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OFFICE OF PREPUBLICATION AND SECURITY REVIEW

CHINOOK BLOCK II (CH-47F)

December 2021 Selected Acquisition Report (SAR)



December 31, 2021
Department of the Army

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Executive Summary

Program Highlights Since Last Report (Congress): The CH-47F Block II program requirements are stable and the program provides the most affordable path to maintaining the H-47 Chinook fleet's relevance until a Future Vertical Lift Heavy variant decision is made. Research, Development, Test, & Evaluation (RDT&E) funds are adequate to fully qualify the Block II system with legacy Fiberglass Rotor Blades (FRB). Aircraft Procurement Army (APA) funds are adequate to fund congressionally directed procurements. However, there is insufficient APA to fund logistics non-recurring, spares, publications and training support for CH-47F Block II Lot 1.

Since the 2019 Selected Acquisition Report (SAR) the program risk increased. CH-47F Block II with FRB does not meet the following two Key Performance Parameters (KPP): Transport 16,000 lbs of internal/external cargo at 4K/95F with 30-minute reserve and Transport combat equipped troops-range. As of December 2021, current programmatic risks include: Future Program Funding, CH-47F Industrial Base, and Logistics Supportability for CH-47F Block II Lot 1.

Schedule Deviation: Specifically, the program experienced technical challenges and realized risk resulting from the Advanced Chinook Rotor Blade (ACRB). Due to previous RDT&E funding decrements, the CH-47F Block II program was unable to mitigate the increased technical risk.

On September 27, 2021, there was an Army decision to procure Lot 1 of the CH-47F Block II with the currently fielded FRB and to discontinue ACRB RDT&E Army funded efforts. The FY 2022 RDT&E funding increase will enable the program to continue system level qualification, mitigate the technical risk, initiate a Limited User Test and continue both Live Fire and Ballistic Testing. Testing will remain behind schedule and a total system evaluation with the FRB will be completed before planned production start, which will occur no earlier than August 2023.

Key Accomplishments during 2020 and 2021 include:

Successfully completed Electromagnetic Environment Effects (E3) Testing and Telecommunications Electronics Materials Protected from Emanating Spurious Transmissions (TEMPEST) at Naval Air Station (NAS) Patuxent River, MD and Redstone Test Center (RTC), AL on March 12, 2020 and October 16, 2020, respectively.

Successfully completed high-altitude, tethered hover developmental flight test event at Gunnison, CO on June 26, 2020.

Successfully completed Cooperative Vulnerability Identification (CVI) cyber assessment at RTC, AL on August 14, 2020.

Successfully completed CH-47 F Block II Cybersecurity Cooperative Vulnerability and Penetration Assessment (CVPA) Testing at RTC, AL, on April 30, 2021.

Successfully completed component level testing for the CH-47F Block II dynamic components.

Successfully completed the Independent Technical Assessment for ACRB on August 6, 2021.

Army decision to remove ACRB from the CH-47F Block II configuration, on September 27, 2021.

Awarded CH-47F Block II Lot 1 contract for four aircraft with Fiberglass Rotor Blade (FRB), to fulfill the FY 2021 Congressional mandate, on September 30, 2021.

There are no significant software-related issues at this time.

History of Significant Developments Since Program Initiation:

Date	Description
Jul 2017	The Army Acquisition Executive ADM approved Milestone B, authorizing the CH-47F Block II program to enter EMD and designating the CH-47F Block II as ACAT IC.
Jul 2017	The CH-47F Block II EMD contract was awarded to The Boeing Company.
Dec 2017	System Critical Design Review was completed.
Jun 2018	First Block II test aircraft loaded was loaded onto the main assembly line at Boeing Philadelphia.
Aug 2018	The second Block II test aircraft loaded was loaded onto the main assembly line at Boeing Philadelphia.
Nov 2018	The third Block II test aircraft loaded was loaded onto the main assembly line at Boeing Philadelphia.
Nov 2019	CH-47F Block II test aircraft completed first test flight with Advanced Chinook Rotor Blades representing the complete Block II baseline configuration.
Jan 2020	CH-47F Block II test aircraft arrived at Naval Air Station Patuxent River for Electromagnetic Environment Effects Testing and testing was initiated.
Sep 2021	Awarded CH-47F Block II Lot 1 contract for four aircraft with Fiberglass Rotor Blade (FRB), to fulfill the FY 2021 Congressional mandate.

