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RCS: DD-A&T(Q&A)823-539



M88A2 Heavy Equipment Recovery Combat Utility Lift Evacuation System (M88A2 HERCULES)

As of FY 2021 President's Budget

Defense Acquisition Management
Information Retrieval
(DAMIR)

UNCLASSIFIED

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Common Acronyms and Abbreviations for MDAP Programs

Acq O&M - Acquisition-Related Operations and Maintenance
ACAT - Acquisition Category
ADM - Acquisition Decision Memorandum
APB - Acquisition Program Baseline
APPN - Appropriation
APUC - Average Procurement Unit Cost
\$B - Billions of Dollars
BA - Budget Authority/Budget Activity
Blk - Block
BY - Base Year
CAPE - Cost Assessment and Program Evaluation
CARD - Cost Analysis Requirements Description
CDD - Capability Development Document
CLIN - Contract Line Item Number
CPD - Capability Production Document
CY - Calendar Year
DAB - Defense Acquisition Board
DAE - Defense Acquisition Executive
DAMIR - Defense Acquisition Management Information Retrieval
DoD - Department of Defense
DSN - Defense Switched Network
EMD - Engineering and Manufacturing Development
EVM - Earned Value Management
FOC - Full Operational Capability
FMS - Foreign Military Sales
FRP - Full Rate Production
FY - Fiscal Year
FYDP - Future Years Defense Program
ICE - Independent Cost Estimate
IOC - Initial Operational Capability
Inc - Increment
JROC - Joint Requirements Oversight Council
\$K - Thousands of Dollars
KPP - Key Performance Parameter
LRIP - Low Rate Initial Production
\$M - Millions of Dollars
MDA - Milestone Decision Authority
MDAP - Major Defense Acquisition Program
MILCON - Military Construction
N/A - Not Applicable
O&M - Operations and Maintenance
ORD - Operational Requirements Document
OSD - Office of the Secretary of Defense
O&S - Operating and Support
PAUC - Program Acquisition Unit Cost

PB - President's Budget
PE - Program Element
PEO - Program Executive Officer
PM - Program Manager
POE - Program Office Estimate
RDT&E - Research, Development, Test, and Evaluation
SAR - Selected Acquisition Report
SCP - Service Cost Position
TBD - To Be Determined
TY - Then Year
UCR - Unit Cost Reporting
U.S. - United States
USD(AT&L) - Under Secretary of Defense (Acquisition, Technology and Logistics)
USD(A&S) - Under Secretary of Defense (Acquisition and Sustainment)

Program Information

Program Name

M88A2 Heavy Equipment Recovery Combat Utility Lift Evacuation System (M88A2 HERCULES)

DoD Component

Army

Responsible Office

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Date Assigned: May 23, 2018

References

SAR Baseline (Production Estimate)

Army Acquisition Executive (AAE) Approved Acquisition Program Baseline (APB) dated January 03, 2017

Approved APB

Army Acquisition Executive (AAE) Approved Acquisition Program Baseline (APB) dated December 5, 2017

Mission and Description

The M88A2 Heavy Equipment Recovery Combat Utility Lifting Evacuation System (HERCULES) is a 70 ton armored, full tracked, diesel powered recovery vehicle based on the M88A1 chassis. The HERCULES is intended to provide single vehicle recovery, evacuation, and battle damage repair of the Abrams Main Battle Tank, and other combat vehicles weighing up to 70 tons.

The M88A2 hull is armored for protection against small arms fire, artillery fragments, and anti-personnel mines. The vehicle mounts a 50 caliber machine gun for self-protection. It is configured with three winches, an improved spade, and an improved A-frame boom which enables the vehicle to have a 35 ton lift capability. The M88A2 is an improvement over the M88A1 Medium Recovery Vehicle (MRV); it is the only vehicle capable of providing Single Vehicle Recovery (SVR) of the 70 ton Abrams tank.

The M88A2 is key to rapid maintenance and recovery of disabled combat systems (which type -- self-propelled; rolling) for return to operational condition in order to dominate the maneuver battle. HERCULES vehicles prevent the need for tank-on-tank recovery, thus preserving combat power.

The HERCULES operates during adverse battlefield conditions of darkness, smoke, dust and adverse weather and protects equipment and crew from the effects of indirect artillery, Nuclear, Biological and Chemical (NBC) attack; electronic countermeasures; directed, optical, low-energy weapons; anti-personnel mines; and small arms fire. The M88A2 operates in the same environment and geographical areas as the Armored Brigade Combat Teams (ABCTs) it supports, normally one terrain feature behind supported units, thus maximizing available cover and concealment.

Executive Summary

Program Highlights Since Last Report

Pursuant to section 2432 of title 10, United States Code, this is the final SAR submission for M88A2 HERCULES because the program is 90% or more delivered.

The M88A2 HERCULES vehicle started production in 1994 and FRP in 1997. The program is post-Milestone C and on schedule.

The M88A2 HERCULES requirements are stable and funding is adequate to meet cost and schedule baselines. There is no increased risk to the program since the 2018 SAR.

Current baseline Procurement funding procures 930 systems thru FY 2020. The Army Acquisition Objective (AAO) is for 933 vehicles. Currently there is no funding to complete the remaining 3 vehicles. If funds do become available in future budget cycles, the remaining 3 vehicles can be added to the current production contract.

The current budget includes Overseas Contingency Operations funding of \$42.8M in FY 2019 and \$80.1M in FY 2020.

On September 18, 2019 a modification to the current contract was awarded for an additional 43 vehicles. As of February 12, 2020, 841 vehicles have been produced and delivered. An additional 73 are on contract to be delivered in CY 2020 - CY 2022 bringing the Army inventory to 914 M88A2 vehicles. The additional 16 funded vehicles will be awarded in FY 2020. The AAO pure fleets the Army's Active and National Guard Armored Brigade Combat Teams with M88A2 HERCULES. When M88A2 HERCULES production is complete, 237 M88A1s will remain in inventory in non-Abrams equipped units.

