Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Army											Date: May 2017	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 0607137A / *Chinook Product Improvement Program*							
COST ($ in Millions)	**Prior Years**	**FY 2016**	**FY 2017**	**FY 2018 Base**	**FY 2018 OCO**	**FY 2018 Total**	**FY 2019**	**FY 2020**	**FY 2021**	**FY 2022**	**Cost To Complete**	**Total Cost**
Total Program Element	-	31.122	91.848	194.567	-	194.567	131.124	59.383	35.740	41.030	Continuing	Continuing
ES4: *Chinook Product Improvement Program*	-	31.122	91.848	194.567	-	194.567	131.124	59.383	35.740	41.030	Continuing	Continuing

Note

Funds in this Program Element (PE) were realigned from PE 0203744A Aircraft Modifications/Product Improvement Programs, Project Number 430 Impr Cargo Helicopter.

A. Mission Description and Budget Item Justification

The CH-47 Chinook is the Army's only heavy lift helicopter and is an essential element of the Army Aviation portfolio strategy. This program funds improvements to the CH-47F System that include the transition from individual Engineering Change Proposals (ECPs) into a CH-47F Block II program of record with entry into Engineering/ Manufacturing Design (EMD) phase with Milestone B approval expected in 3rd quarter 2017. Additionally, funding supports: continued development and testing of the Advanced Chinook Rotor Blades (ACRB) which will provide increased lift in high/hot conditions and reduce Operation and Support (O&S) costs, T55-GA-714A engine control and component upgrades, and advanced flight control and drive train component improvements to improve aircraft performance. Development of requirements specifications, studies and risk reduction prototyping are also part of this effort.

B. Program Change Summary ($ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Previous President's Budget	32.407	91.848	118.435	-	118.435
Current President's Budget	31.122	91.848	194.567	-	194.567
Total Adjustments	-1.285	0.000	76.132	-	76.132
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	0.000	0.000	78.614	-	78.614
• FY16 Actual Year End	-1.285	0.000	0.000	-	0.000
• PB17 WORKSET FOR EA008 INFLATION RATES	0.000	0.000	-1.864	-	-1.864
• PER DOM & DOR TO FUND RAPID CAPABILITIES OFFICE (RCO)	0.000	0.000	-0.618	-	-0.618

Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Army	Date: May 2017
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0607137A *I Chinook Product Improvement Program*

Change Summary Explanation

The FY 2016 funds have been adjusted to actuals. The FY 2018 funds increase of $78.614 million is based on an EMD Block II revised cost estimate, BES Adjustments for -2.482 million (-1.864 and -0.618).

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army			Date: May 2017
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0607137A / *Chinook Product Improvement Program*	Project (Number/Name) ES4 / *Chinook Product Improvement Program*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
ES4: *Chinook Product Improvement Program*	-	31.122	91.848	194.567	-	194.567	131.124	59.383	35.740	41.030	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Funds in this Program Element (PE) were realigned from PE 0203744A Aircraft Modifications/Product Improvement Programs, Project Number 430 Impr Cargo Helicopter.

A. Mission Description and Budget Item Justification

The CH-47 Chinook is the Army's only heavy lift helicopter and is an essential element of the Army Aviation portfolio strategy. This program funds improvements to the CH-47F System that include the transition from individual Engineering Change Proposals (ECPs) into a CH-47F Block II program of record with entry into Engineering/ Manufacturing Design (EMD) phase with Milestone B approval expected in 3rd quarter 2017. Additionally, funding supports: continued development and testing of the Advanced Chinook Rotor Blades (ACRB) which will provide increased lift in high/hot conditions and reduce Operation and Support (O&S) costs, T55-GA-714A engine control and component upgrades, and advanced flight control and drive train component improvements to improve aircraft performance. Development of requirements specifications, studies and risk reduction prototyping are also part of this effort.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Title: Modernization Integration	4.081	15.404	4.388
Description: Modernization Integration is an Airframe Component Improvement Program (ACIP) effort that provides system engineering, program management, and planning for manufacturing/modification, test, and logistics that will facilitate the integration of multiple ECPs.			
FY 2016 Accomplishments: Conducted System Level Preliminary Design Review (PDR). Developed Airframe Sub-System Specification (SSS) and Airworthiness Qualification Specification (AQS). Completed preliminary design for Ground Test Vehicle (GTV).			
FY 2017 Plans: Continue system integration non-recurring engineering prior to EMD. Develop the Air Vehicle AQS and EMD Disposition Document Completion of Manufacturing Tool Designs for specific cockpit and cabin positions. Update the Air Vehicle Survivability Assessment. Update weight and balance information. Generate and provide structural, stress, and fatigue substantiation. Develop the Test Unit Release for Heads-up Display Installation. Create manufacturing tool orders for all zones and prepare them for release. Generate preliminary manufacturing planning for the Block II Air Vehicle. Continue GTV design work.			
FY 2018 Plans:			