Schedule

Schedule Events

Event Title (or Header)	Current Objective	Current Threshold	Current Estimate/ Actual Date	Deviation?
PDR	May-2016	May-2016	May-2016	
Milestone B	Jul-2017	Jul-2017	Jul-2017	
CDR	Dec-2017	Jun-2018	Dec-2017	
Development Test				

Start	Jul-2019	Jan-2020	Jul-2019	
Finish	May-2021	Nov-2021	May-2023	Yes
Milestone C	Aug-2021	Feb-2022	Aug-2023	Yes
IOT&E				
Start	Nov-2023	May-2024	Nov-2025	Yes
Finish	Mar-2024	Sep-2024	Mar-2026	Yes
Initial Operational Capability	Nov-2024	May-2025	Nov-2026	Yes
Full Rate Production Contract Award	Dec-2024	Jun-2025	Dec-2026	Yes

<i>Schedule Notes:</i>	<i>Schedule Deviation Explanations:</i>
The FY 2022 RDT&E funding increase will enable the program to continue system level qualification, mitigate the technical risk, initiate Limited User Test, and continue Live Fire and Ballistic Testing. The revised estimate will be provided upon completion of a program rebaseline. A revised APB reflecting these changes will be submitted at the next Milestone review.	As a result of the delay to the Developmental Test - Finish event, the subsequent milestones also have deviations: Milestone C from February 2022 to August 2023; IOT&E - Start from May 2024 to November 2025; IOT&E - Finish from September 2024 to March 2026; Initial Operational capability from May 2025 to November 2026; and Full Rate Production Contract Award from June 2025 to December 2026.

Significant Schedule Risks

Event	Date	Description
Current	12/31/2021	If CH-47F Block II does not receive long term production funding, then program uncertainty impacts future planning. Mitigation: Army production decision no earlier than FY 2023.
Current	12/31/2021	If Logistics Non-Recurring, Spares, and publications and training support for CH-47F Block II are not funded then there will be a delay in executing Initial Operational Test & Evaluation which will ultimately impact the fielding schedule. Mitigation: Identify funding and contract vehicle to cover the effort; and program aircraft utilization to support required publications events that may cause schedule slips to major milestones.

Performance

Performance Attributes					
Current Objective	Current Threshold	Current Estimate	Deviation?	Demonstrated Performance	Date
Attribute Title:	Self-Deploy with 30 minute fuel reserve (NM)			KPP	
1260	1056	1056		ORD Revision 4 dated January 26, 2006	
Attribute Title:	Transport 16,000 lbs of internal/external cargo at 4K/95F with 30 minute reserve (NM)			KPP	
100	50	0	Yes	ORD Revision 4 dated January 26, 2006 Analysis with the fiberglass rotor blades shows that the system is capable of carrying 13,800 lbs for 50 NM at 4K/95F with 30 minute reserve.	
Attribute Title:	Transport combat equipped troops: Number of Troops			KPP	
44	31	25	Yes	ORD Revision 4 dated January 26, 2006	
Attribute Title:	Transport combat equipped troops: Range (NM)			KPP	
150	100	100		ORD Revision 4 dated January 26, 2006	
Attribute Title:	Reliability: Mean Time Between Essential Maintenance Actions (MTBEMA) (fit hrs)			KSA	
3.5	3.3	3.5		ORD Revision 4 dated January 26, 2006.	

Attribute Title:	Maintenance: Total Maintenance Ratio (mmh/ft hr)		KSA	
9.2	9.8	9.2		ORD Revision 4 dated January 26, 2006

<i>Performance Notes:</i>	<i>Performance Deviation Explanations:</i>
Self Deploy with 30 minute fuel reserve (NM) changed from 1260 to 1056; and Transport combat equipped troops: Range (NM) changed from 150 to 100. The current performance estimates reflect results of engineering analysis.	As a result of the Army decision to continue the CH-47F Block II program with the currently fielded Fiberglass Rotor Blades (FRB) instead of the Advanced Chinook Rotor Blades (ACRB), the following estimated KPP deviations have occurred: Transport 16,000 lbs of internal/external cargo at 4K/95F with 30 minute reserve (NM) from 50 NM to 0 NM (Analysis with the fiberglass rotor blades shows that the system is capable of carrying 13,800 lbs for 50 NM at 4K/95F with 30 minute reserve) and Transport combat equipped troops: Number of Troops from 31 to 25 (Analysis with the fiberglass rotor blades shows that the system is capable of carrying 25 troops that weigh 335 lbs each for 100 NM.) The current performance estimates reflect results of engineering analysis.