The M88A2 HERCULES is the only system capable of providing single vehicle recovery, evacuation, and battle damage repair of the Abrams Main Battle Tank and other combat vehicles up to 70 tons. The current Abrams M1A2 System Enhancement Program version 2 (M1A2 SEPV2) tank with force protection kits exceeds 74 tons. Subsequently, the M88A2 HERCULES can no longer perform the required single vehicle recovery in all mission scenarios due to the increased weight of the M1 Abrams platform.

The Project Director (PD) - Main Battle Tank Systems is executing an Operations and Support (O&S) initiative through an Engineering Change Proposal (ECP) effort to improve the current the M88A2 HERCULES to regain Single Vehicle Recovery (SVR) of the heaviest tracked combat vehicle with Force Protection kits applied. The M88A3 SVR ECP prototype developmental effort was awarded on September 13, 2019 and will continue through 2nd quarter FY 2022 followed by government testing through 3rd quarter FY 2023, production beginning in 4th quarter FY 2023, and First Unit Equipped in 3rd quarter FY 2025 of the M88A3.

The addition of the SVR ECP initiative costs to existing M88A2 O&S costs caused an O&S APB deviation because these costs are not included in the M88A2 APB.

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

History of Significant Developments Since Program Initiation

History of Significant Developments Since Program Initiation	
Date	Significant Development Description
June 2016	Milestone decision authority delegated to the Secretary of the Army and designated ACAT IC program by the DAE.

Threshold Breaches

APB Breaches

Schedule		<input type="checkbox"/>
Performance		<input type="checkbox"/>
Cost	RDT&E	<input type="checkbox"/>
	Procurement	<input type="checkbox"/>
	MILCON	<input type="checkbox"/>
	Acq O&M	<input type="checkbox"/>
O&S Cost		<input checked="" type="checkbox"/>
Unit Cost	PAUC	<input type="checkbox"/>
	APUC	<input type="checkbox"/>

Explanation of Breach

The O&S cost breach was previously reported in the December 2018 SAR.

Nunn-McCurdy Breaches

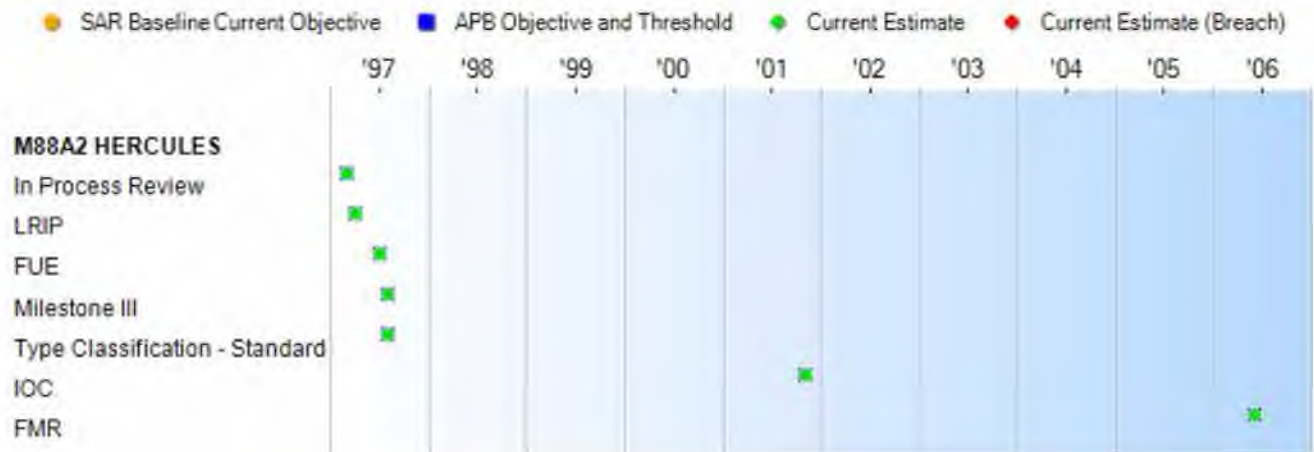
Current UCR Baseline

PAUC	None
APUC	None

Original UCR Baseline

PAUC	None
APUC	None

Schedule



Schedule Events				
Events	SAR Baseline Production Estimate	Current APB Production Objective/Threshold		Current Estimate
In Process Review	Mar 1997	Mar 1997	Mar 1997	Mar 1997
LRIP	Apr 1997	Apr 1997	Apr 1997	Apr 1997
FUE	Jul 1997	Jul 1997	Jul 1997	Jul 1997
Milestone III	Aug 1997	Aug 1997	Aug 1997	Aug 1997
Type Classification - Standard	Aug 1997	Aug 1997	Aug 1997	Aug 1997
IOC	Nov 2001	Nov 2001	Nov 2001	Nov 2001
FMR	Jun 2006	Jun 2006	Jun 2006	Jun 2006

Change Explanations

None

Notes

Previously an ACAT II program, HERCULES was designated ACAT IC by the DAE in the June 2016 ADM as a result of cost projections reaching the ACAT I Procurement costs threshold when procuring to the Army Acquisition Objective of 933.