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: May 2017
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607137A / *Chinook Product Improvement Program*	**Project (Number/Name)** ES4 / *Chinook Product Improvement Program*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
This effort will develop a preliminary test article design that converts a CH-47D aircraft to a GTV and identify any new material required for GTV implementation. Finalize GTV design, continue Command Avionics Architecture System (CAAS) Coordination and Vehicle Interface Planning. Finalize Reliability and Maintainability (R&M) and Safety Analysis. Finalize and provide structural, stress, and fatigue substantiation. Update weight and balance data with the latest design inputs. Finalize vehicle level drawings and assemblies (including alignment definitions). Finalize all manufacturing tooling designs.			
Title: CH-47F Block II Engineering and Manufacturing Development (EMD) ***Description:*** The EMD Phase will begin after a 2017 Milestone (MS) B decision and the subsequent contract will develop affordable and executable manufacturing processes; complete system fabrication; remanufacture three production representative CH-47F Block II Chinook test articles; and reduce program risk. ***FY 2017 Plans:*** The Block II EMD contract planned for award in third quarter FY17 will integrate separate, on-going non-recurring engineering changes into the CH-47F Block II configuration to satisfy the Army's heavy lift requirement. The four-year EMD contract will provide design, development, integration, qualification, remanufacture and delivery of three production representative CH-47F Block II test articles. Conduct and support aircraft development; induction and teardown of Aircraft; delivery of documentation that demonstrates requirements verification; a production configuration baseline. ***FY 2018 Plans:*** Second year of the four year contract. Conduct and support aircraft development and assembly to include ACRB, airframe components, improved drive train (IDT) and rotor components, light weight fuel system and electrical components; delivery of documentation that demonstrates requirements verification; and production configuration baseline; building the GTV.	-	38.453	107.289
Title: Advanced Chinook Rotor Blade (ACRB) ***Description:*** This effort provides an ACRB which is a redesign of the current rotor blade to provide improved capability. It improves high/hot performance, reduces Operations and Support (O&S) costs and is a form, fit, function replacement for the legacy blade. ***FY 2016 Accomplishments:*** Conducted additional wind tunnel testing to validate the Best Technical Approach (BTA) 13 performance and vibratory loads. Built 12 ACRB blades to support component level testing and flight testing. Initiated build of 2 ACRB blades to support component level testing. Conducted Interim-First Flight Design Review (I-FFDR) and the final FFDR. Commenced testing on component level test specimens. ***FY 2017 Plans:***	10.345	12.828	17.700

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: May 2017
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607137A / *Chinook Product Improvement Program*	**Project (Number/Name)** ES4 / *Chinook Product Improvement Program*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Complete flight testing of ACRB to validate performance and demonstrate Test Readiness Level (TRL) 6. Conduct trade off analysis for ACRB design improvements to support Block II EMD flight test program. Commence preparation of blades for live fire testing. ***FY 2018 Plans:*** Complete build of ACRB blades to support component level testing. Commence testing of material coupons (samples) for component structural testing in support of ACRB full qualification requirements.			
Title: Improved Drive Train (IDT) ***Description:*** This effort addresses O&S cost reduction while simultaneously re-qualifying the combining, forward, and aft transmissions to a higher power level to maximize engine power available at sea-level conditions. Funding completes PDR and begins preparation for Critical Design Review (CDR) effort. ***FY 2016 Accomplishments:*** Purchased test materials to support the conduct of transmission re-qualification testing. Conducted material coupon testing to validate material properties and characteristics. Conducted initial bench testing, aft transmission static/dynamics strain surveys test, and the forward transmission demonstration test utilizing new material for the integral planetary carrier/forward rotor shaft. Completed Subsystem CDR which provided the technical basis for proceeding into fabrication, integration, and developmental test and evaluation of the components to allow the transmission re-qualification testing. ***FY 2017 Plans:*** Continue test preparation including purchase of test materials to support the C-61 (vertical shafting) coupon samples. Initiate forward transmission, static/dynamics strain surveys test, sync shaft fatigue tests, and the material coupon testing to assess material properties of component. ***FY 2018 Plans:*** Continue test preparation. Continue test execution for the forward transmission, static/dynamics strain surveys test, sync shaft fatigue tests. Initiate qualification endurance, overstress, gear tooth bending fatigue test for Aft/Forward transmission. Initiate reduced lubrication and oil out test planning for Aft/Combiner/Forward transmissions.	6.266	6.842	19.500
Title: Transportable Flight Proficiency Simulator (TFPS) ***Description:*** The TFPS is a high fidelity, motion cueing, transportable, flight simulator capable of training to include training for mission tasks and emergency procedures. Since it is a high fidelity, certified trainer, units can conduct individual training task in the simulator rather than the aircraft saving flying hour dollars. ***FY 2018 Plans:***	-	-	20.915