Acquisition Budget Estimate

Total Acquisition Cost

Budget Year: 2023

Base Year: 2017

Appropriation Category (\$Millions)	Objective Base Year (Current APB)	Threshold Base Year (Current APB)	Budget Estimate Base Year	Budget Estimate Then Year	Deviation?
RDT&E	\$766.2	\$842.8	\$760.2	\$811.2	
Procurement	\$15,208.8	\$16,279.7	\$14,753.8	\$21,296.2	
MILCON	\$0.0	\$0.0	\$0.0	\$0.0	
Acq O&M	\$244.8	\$269.3	\$34.2	\$34.2	
Total Acquisition	\$16,219.8		\$15,548.2	\$22,141.6	
PAUC	\$29.926		\$28.687	\$40.852	
APUC	\$28.217		\$27.373	\$39.511	

Total End Item Quantity

Quantity	Current APB	Current Estimate
Development Qty	3	3
Procurement Qty	539	539

Budget Notes:

A Program Deviation Report has been submitted. The revised estimate will be provided upon completion of a program re-baseline. A revised Acquisition Program Baseline reflecting these changes will be submitted at the next Milestone review.

Base Year change in cost due to revised inflation indices.

Quantity Notes:

While the common production costs of 69 MH-47Gs are included in the Procurement costs, they are excluded from the O&S costs as they are managed by Special Operations Aviation Regiment. The remaining aircraft are three RDT&E-funded aircraft that incur no O&S costs.

Cost Deviations Explanations:

Risk and Sensitivity Analysis

Current Procurement Risks:

As a result of recent Army decision and schedule deviation, the program is preparing for a re-baseline to document and measure program change.

Unit Cost

Current Baseline Compared with Current Estimate

Current Baseline Base Year: 2017

Category (\$ Millions)	Current Baseline	Current Estimate	% Change	Breach? Significant or Critical
Program Acquisition Unit Cost				
Acquisition Cost	\$16,219.8	\$15,548.2		
Program Quantity	542	542		

PAUC	\$29.926	\$28.687	-4.14%	None
Average Procurement Unit Cost				
Procurement Cost	\$15,208.8	\$14,753.8		
Procurement Quantity	539	539		
APUC	\$28.217	\$27.373	-2.99%	None

Original Baseline Compared with Current Estimate

Original Baseline Base Year: 2017

Category (\$ Millions)	Original Baseline	Current Estimate	% Change	Breach? Significant or Critical
Program Acquisition Unit Cost				
Acquisition Cost	\$16,219.8	\$15,548.2		
Program Quantity	542	542		
PAUC	\$29.926	\$28.687	-4.14%	None
Average Procurement Unit Cost				
Procurement Cost	\$15,208.8	\$14,753.8		
Procurement Quantity	539	539		
APUC	\$28.217	\$27.373	-2.99%	None

Unit Cost Notes:

A Program Deviation Report has been submitted. The revised estimate will be provided upon completion of a program re-baseline. A revised Acquisition Program Baseline reflecting these changes will be submitted at the next Milestone review.

Contracts

Contract Number:	W58RGZ-17-C-0059	Order Number:		Contract Title:	Engineering and Manufacturing Development
CAGE Code	77272	City	Ridley park	Contracting Office	ACC_Redstone
CAGE Legal Name	The Boeing Company	State/Province	PA	Contract Strategy	FAR 15: Negotiated Contracts
Effort Number					
Supportive Phase	Development	Latest Modification Number	P00051	Definitization Date	7/27/2017
Contract Type	Cost-Plus-Incentive-Fee	Latest Modification Date	9/11/2020	Work Start Date	7/27/2017

Technical Data Rights	Government Purpose License Rights to Technical Data-- Noncommercial Items & Software	Notes	Due to Army decision to continue the CH-47F Block II program with the currently fielded fiberglass blades instead of the Advanced Chinook Rotor Blades, changes will be made to the EMD contract based on programmatic decisions.				
Contract/Effort Price, Quantity and Performance (\$M)							
Initial Target Price	\$269.50	Current Target Price	\$273.80	Contractor's EAC	\$285.80		
Initial Ceiling Price		Current Ceiling Price	\$285.90	PM's EAC	\$285.80		
Initial Quantity		BAC	\$286.60	BCWP	\$237.10	Work Completed	82.73%
Current Quantity		ACWP	\$251.00	BCWS	\$241.60	Cost Variance	-\$13.90
Delivered Quantity	155					Schedule Variance	-\$4.50
Factors Contributing to Cost Variance and Projected Effects on Program Costs:				Factors Contributing to Schedule Variance and Projected Effects on Program Schedule:			
The unfavorable cost variance is due to realization of technical risks.				The unfavorable schedule variance is due to realization of technical risks.			