Acronyms and Abbreviations

FMR - Full Material Release
FUE - First Unit Equipped

Performance

Performance Characteristics				
SAR Baseline Production Estimate	Current APB Production Objective/Threshold	Demonstrated Performance	Current Estimate	
TOWING CAPACITY: 70 tons up & down a 10% slope / 70 tons up & down a 20% slope / 70 tons up & down a 25% slope				
5 MPH / 3 MPH / Continued, Positive Forward Speed	5 MPH / 3 MPH / Continued, Positive Forward Speed	(T=O) 5 MPH / 3 MPH / Continued, Positive Forward Speed	5 MPH / 3 MPH / Continued, Positive Forward Speed	5 MPH / 3 MPH / Continued, Positive Forward Speed
CONVOY SPEED without Towed Load on dry, paved, level roads				
30 MPH	30 MPH	25 MPH	30 MPH	30 MPH
HOIST WINCH LIFT CAPACITY				
35 tons	35 tons	(T=O) 35 tons	35 tons	35 tons
MAIN WINCH PULL CAPACITY				
70 tons	70 tons	(T=O) 70 tons	70 tons	70 tons
CRUISING RANGE without Towed Load on paved, level, dry surfaces				
200 miles	200 miles	(T=O) 200 miles	300 miles	300 miles
RELIABILITY				
210 MMBOMF	210 MMBOMF	(T=O) 210 MMBOMF	210 MMBOMF	210 MMBOMF
MAINTENANCE RATIO Maintenance Man-Hours per Mile				
0.14	0.14	0.17	0.14	0.14
ARMOR PROTECTION: Direct Fire / Indirect Fire / Anti-Personnel				
30 MM / 155 MM / Anti-Personnel	30 MM / 155 MM / Anti-Personnel	(T=O) 30 MM / 155 MM / Anti-Personnel	30 MM / 155 MM / Anti- Personnel	30 MM / 155 MM / Anti-Personnel
CLIMBING Longitudinal Grade				
60%	60%	(T=O) 60%	60%	60%
ACCELERATION Standing Start to 200 Feet				
Less than 14 seconds	Less than 14 seconds	(T=O) Less than 14 seconds	Less than 14 seconds	Less than 14 seconds

Requirements Reference

ORD dated November 9, 1998

Change Explanations

None

Acronyms and Abbreviations

% - Percent

MM - Millimeter

MMBOMF - Mean Miles Between Operational Mission Failure

MPH - Miles Per Hour

O - Objective

T - Threshold

Track to Budget

RDT&E

Appn	BA	PE
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Army 2040 07 0203735A

Project	Name
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280 Recovery Vehicle (Shared) (Sunk)
Improvement Program

Notes: Starting in FY 2018, Line Item 0203735A/280 is shared with the Single Vehicle Recovery Engineering Change Proposal effort that will be applied to currently fielded M88A2s as a post production modification.

Procurement

Appn	BA	PE
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Army 2033 01 0211700A

Line Item	Name
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3700GA0570 Improved Recovery Vehicle (Shared)
(M88A2 HERCULES)

Notes: Starting in FY 2022, Line Item 3700GA050 is shared with the Single Vehicle Recovery Engineering Change Proposal effort that will be applied to currently fielded M88A2s as a post production modification.

Acq O&M

Notes

Due to the age of this program, the timeframe of the O&M, Army funding used in the 1990s, the document that provides the budget source cannot be located.

Cost and Funding

Cost Summary

Total Acquisition Cost							
Appropriation	BY 1997 \$M			BY 1997 \$M	TY \$M		
	SAR Baseline Production Estimate	Current APB Production Objective/Threshold		Current Estimate	SAR Baseline Production Estimate	Current APB Production Objective	Current Estimate
RDT&E	55.9	62.4	68.6	62.4	53.3	54.2	54.2
Procurement	2298.7	2290.8	2519.9	2292.5	2927.8	2925.2	2898.1
Flyaway	--	--	--	2186.6	--	--	2767.5
Recurring	--	--	--	2178.4	--	--	2758.3
Non Recurring	--	--	--	8.2	--	--	9.2
Support	--	--	--	105.9	--	--	130.6
Other Support	--	--	--	49.8	--	--	65.5
Initial Spares	--	--	--	56.1	--	--	65.1
MILCON	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Acq O&M	4.5	4.5	5.0	4.5	4.5	4.5	4.5
Total	2359.1	2357.7	N/A	2359.4	2985.6	2983.9	2956.8

Current APB Cost Estimate Reference

POE dated October 31, 2017

Cost Notes

No cost estimate has been completed for the program in the past year.

Total Quantity			
Quantity	SAR Baseline Production Estimate	Current APB Production	Current Estimate
RDT&E	5	5	5
Procurement	933	933	930
Total	938	938	935

Quantity Notes

FY2019 Quantity is for 31 Base vehicles and 12 OCO vehicles.

Cost and Funding

Funding Summary

Appropriation Summary									
FY 2021 President's Budget / December 2019 SAR (TY\$ M)									
Appropriation	Prior	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	To Complete	Total
RDT&E	54.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54.2
Procurement	2818.0	80.1	0.0	0.0	0.0	0.0	0.0	0.0	2898.1
MILCON	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Acq O&M	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5
PB 2021 Total	2876.7	80.1	0.0	0.0	0.0	0.0	0.0	0.0	2956.8
PB 2020 Total	2856.8	80.1	0.0	0.0	20.0	60.0	0.0	0.0	3016.9
Delta	19.9	0.0	0.0	0.0	-20.0	-60.0	0.0	0.0	-60.1

Funding Notes

FY2019 Funding is \$110.5M of Base funding and \$42.354M of OCO funding.

Quantity Summary										
FY 2021 President's Budget / December 2019 SAR (TY\$ M)										
Quantity	Undistributed	Prior	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	To Complete	Total
Development	5	0	0	0	0	0	0	0	0	5
Production	0	914	16	0	0	0	0	0	0	930
PB 2021 Total	5	914	16	0	0	0	0	0	0	935
PB 2020 Total	5	909	16	0	0	0	8	0	0	938
Delta	0	5	0	0	0	0	-8	0	0	-3

