4B National Airborne Operations Center (NAOC)							
COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
Total Program Element	-	25.104	35.467	57.758	0.000	57.758	70.173	3.474	0.000	0.000	Continuing	Continuing
674777: E-4B Aircraft Modernization	-	25.104	35.467	57.758	0.000	57.758	70.173	3.474	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This program, BA 7, PE 0302015F, project 674777, E-4B Mobile User Objective System (MUOS), is a new start.
This program, BA 7, PE 0302015F, project 674777, Survivable SHF, is a new start.

FY18 E-4B Recapitalization efforts are executed under PE0604288F, Project 646507, BA4.

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). 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. Developmental modifications and studies/projects currently underway or planned for accomplishment under this program include:

- 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.

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<p>- The 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 6251_01D 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.</p> <p>- Survivable SHF will upgrade and replace portions of the E-4B's SHF 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).</p> <p>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 as required.</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>						
B. Program Change Summary (\$ in Millions)		FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Previous President's Budget		30.948	35.467	13.283	0.000	13.283
Current President's Budget		25.104	35.467	57.758	0.000	57.758
Total Adjustments		-5.844	0.000	44.475	0.000	44.475
• Congressional General Reductions		0.000	0.000			
• Congressional Directed Reductions		-4.900	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		-0.944	0.000			
• Other Adjustments		0.000	0.000	44.475	0.000	44.475
Change Summary Explanation						
FY17 Congressional mark for Recap exces of \$4.9M						
FY19 funding increased by a total of \$44.5M, with adjustments to the AEHF/PNVC (\$11.4M), LFTS (\$25.2M), SHF Modernization (\$2.1M) and MUOS (\$5.8M) programs.						

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
<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 2018 Plans: Prepare for Milestone C decision, including determining entrance/exit criteria, update Acquisition Strategy and draft Capabilities Production Document (CPD); continue efforts in preparation for installation and testing of prototype kit onto aircraft.</p> <p>FY 2019 Base Plans: Install first prototype kit and conduct remaining activities leading up to the installation of the second prototype kit. Milestone C to be achieved by 4QFY19.</p> <p>FY 2018 to FY 2019 Increase/Decrease Statement: Funding increase due to FabT/PNVC B Kit delays and clarification of requirements.</p>		0.349	15.438	24.745	-	24.745
<p>Title: National Airborne Ops Center (NAOC) Recap</p> <p>Description: National Airborne Ops Center (NAOC) Recap</p> <p>FY 2018 Plans: NONE - In FY18 E-4B Recapitalization efforts are executed under PE0604288F</p> <p>FY 2019 Base Plans: None - In FY18 E-4B Recapitalization efforts are executed under PE0604288F.</p> <p>FY 2018 to FY 2019 Increase/Decrease Statement: NONE - In FY18 E-4B Recapitalization efforts are executed under PE0604288F</p>		1.000	0.000	0.000	-	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>		23.755	20.029	25.167	-	25.167

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
FY 2018 Plans: - Installation of prototype during Programmed Depot Maintenance, initial ground system testing and preparation for Ground and Flight testing at Offutt AFB.						
FY 2019 Base Plans: Complete ground and flight test activities on first prototype install at Offutt AFB after PDM completion.						
FY 2018 to FY 2019 Increase/Decrease Statement: Funding increased from FY18 to FY19 due to the prototype testing and evaluation scheduled during FY19, which has a higher cost than the installation during FY18.						
Title: E-4B Mobile User Objective System (MUOS) Description: The MUOS program upgrades E-4B Ultra-High Frequency Radio transmitters to be MUOS capable to meet the E-4B CDD and CJCSI 6251_01D. 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 radio system.		0.000	0.000	5.757	-	5.757
FY 2018 Plans: N/A						
FY 2019 Base Plans: Prepare for Acquisition Strategy decision, including document development, aircraft integration, and test of the MUOS system on one E-4B.						
FY 2018 to FY 2019 Increase/Decrease Statement: Funding increased because FY19 is the first year of funding for the effort.						
Title: Survivable SHF Description: SHF Modernization will upgrade and replace portions of the E-4B's SHF 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.		-	0.000	2.089	0.000	2.089
FY 2018 Plans:						

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
N/A					
FY 2019 Base Plans: Perform obsolesce, reliability, and maintainability study to determine scope of modification.					
FY 2019 OCO Plans: N/A					
FY 2018 to FY 2019 Increase/Decrease Statement: Funding increased because FY19 is the first year of funding for the effort.					
Accomplishments/Planned Programs Subtotals	25.104	35.467	57.758	0.000	57.758

D. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
• RDTE 04 PE0604288F BA04: <i>National Airborne Operations Center (NAOC) Recap</i>	0.000	7.850	9.740	-	9.740	19.549	101.011	135.532	138.000	Continuing	Continuing
• APAF 05 Line Item E00400: <i>E-4B Nat Airborne Ops Center (NAOC)</i>	53.348	30.493	67.858	-	67.858	48.477	83.896	52.318	0.000	Continuing	Continuing
• APAF 06 Line Item 000999: <i>Initial Spares/Repair Parts</i>	5.338	1.072	1.061	-	1.061	0.332	0.339	0.346	0.352	Continuing	Continuing
Remarks											
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.											
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 Mobility 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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F. Performance Metrics Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Air Force												Date: February 2018			
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 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
AEHF Compatible Terminal-Risk Study 2	C/CPFF	Raytheon : Largo, FL	-	-		-		-		-		-	Continuing	Continuing	2.489
AEHF/PNVC Integration	C/CPFF	Raytheon : Largo, FL	-	0.349		15.438	Mar 2018	24.745	Oct 2018	-		24.745	Continuing	Continuing	44.471
LFTS Development	SS/CPIF	Boeing : OKC, OK	-	23.755	Dec 2016	20.029	Nov 2017	25.167	Nov 2018	-		25.167	Continuing	Continuing	103.857
E-4B Recapitilization	TBD	TBD: TBD : TBD	-	1.000		-		-		-		-	Continuing	Continuing	-
MUOS	TBD	Boeing : OKC, OK	-	-		-		5.757	Feb 2019	-		5.757	Continuing	Continuing	-
Survivable SHF	TBD	L-3 : SLC, UT	-	-		-		2.089	Feb 2019	-		2.089	Continuing	Continuing	-
Subtotal			-	25.104		35.467		57.758		-		57.758	Continuing	Continuing	N/A
			Prior Years	FY 2017		FY 2018		FY 2019 Base		FY 2019 OCO		FY 2019 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	25.104		35.467		57.758		-		57.758	Continuing	Continuing	N/A
Remarks															
FY17: Recap funding supports E-4B NAOC Sustainment Study and Recap CONOPS analysis.															
FY18: E-4B Recapitalization efforts include those activities related to the replacement of the E-4B NAOC fleet, and are executed under PE0604288F Project 646507 BA4.															
FY18 & FY19 LFTS funding supports installation and test of prototype LFTS system under Boeing's ESS contract.															
FY18 & FY19 AEHF funding incrementally funds AEHF EMD and prototype installation efforts under DMEA contract.															

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Exhibit R-4, RDT&E Schedule Profile: PB 2019 Air Force

Date: February 2018

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 2017				FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023			
	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 Risk Reduction																												
AEHF Compatible Terminal/PNVC Integration																												
AEHF Compatible Terminal/PNVC Milestone Decision B																												
AEHF Compatible Terminal/PNVC PDR																												
AEHF Compatible Terminal/PNVC CDR																												
AEHF Compatible Terminal/PNVC Integration DT																												
AEHF Compatible Terminal/PNVC Milestone Decision C																												
LFTS Modification Design and Development																												
LFTS Modification Integration and Testing																												
LFTS Modification Milestone Decision C																												
MUOS Modification Integration and Testing																												
MUOS Modification Milestone Decision C																												
Survivable SHF Study																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2019 Air Force			Date: February 2018
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 Risk Reduction	1	2017	4	2020
AEHF Compatible Terminal/PNVC Integration	1	2017	2	2021
AEHF Compatible Terminal/PNVC Milestone Decision B	1	2017	1	2017
AEHF Compatible Terminal/PNVC PDR	3	2018	3	2018
AEHF Compatible Terminal/PNVC CDR	4	2018	4	2018
AEHF Compatible Terminal/PNVC Integration DT	3	2020	3	2020
AEHF Compatible Terminal/PNVC Milestone Decision C	4	2019	4	2019
LFTS Modification Design and Development	1	2017	2	2017
LFTS Modification Integration and Testing	1	2017	3	2019
LFTS Modification Milestone Decision C	3	2017	3	2017
MUOS Modification Integration and Testing	2	2019	2	2020
MUOS Modification Milestone Decision C	2	2020	2	2020
Survivable SHF Study	2	2019	2	2020