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: May 2017
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607137A / *Chinook Product Improvement Program*	**Project (Number/Name)** ES4 / *Chinook Product Improvement Program*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Redesign of the existing CH-47F TFPS to incorporate Block II changes.			
Title: Electronic Control Unit (ECU) Software Upgrade ***Description:*** Software upgrade improves engine communication with the aircraft monitoring system to increase aircrew situational awareness and reduce workload. In addition software enhancements accommodate increased capability of the Improved Drive Train (IDT). Software upgrades will occur at designated intervals to allow efficient and expedient fielding of any improvements/ enhancements. ***FY 2016 Accomplishments:*** Completed qualification of Version 3 ECU Software and Ground Support Equipment (GSE) 3.0 software. ***FY 2017 Plans:*** Testing and qualification of the software enhancements. Test Readiness Review (TRR) followed by the formal qualification and testing. ***FY 2018 Plans:*** Complete integration of Version 3+ ECU with Block II aircraft design, develop, and qualify a Version 4 ECU and conduct Electromagnetic Environmental Effects (E3) and Engine Testing on the Improved Hydro Mechanical Assembly (HMA).	2.405	2.697	5.000
Title: Ratio Detector Power Supply (RDPS) ***Description:*** The RDPS is a component of the engine torque measuring system. The RDPS addresses obsolescence related to one of the microprocessors and accuracy of the torque measurement signal. The redesigned RDPS improves the accuracy of the engine signal to the torque measuring system and provides improved mission planning capability to the aviators. ***FY 2016 Accomplishments:*** Design and development of a replacement T55-GA-714A Engine RDPS.	2.905	-	-
Title: In-house and Program Management Administration ***Description:*** This funding provides support costs for various government agencies. ***FY 2016 Accomplishments:*** Funded Support cost for various government agencies. ***FY 2017 Plans:*** This funding provides support costs for various government agencies to include the increased effort in support of Block II. ***FY 2018 Plans:***	1.620	4.592	13.053

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: May 2017
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607137A / *Chinook Product Improvement Program*	**Project (Number/Name)** ES4 / *Chinook Product Improvement Program*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Continue funding support costs for various government agencies in addition to funding for Project Management Office Full Time Equivalent (FTE) employees supporting the Block II development Program.			
Title: Testing and Evaluation ***Description:*** This effort incorporates all testing requirements to integrate numerous ECPs into one system level requirement to include the ACRB. ***FY 2016 Accomplishments:*** The continued maturing of the Sub-systems of the CH-47F Block II aircraft. Continued test preparations for initiation of the CH-47F Block II program. Continued developmental testing of the ACRB. ***FY 2017 Plans:*** Continue component level airworthiness qualification and Live Fire Testing for ACRB and developmental ECP components to characterize performance improvements. Finalize test planning activity for EMD ground test and continue test planning activity for EMD flight test. ***FY 2018 Plans:*** Include the continuation of the ACRB Live Fire Test and Evaluation (LFTE). Emplacement of a GTV fixture and endurance testing of the IDT subsystem.	3.500	11.032	6.722
Accomplishments/Planned Programs Subtotals	31.122	91.848	194.567

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
• AA0252: *CH-47 CARGO HELICOPTER MODS*	90.330	163.943	20.166	-	20.166	8.557	5.195	4.394	2.618	Continuing	Continuing
• A05105: *CH-47 SLEP (Including Adv Proc)*	646.767	556.257	88.560	-	88.560	152.528	190.917	367.421	404.367	Continuing	Continuing
• A05008: *CH-47 CARGO HELICOPTER NEW BUILD*	357.820	-	131.836	-	131.836	-	-	-	-	0	489.656