Cost and Funding

Annual Funding By Appropriation

Annual Funding							
2040 RDT&E Research, Development, Test, and Evaluation, Army							
Fiscal Year	Quantity	TY \$M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
1986	--	--	--	--	--	--	8.0
1987	--	--	--	--	--	--	6.8
1988	--	--	--	--	--	--	8.9
1989	--	--	--	--	--	--	1.7
1990	--	--	--	--	--	--	--
1991	--	--	--	--	--	--	2.0
1992	--	--	--	--	--	--	0.9
1993	--	--	--	--	--	--	5.6
1994	--	--	--	--	--	--	7.4
1995	--	--	--	--	--	--	6.5
1996	--	--	--	--	--	--	2.9
1997	--	--	--	--	--	--	3.5
Subtotal	5	--	--	--	--	--	54.2

Annual Funding 2040 RDT&E Research, Development, Test, and Evaluation, Army							
Fiscal Year	Quantity	BY 1997 \$M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
1986	--	--	--	--	--	--	10.7
1987	--	--	--	--	--	--	8.8
1988	--	--	--	--	--	--	11.1
1989	--	--	--	--	--	--	2.0
1990	--	--	--	--	--	--	--
1991	--	--	--	--	--	--	2.2
1992	--	--	--	--	--	--	1.0
1993	--	--	--	--	--	--	5.9
1994	--	--	--	--	--	--	7.7
1995	--	--	--	--	--	--	6.6
1996	--	--	--	--	--	--	2.9
1997	--	--	--	--	--	--	3.5
Subtotal	5	--	--	--	--	--	62.4

Annual Funding								
2033 Procurement Procurement of Weapons and Tracked Combat Vehicles, Army								
Fiscal Year	Quantity	TY \$M						
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program	
1994	13	28.5	1.2	1.3	31.0	0.2	31.2	
1995	15	24.5	1.4	4.6	30.5	6.3	36.8	
1996	24	47.5	4.0	--	51.5	2.9	54.4	
1997	24	46.5	6.3	--	52.8	2.7	55.5	
1998	10	21.8	9.7	--	31.5	0.5	32.0	
1999	16	33.4	17.2	--	50.6	3.0	53.6	
2000	--	--	--	--	--	--	--	
2001	29	55.3	14.2	--	69.5	6.9	76.4	
2002	21	43.6	12.5	--	56.1	3.7	59.8	
2003	5	16.2	28.2	--	44.4	7.2	51.6	
2004	--	--	--	--	--	--	--	
2005	55	103.0	38.3	--	141.3	4.8	146.1	
2006	--	--	--	--	--	--	--	
2007	147	295.6	53.3	--	348.9	9.8	358.7	
2008	116	245.0	30.0	--	275.0	6.5	281.5	
2009	85	180.3	54.8	--	235.1	19.0	254.1	
2010	27	76.9	6.6	--	83.5	13.0	96.5	
2011	45	124.7	10.2	--	134.9	3.9	138.8	
2012	--	1.8	4.8	--	6.6	0.9	7.5	
2013	49	153.7	13.3	--	167.0	2.7	169.7	
2014	53	162.6	17.4	--	180.0	6.0	186.0	
2015	36	112.9	7.2	--	120.1	2.4	122.5	
2016	47	149.2	27.8	--	177.0	10.1	187.1	
2017	18	66.3	21.1	--	87.4	4.6	92.0	
2018	36	121.8	22.1	--	143.9	9.4	153.3	
2019	43	155.2	12.5	3.3	171.0	1.9	172.9	
2020	16	62.7	15.2	--	77.9	2.2	80.1	
Subtotal	930	2329.0	429.3	9.2	2767.5	130.6	2898.1	

Annual Funding							
2033 Procurement Procurement of Weapons and Tracked Combat Vehicles, Army							
Fiscal Year	Quantity	BY 1997 \$M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
1994	13	29.1	1.2	1.4	31.7	0.2	31.9
1995	15	24.6	1.4	4.6	30.6	6.4	37.0
1996	24	47.1	4.0	--	51.1	2.9	54.0
1997	24	45.7	6.2	--	51.9	2.7	54.6
1998	10	21.2	9.4	--	30.6	0.5	31.1
1999	16	32.2	16.7	--	48.9	2.8	51.7
2000	--	--	--	--	--	--	--
2001	29	52.1	13.4	--	65.5	6.5	72.0
2002	21	40.5	11.7	--	52.2	3.4	55.6
2003	5	14.7	25.6	--	40.3	6.6	46.9
2004	--	--	--	--	--	--	--
2005	55	88.7	33.0	--	121.7	4.1	125.8
2006	--	--	--	--	--	--	--
2007	147	242.3	43.6	--	285.9	8.1	294.0
2008	116	198.1	24.3	--	222.4	5.2	227.6
2009	85	143.8	43.8	--	187.6	15.1	202.7
2010	27	60.2	5.2	--	65.4	10.1	75.5
2011	45	95.5	7.8	--	103.3	3.0	106.3
2012	--	1.4	3.6	--	5.0	0.7	5.7
2013	49	114.0	9.9	--	123.9	2.0	125.9
2014	53	119.4	12.8	--	132.2	4.4	136.6
2015	36	81.7	5.2	--	86.9	1.7	88.6
2016	47	105.7	19.7	--	125.4	7.2	132.6
2017	18	46.1	14.6	--	60.7	3.2	63.9
2018	36	83.0	15.1	--	98.1	6.4	104.5
2019	43	103.7	8.3	2.2	114.2	1.3	115.5
2020	16	41.1	10.0	--	51.1	1.4	52.5
Subtotal	930	1831.9	346.5	8.2	2186.6	105.9	2292.5

Cost Quantity Information			
2033 Procurement Procurement of Weapons and Tracked Combat Vehicles, Army			
Fiscal Year	Quantity	End Item Recurring Flyaway (Aligned With Quantity) BY 1997 \$M	
1994	13	29.1	
1995	15	24.6	
1996	24	47.1	
1997	24	45.7	
1998	10	21.2	
1999	16	32.2	
2000	--	--	
2001	29	52.1	
2002	21	40.5	
2003	5	14.7	
2004	--	--	
2005	55	88.7	
2006	--	--	
2007	147	242.3	
2008	116	198.1	
2009	85	143.8	
2010	27	60.2	
2011	45	96.9	
2012	--	--	
2013	49	114.0	
2014	53	119.4	
2015	36	81.7	
2016	47	105.7	
2017	18	46.1	
2018	36	83.0	
2019	43	103.7	
2020	16	41.1	
Subtotal	930	1831.9	