Contract Number:	W58RGZ-14-D-0075	Order Number:	42	Contract Title:	ACRB NRE
CAGE Code	77272	City	Ridley park	Contracting Office	ACC_Redstone
CAGE Legal Name	The Boeing Company	State/Province	PA	Contract Strategy	FAR 16.5: Indefinite Delivery Indefinite Quantity
Effort Number					
Supportive Phase	Development	Latest Modification Number	P00018	Definitization Date	4/15/2016
Contract Type	Cost-Plus-Fixed-Fee	Latest Modification Date	9/25/2020	Work Start Date	4/15/2016
Technical Data Rights	Government Purpose License Rights to Technical Data-- Noncommercial Items & Software	Notes	Due to Army decision to continue the CH-47F Block II program with the currently fielded fiberglass blades instead of the Advanced Chinook Rotor Blades, changes will be made to the EMD contract based on programmatic decisions. Earned Value Management reporting has been suspended.		
Contract/Effort Price, Quantity and Performance (\$M)					
Initial Target Price	\$51.30	Current Target Price	\$64.80	Contractor's EAC	\$80.00

Initial Ceiling Price		Current Ceiling Price		PM's EAC	\$80.00		
Initial Quantity	0	BAC	\$75.61	BCWP	\$63.00	Work Completed	83.32%
Current Quantity	9	ACWP	\$66.00	BCWS	\$65.40	Cost Variance	-\$3.00
Delivered Quantity	6					Schedule Variance	-\$2.40
Factors Contributing to Cost Variance and Projected Effects on Program Costs:				Factors Contributing to Schedule Variance and Projected Effects on Program Schedule:			
The unfavorable cost variance is due to realization of technical risks.				The unfavorable schedule variance is due to realization of technical risks.			

Contract Number:	W58RGZ-14-D-0075	Order Number:	8	Contract Title:	Improved Drive Train Phase II		
CAGE Code	77272	City	Ridley par	Contracting Office	ACC_Redstone		
CAGE Legal Name	The Boeing Company	State/Province	PA	Contract Strategy	FAR 16.5: Indefinite Delivery Indefinite Quantity		
Effort Number							
Supportive Phase	Development	Latest Modification Number	P00021	Definitization Date	10/20/201		
Contract Type	Cost-Plus-Fixed-Fee	Latest Modification Date	9/8/2020	Work Start Date	11/20/201		
Technical Data Rights	Government Purpose License Rights to Technical Data-- Noncommercial Items & Software	Notes	Contract is over 90% complete. This will be the last report.				
Contract/Effort Price, Quantity and Performance (\$M)							
Initial Target Price	\$51.50	Current Target Price	\$52.50	Contractor's EAC	\$44.50		
Initial Ceiling Price		Current Ceiling Price		PM's EAC	\$931.20		
Initial Quantity	23	BAC	\$48.00	BCWP	\$44.40	Work Completed	92.50%
Current Quantity	101	ACWP	\$43.80	BCWS	\$44.80	Cost Variance	\$0.60
Delivered Quantity	87					Schedule Variance	\$0.40

Factors Contributing to Cost Variance and Projected Effects on Program Costs:	Factors Contributing to Schedule Variance and Projected Effects on Program Schedule:
The favorable cost variance is due to efficient execution of the contract.	The unfavorable schedule variance is due to minor schedule fluctuations.

Contract Number:	W58RGZ-21-D0098	Order Number:		Contract Title:	Production	
CAGE Code	77272	City	Ridley Park	Contracting Office	ACC_Redstone	
CAGE Legal Name	The Boeing Company	State/Province	PA	Contract Strategy	FAR 16.5: Indefinite Delivery Indefinite Quantity	
Effort Number						
Supportive Phase	Production	Latest Modification Number		Definitization Date	9/30/2021	
Contract Type	Fixed-Price Incentive (Firm Target)	Latest Modification Date		Work Start Date	9/30/2021	
Technical Data Rights	Government Purpose License Rights to Technical Data-- Noncommercial Items & Software	Notes	First IPMR has not been submitted.			
Contract/Effort Price, Quantity and Performance (\$M)						
Initial Target Price	\$136.4	Current Target Price	\$136.4	Contractor's EAC	\$136.4	
Initial Ceiling Price		Current Ceiling Price		PM's EAC	\$136.4	
Initial Quantity	233	BAC		BCWP		Work Completed 0.00%
Current Quantity	496	ACWP		BCWS		Cost Variance
Delivered Quantity	496					Schedule Variance
Factors Contributing to Cost Variance and Projected Effects on Program Costs:				Factors Contributing to Schedule Variance and Projected Effects on Program Schedule:		
N/A				N/A		