Remarks

The CH-47F program replaces the aging CH-47D aircraft by FY 2020, incorporates a new machined airframe, and includes a new Common Avionics Architecture System (CAAS) cockpit with digital communication/navigation capability allowing improved interoperability on the digital battlefield. The CH-47F program includes recapitalization of key dynamic components, bringing them to a near zero time.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: May 2017
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607137A / *Chinook Product Improvement Program*	**Project (Number/Name)** ES4 / *Chinook Product Improvement Program*

D. Acquisition Strategy

Given the need to maintain the fleet's relevance through 2060, the PM is proposing a block strategy to facilitate incremental upgrades to the Chinook fleet. Using the CH-47F as a baseline, the H-47 Block II is the first increment of this potential multi-block strategy. The Block II program will restore performance lost due to the added weight of safety and survivability equipment incorporated since initial fielding in 2007. Additional objectives of the Block II program include: Efficiently incorporating multiple engineering changes; Accomplishing required mid-life airframe recapitalization; Converging the special operations and conventional Army designs; Establishing a foundation for future block upgrades; and Maintaining the industrial base until Future Vertical Lift (FVL)-Heavy is realized.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Army			Date: May 2017
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0607137A / *Chinook Product Improvement Program*	Project (Number/Name) ES4 / *Chinook Product Improvement Program*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Modernization Integration	SS/CPFF	Boeing Ridley : Park PA	11.396	4.081	Dec 2015	15.404	Nov 2016	4.388	Oct 2017	-		4.388	Continuing	Continuing	Continuing
Engineering and Manufacturing Development (Pre-Decisional)	SS/CPIF	Boeing Ridley : Park, PA	0.000	-		38.453	Jun 2017	107.289	Nov 2017	-		107.289	Continuing	Continuing	Continuing
Advanced Chinook Rotor Blade (ACRB)	SS/CPFF	Boeing Ridley : Park PA	8.350	10.345	Dec 2015	12.828	Mar 2017	17.700	Nov 2017	-		17.700	Continuing	Continuing	Continuing
Improved Drive Train	SS/CPFF	Boeing Ridley : Park, PA	5.396	6.266	Dec 2015	6.842	Oct 2016	19.500	Nov 2017	-		19.500	Continuing	Continuing	Continuing
Electronic Control Unit (ECU) Software Upgrade	SS/CPFF	Honeywell : Phoenix, AZ	3.505	2.405	Feb 2016	2.697	Apr 2017	5.000	Jul 2018	-		5.000	Continuing	Continuing	Continuing
Ratio Detector Power Supply (RDPS)	SS/CPFF	Boeing Ridley : Park, PA	2.665	2.905	Dec 2015	-		-		-		-	0.000	5.570	0.000
Transportable Flight Proficienct Simulator (TFPS)	MIPR	NAVAIR : Patuxent River NAS, MD	0.000	-		-		20.915	Mar 2018	-		20.915	Continuing	Continuing	0.000
		Subtotal	31.312	26.002		76.224		174.792		-		174.792	-	-	-

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
PMO/OGA	Various	Various Government : Redstone Arsenal AL	1.771	1.620	Mar 2016	4.592	Oct 2016	13.053	Oct 2017	-		13.053	Continuing	Continuing	Continuing
		Subtotal	1.771	1.620		4.592		13.053		-		13.053	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Army			Date: May 2017
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0607137A / *Chinook Product Improvement Program*	Project (Number/Name) ES4 / *Chinook Product Improvement Program*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Testing of configuration update ECPs to include the Advanced Chinook Rotor Blades	SS/CPFF	Boeing Ridley : Park PA	2.341	3.500	Jan 2016	11.032	Jun 2017	6.722	Nov 2017	-		6.722	Continuing	Continuing	Continuing
		Subtotal	2.341	3.500		11.032		6.722		-		6.722	-	-	-

	Prior Years	FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	35.424	31.122		91.848		194.567		-		194.567	-	-	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Army		Date: May 2017
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607137A / *Chinook Product Improvement Program*	**Project (Number/Name)** ES4 / *Chinook Product Improvement Program*