Annual Funding		
2020 Acq O&M Operation and Maintenance, Army		
Fiscal Year	TY \$M	
	Total Program	
1997		4.5
Subtotal		4.5

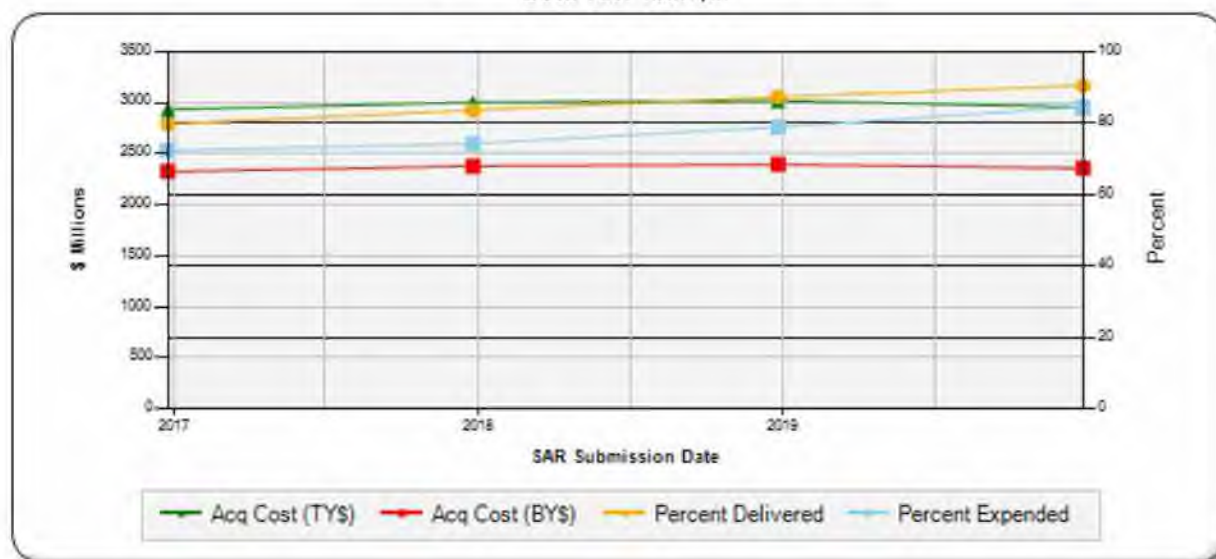
Annual Funding	
2020 Acq O&M Operation and Maintenance, Army	
Fiscal Year	BY 1997 \$M
	Total Program
1997	4.5
Subtotal	4.5

Beginning in FY 2019, the Army realigned direct civilian pay costs from RDT&E and Procurement investment accounts to O&M for better transparency and auditability. However funding realignment is still pending. Therefore, no O&M estimate is included for FY19 and beyond.