Technologies and Systems Engineering

Significant Technical Risks

Event	Date	Description
MS B	7/31/2017	If the Block II aircraft weight is higher than expected, then there may be a potential risk to mission performance. Mitigation: Monitor aircraft weight growth, incentivize weight reduction in contract, review load and fatigue assumptions and pursue weight reduction initiatives.
MS B	7/31/2017	If H-47 industrial base is not kept in operation, then cost for H-47 production and support will increase. Mitigation: Use Indefinite Delivery Indefinite Quantity contract to sustain production line, support Technology Applications Program Office production and encourage Foreign Military Sales.
MS B	7/31/2017	If all the individual contracts and engineering change proposals (ECPs) forming the subsystem development efforts are not synchronized with EMD, then there will be schedule delays. Mitigation: Manage all individual efforts to Block II Master schedule, and monitor progress to identify potential problems ahead of time.
MS B	7/31/2017	If the fuel cell test asset design and back up structure are insufficiently compatible with the Block II structure, then the fuel cell may not self-seal. Mitigation: Design and build a backup structure representative of a Block II airframe.
MS B	7/31/2017	If appropriate data rights are not acquired by the program, then the Project Manager will not be able to execute the strategy outlined in the Life-Cycle Sustainment Plan. Mitigation: Conduct detailed negotiations for rights in Engineering and Manufacturing Development and Engineering Change Proposal contracts, and enforce Government rights through the configuration management process.
Current	12/31/2021	If CH-47F industrial base is not kept in operation, then costs for CH-47 and MH-47 production and support will increase. Mitigation: Use Indefinite Delivery Indefinite Quantity contract to sustain production line; support Technology Applications Program Office production; and encourage Foreign Military Sales.

Deliveries and Expenditures

Quantities	Planned to Date	Actual to Date	Total Quantity	Percent Delivered
Development	3	3	3	100.00%
Procurement	0	0	539	0.00%
Total	3	3	542	0.55%

Years Appropriated to date	8	Total Years Appropriated Funding (Current Baseline):	29	Percent Years Appropriated:	27.59%
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Appropriation Category (\$Millions)	Then Year Appropriated Amount	Then Year Expended Amount
RDT&E	767.10	386.00
Procurement	1,355.50	258.90
MILCON	0.00	0.00
Acq O&M	34.20	34.20
Total Appropriated/Expended	\$2,156.80	\$679.10
Percent Appropriated/Expended	9.74%	3.07%



Low-Rate Initial Production

	Initial Decision LRIP	Current Total LRIP
Approval Date		
Approval LRIP Quantity		
Approval Document Title		
Start Year		
End Year		

Rationale if quantity exceeds 10% of the total number of articles to be produced: CUI: _____



Quantity Notes: CUI: _____

Milestone C is projected for August 2023; thus, no LRIP information is available.

Operating and Support (O&S) Cost

Total Program O&S Cost Compared with Baseline

Budget Year: 2017

	Current Base Year Objective	Current Base Year Threshold	Current Base Year Estimate	Current Then Year Estimate	Deviation ?
Total O&S (\$Millions)	\$21,737.0	\$23,910.7	\$21,737.0	\$42,443.60	

Deviation Explanation:

Operation and Support Cost Breakdown

Category (Base Year \$Millions)	System Name: CH-47F Block II	System Name: CH-47F
Unit-Level Manpower	\$6,063.0	\$8,184.0
Unit Operations	\$2,937.5	\$967.2
Maintenance	\$8,800.8	\$11,373.9
Sustaining Support	\$117.5	\$930.0
Continued System Improvements	\$2,514.3	\$ 1,050.9
Other	\$ 1,304	
Total O&S	\$21,737.0	\$22,506.0

Cost Estimate Source

Type: Other

Approval Authority and Date: CH-47F Block II Milestone B Army Cost Position dated May 2017. CH-47F Operational Sustainment Review dated February 2021.

Note: CH-47F Block II O&S cost also includes \$1,304.0M for Indirect Support. CH-47F O&S cost also includes \$2,000.5M for Indirect Support.

O&S Notes:

The CH-47F Block II estimate assumes an end state of 470 CH-47F Block II aircraft when fully fielded with an Operational tempo (OPTEMPO) of 174 peacetime flying hours per operational aircraft. While the common production costs of 69 MH-47Gs are included in the Procurement costs, they are excluded from the O&S costs as they are managed by Special Operations Aviation Regiment. The remaining aircraft are three RDT&E-funded aircraft that incur no O&S costs.

The antecedent to the CH-47F Block II is the CH-47F, for which O&S costs are from the CH-47F Operational Sustainment Review. The total O&S cost is based on 465 operational aircraft with a service life of 20 years peacetime.