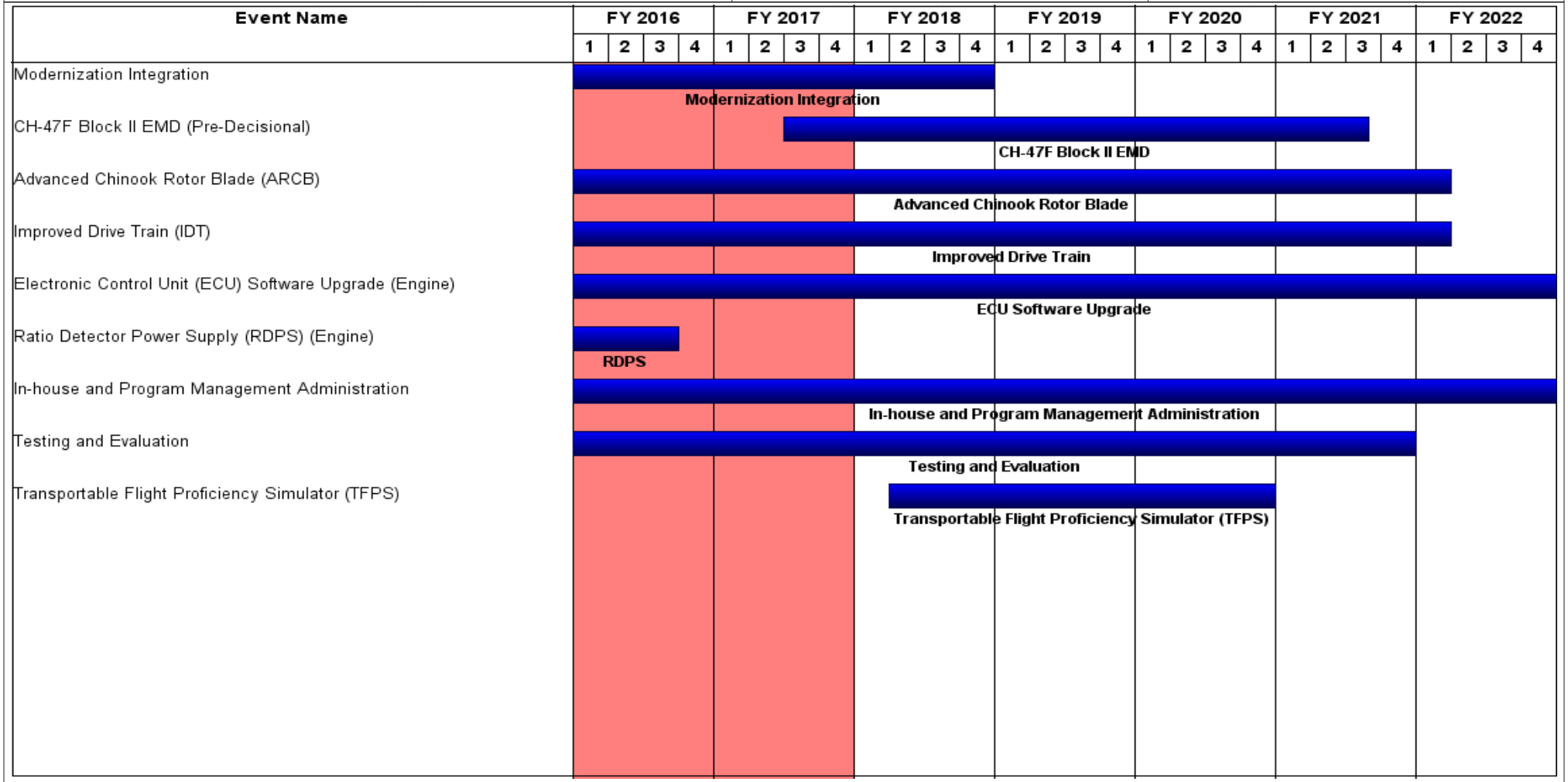

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Army		Date: May 2017
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0607137A / *Chinook Product Improvement Program*	**Project (Number/Name)** ES4 / *Chinook Product Improvement Program*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
Modernization Integration	3	2015	4	2018
CH-47F Block II EMD (Pre-Decisional)	3	2017	3	2021
Advanced Chinook Rotor Blade (ARCB)	1	2009	1	2022
Improved Drive Train (IDT)	3	2014	1	2022
Electronic Control Unit (ECU) Software Upgrade (Engine)	4	2010	4	2022
Ratio Detector Power Supply (RDPS) (Engine)	3	2015	3	2016
In-house and Program Management Administration	1	2016	4	2022
Testing and Evaluation	3	2015	4	2021
Transportable Flight Proficiency Simulator (TFPS)	2	2018	4	2020