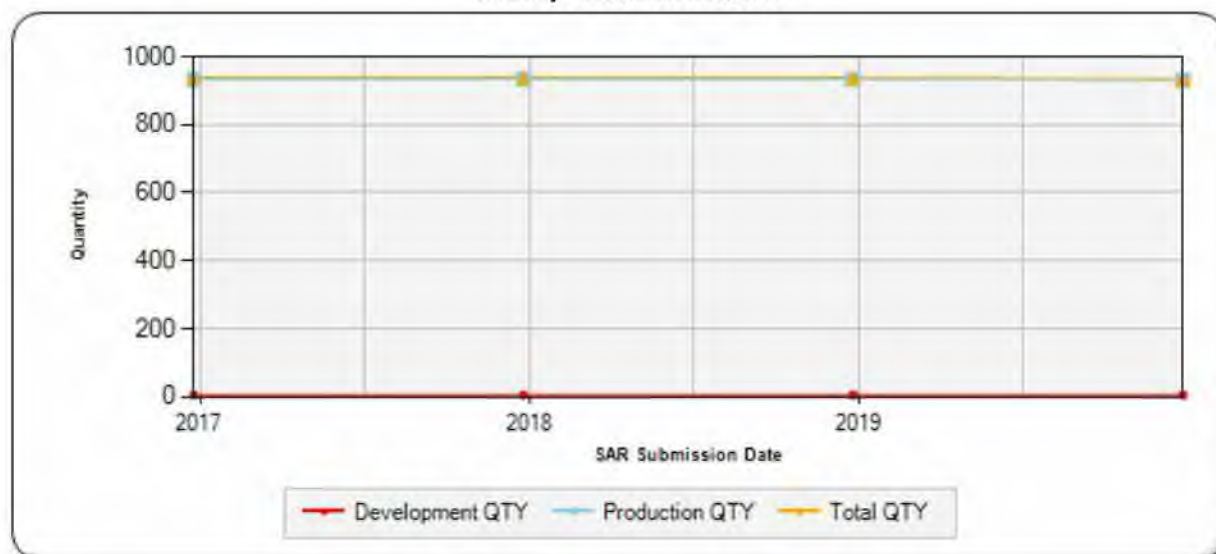
Charts

M88A2 HERCULES first began SAR reporting in December 2016

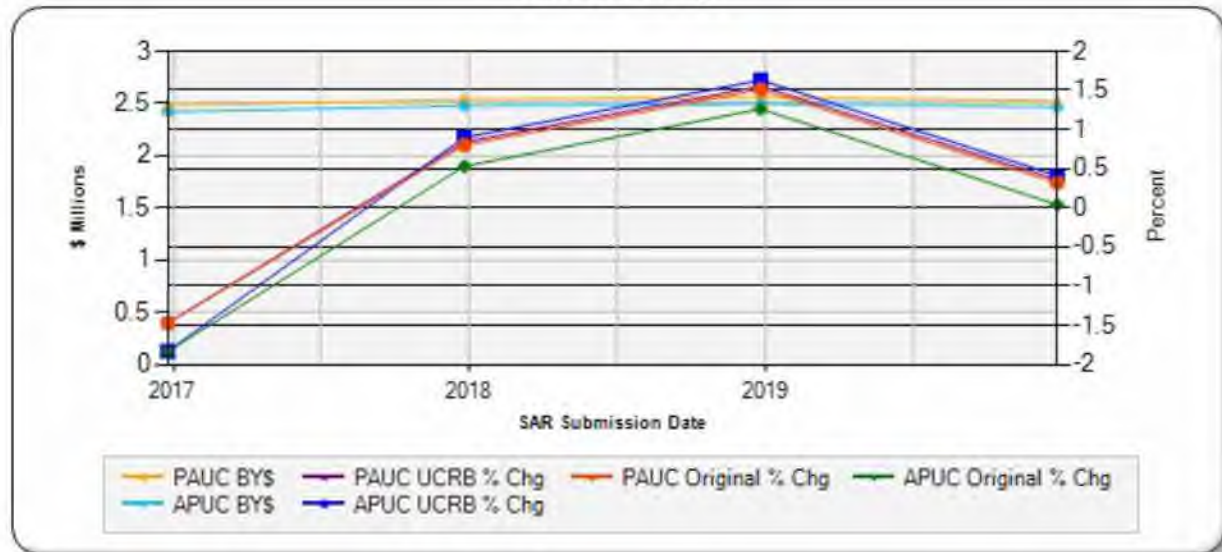
Program Acquisition Cost - M88A2 HERCULES
Base Year 1997 \$M



Quantity - M88A2 HERCULES



Unit Cost - M88A2 HERCULES
Base Year 1997 \$M



Risks

Significant Schedule and Technical Risks

Significant Schedule and Technical Risks	
Current Estimate (December 2019)	
1.	Production Risk: The current M88A2-HERCULES Army Acquisition Objective (AAO) is 933. The M88A2-HERCULES production is currently funded through FY 2020 for a total quantity of 930 with no M88A2-HERCULES production funding beyond FY 2020. The army is reevaluating the current AAO in synchronization with the Armored Brigade Combat Team (ABCT) Modernization strategy and Force Structure which will likely change the AAO to 930, as currently funded through FY 2020.

Risks

Risk and Sensitivity Analysis

Risks and Sensitivity Analysis	
Current Baseline Estimate (December 2017)	
1.	The M88A2 HERCULES POE generated in October 2017 was used to establish the APB. . It reflects a 50% Confidence Level in accordance with the Army Cost Guidance. The most significant cost driver is the recurring manufacturing cost for vehicles. This recurring manufacturing cost estimate assumes high component design maturity. The cost estimate would increase if changes to components are made resulting in new vendor qualifications.
Original Baseline Estimate (January 2017)	
1.	The M88A2 HERCULES Original Baseline was established when the program was designated ACAT IC in June of 2016. The POE estimated the costs using actuals from historical data for RDT&E and Procurement. At the time there was no O&S costs established . It reflects a 50% Confidence Level in accordance with the Army Cost Guidance. The most significant cost driver is the recurring manufacturing cost for vehicles. This recurring manufacturing cost estimate assumes high component design maturity.
Revised Original Estimate (N/A)	
None	
Current Procurement Cost (December 2019)	
1.	The DASA-CE ICE was approved for the Operational Sustainment Review in June 2018. The current POE was based on the ICE with adjustments due to time-phasing and budget changes. It reflects a 50% Confidence Level in accordance with the Army Cost Guidance. The vehicle recurring manufacturing costs is the most significant cost driver in the estimate. Factors that impact the manufacturing unit costs include lower quantity buys and diminishing manufacturing sources. PAUC and APUC remain within 1% of the APB.

Low Rate Initial Production

Item	Initial LRIP Decision	Current Total LRIP
Approval Date	9/9/1994	9/24/1994
Approved Quantity	13	42
Reference	Milestone III ADM	Milestone III ADM Addendum
Start Year	1994	1994
End Year	1997	1997

Foreign Military Sales

Country	Date of Sale	Quantity	Total Cost \$M	Description
Lebanon	9/13/2017	2	7.6	Case LE/U7-UDA
Australia	9/19/2015	6	28.2	Case AT-UHN
Iraq	7/8/2012	8	31.8	Case H3-UAY
Iraq	9/8/2008	8	26.2	Case IQ-VPP
Australia	7/7/2004	7	26.4	Case AT-ZZH
Egypt	11/1/2003	21	47.1	Case EG-NFU
Egypt	4/11/2002	3	7.9	Case EG-B-UUH
Egypt	4/30/2001	13	29.0	Case EG-NFQ
Egypt	3/19/1999	51	113.3	Case EG-JBM
Kuwait	7/7/1993	14	35.0	Case KU-JAT

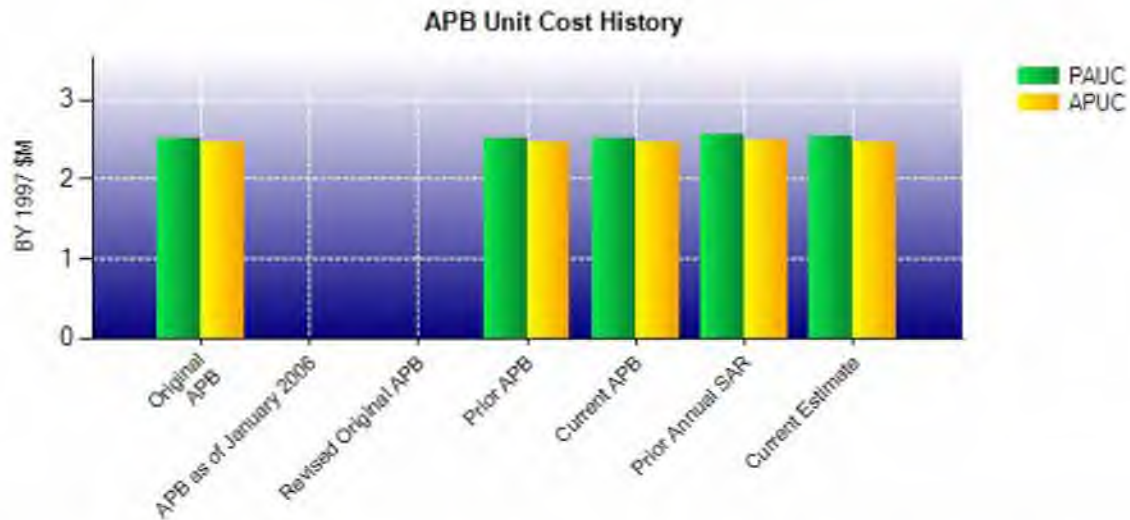
Notes

Nuclear Costs

None

Unit Cost

Current UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 1997 \$M	BY 1997 \$M	% Change
	Current UCR Baseline (Dec 2017 APB)	Current Estimate (Dec 2019 SAR)	
Program Acquisition Unit Cost			
Cost	2357.7	2359.4	
Quantity	938	935	
Unit Cost	2.514	2.523	+0.36
Average Procurement Unit Cost			
Cost	2290.8	2292.5	
Quantity	933	930	
Unit Cost	2.455	2.465	+0.41
Original UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 1997 \$M	BY 1997 \$M	% Change
	Original UCR Baseline (Jan 2017 APB)	Current Estimate (Dec 2019 SAR)	
Program Acquisition Unit Cost			
Cost	2359.1	2359.4	
Quantity	938	935	
Unit Cost	2.515	2.523	+0.32
Average Procurement Unit Cost			
Cost	2298.7	2292.5	
Quantity	933	930	
Unit Cost	2.464	2.465	+0.04



APB Unit Cost History					
Item	Date	BY 1997 \$M		TY \$M	
		PAUC	APUC	PAUC	APUC
Original APB	Jan 2017	2.515	2.464	3.183	3.138
APB as of January 2006	N/A	N/A	N/A	N/A	N/A
Revised Original APB	N/A	N/A	N/A	N/A	N/A
Prior APB	Jan 2017	2.515	2.464	3.183	3.138
Current APB	Dec 2017	2.514	2.455	3.181	3.135
Prior Annual SAR	Dec 2018	2.553	2.495	3.216	3.171
Current Estimate	Dec 2019	2.523	2.465	3.162	3.116

SAR Unit Cost History

Current SAR Baseline to Current Estimate (TY \$M)									
PAUC Production Estimate	Changes								PAUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
3.183	-0.014	-0.003	0.000	0.000	-0.137	0.000	0.133	-0.021	3.162

Current SAR Baseline to Current Estimate (TY \$M)									
Initial APUC Production Estimate	Changes								APUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
3.138	-0.014	-0.003	0.000	0.000	-0.138	0.000	0.133	-0.022	3.116

SAR Baseline History				
Item	SAR Planning Estimate	SAR Development Estimate	SAR Production Estimate	Current Estimate
Milestone A	N/A	N/A	N/A	N/A
Milestone B	N/A	N/A	N/A	N/A
Milestone C	N/A	N/A	N/A	N/A
IOC	N/A	N/A	Nov 2001	Nov 2001
Total Cost (TY \$M)	N/A	N/A	2985.6	2956.8
Total Quantity	N/A	N/A	938	935
PAUC	N/A	N/A	3.183	3.162

Cost Variance

Summary TY \$M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (Production Estimate)	53.3	2927.8	--	2985.6
Previous Changes				
Economic	--	-12.5	--	-12.5
Quantity	--	--	--	--
Schedule	--	+2.0	--	+2.0
Engineering	--	--	--	--
Estimating	+0.9	-87.5	--	-86.6
Other	--	--	--	--
Support	--	+128.4	--	+128.4
Subtotal	+0.9	+30.4	--	+31.3
Current Changes				
Economic	--	-0.4	--	-0.4
Quantity	--	-12.4	--	-12.4
Schedule	--	-1.7	--	-1.7
Engineering	--	--	--	--
Estimating	--	-41.3	--	-41.3
Other	--	--	--	--
Support	--	-4.3	--	-4.3
Subtotal	--	-60.1	--	-60.1
Total Changes	+0.9	-29.7	--	-28.8
Current Estimate	54.2	2898.1	--	2956.8

Summary BY 1997 \$M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (Production Estimate)	55.9	2298.7	--	2359.1
Previous Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	+6.5	-74.9	--	-68.4
Other	--	--	--	--
Support	--	+103.7	--	+103.7
Subtotal	+6.5	+28.8	--	+35.3
Current Changes				
Economic	--	--	--	--
Quantity	--	-7.5	--	-7.5
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	--	-25.4	--	-25.4
Other	--	--	--	--
Support	--	-2.1	--	-2.1
Subtotal	--	-35.0	--	-35.0
Total Changes	+6.5	-6.2	--	+0.3
Current Estimate	62.4	2292.5	--	2359.4

Previous Estimate: December 2018

Procurement	\$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	-0.4
Total Quantity variance resulting from a decrease of three M88A2s from 933 to 930. (Subtotal)	-6.7	-11.1
Quantity variance resulting from a decrease of three M88A2s from 933 to 930. (Quantity)	(-7.5)	(-12.4)
Allocation to Estimating resulting from Quantity change. (Estimating) (QR)	(+0.8)	(+1.3)
Acceleration of procurement buy profile from FY 2024 to FY 2019. (Schedule)	0.0	-1.7
Revised estimate for Non-Recurring Flyaway for additional tooling. (Estimating)	+2.2	+3.3
Revised estimate for hardware unit costs. (Estimating)	-1.1	-2.3
Revised estimate for System Technical Support due to shortened program. (Estimating)	-12.4	-19.7
Revised estimate for additional testing. (Estimating)	+1.0	+1.5
Revised estimate for System Engineering/Project Management due to shortened program. (Estimating)	-16.0	-25.6
Adjustment for current and prior escalation. (Estimating)	+0.1	+0.2
Adjustment for current and prior escalation. (Support)	+0.2	+0.2
Decrease in Other Support due to changes in fielding costs. (Support)	-2.1	-4.3
Decrease in Initial Spares due to change in requirements. (Support) (QR)	-0.2	-0.2
Procurement Subtotal	-35.0	-60.1

(QR) Quantity Related

Contracts

Contract Identification

Appropriation: Procurement
Contract Name: M88A2 HERCULES FY17 Production
Contractor: BAE Systems Land & Armaments, L.P.
Contractor Location: 1100 Bairs Rd
 York, PA 17408-8975
Contract Number: W56HZV-17-C-0242
Contract Type: Firm Fixed Price (FFP)
Award Date: September 29, 2017
Definitization Date: September 29, 2017

Contract Price								
Initial Contract Price (\$M)			Current Contract Price (\$M)			Estimated Price At Completion (\$M)		
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager	
68.9	N/A	20	331.6	N/A	99	331.6	331.6	

Target Price Change Explanation

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to additional options awarded in FY 2018.

Cost and Schedule Variance Explanations

Cost and Schedule Variance reporting is not required on this (FFP) contract.

Deliveries and Expenditures

Deliveries				
Delivered to Date	Planned to Date	Actual to Date	Total Quantity	Percent Delivered
Development	5	5	5	100.00%
Production	842	841	930	90.43%
Total Program Quantity Delivered	847	846	935	90.48%

Expended and Appropriated (TY \$M)			
Total Acquisition Cost	2956.8	Years Appropriated	35
Expended to Date	2498.8	Percent Years Appropriated	100.00%
Percent Expended	84.51%	Appropriated to Date	2956.8
Total Funding Years	35	Percent Appropriated	100.00%

The above data is current as of February 10, 2020.

Operating and Support Cost

Cost Estimate Details

Date of Estimate: November 15, 2018
Source of Estimate: POE
Quantity to Sustain: 930
Unit of Measure: Vehicle
Service Life per Unit: 40.00 Years
Fiscal Years in Service: FY 1997 - FY 2068

Quantity to Sustain is for the Army Acquisition Objective of 930 and does not include five prototype vehicles. It does include the Single Vehicle Recovery (SVR) Engineering Change Proposal (ECP) that will be applied to the currently fielded M88A2 vehicles as a post production modification. This SVR ECP effort will extend the useful life of the vehicle another 20 years in addition to the existing 20-year useful life.

Sustainment Strategy

The current M88A2 HERCULES ORD, dated November 9, 1998, specifies organic M88A2 support. The M88A2 employs the Army's two-level maintenance strategy for support. The Combat Recovery Systems Integrated Product Support Manager is updating the Life Cycle Sustainment Plan to meet the requirements of an ACAT IC program. The M88A2 product support concept consists of both Operational/Field support and Sustainment support. Operation/Field support is through the use of Brigade Support Battalions using the assigned Forward Support Company for maintenance support. The unit using the M88A2 draws repair parts from the Supply Support Activity. An updated Interactive Electronic Technical Manual will provide crew and maintainer with platform information. Depot Maintenance Work Requirements and National Maintenance Work Requirements are in place for major sub-system components.

Antecedent Information

The antecedent system is the M88A1. This system was in production from 1977 to 1993. Due to the age of the program, O&S costs cannot be collected, therefore no cost comparison can be provided.

Annual O&S Costs BY1997 \$K		
Cost Element	M88A2 HERCULES Average Annual Cost Per Vehicle	N/A (Antecedent) N/A
Unit-Level Manpower	88.136	--
Unit Operations	0.624	--
Maintenance	40.450	--
Sustaining Support	22.120	--
Continuing System Improvements	255.747	--
Indirect Support	20.530	--
Other	0.000	--
Total	427.607	--

Item	Total O&S Cost \$M			
	M88A2 HERCULES			N/A (Antecedent)
	Current Production APB Objective/Threshold		Current Estimate	
Base Year	9802.4	10782.6	15907.0 ¹	N/A
Then Year	17853.7	N/A	39896.8	N/A

¹ APB O&S Cost Breach

Disposal Cost is included in the Operating and Support Cost of the current APB objective and threshold for this program.

Equation to Translate Annual Cost to Total Cost

HERCULES Total O&S Cost = Average Annual O&S Cost Per Vehicle x Number of Vehicles x Economic Useful Life = \$427.607K x 930 vehicles x 40 years = \$15,907.0M (BY 1997 \$M).

Economic Useful Life include 20 years for the M88A2 initial production and an additional 20 years after the vehicle goes through the SVR ECP effort.

O&S Cost Variance		
Category	BY 1997 \$M	Change Explanations
Prior SAR Total O&S Estimates - Dec 2018 SAR	15845.2	
Programmatic/Planning Factors	29.2	Changes to SVR ECP effort (\$30.7M) and Lower Quantity (\$-1.5M)
Cost Estimating Methodology	0.0	
Cost Data Update	5.1	Revised estimate for Spare Parts (\$-28.2) and Field Modifications (\$33.3M).
Labor Rate	27.5	Update to Military Pay Rates
Energy Rate	0.0	
Technical Input	0.0	
Other	0.0	
Total Changes	61.8	
Current Estimate	15907.0	

Disposal Estimate Details

Date of Estimate: September 17, 2018
Source of Estimate: POE
Disposal/Demilitarization Total Cost (BY 1997 \$M): 43.5