08 OCT 2002

THRU: ARMY ACQUISTION EXECUTIVE

FOR: VICE CHIEF OF STAFF, ARMY

SUBJECT: M9 Armored Combat Earthmover (ACE)
Recapitalization Program Baseline (RPB)
Approval

The enclosed subject memorandum is provided for both the Army Acquisition Executive and Vice Chief of Staff, Army signatures. The M9 ACE RPB obtained the required documentation and coordination from the Army Staff.

Very respectfully,

John S. Caldwell, Jr.
LTG, GS

Enclosure

DEPARTMENT OF THE ARMY
WASHINGTON, D.C. 20310

05 NOV 2002

SAAL-SI

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: M9 Armored Combat Earthmover (ACE) Recapitalization Program Baseline (RPB) Approval

The M9 ACE RPB (TAB C) is submitted for review and approval by the *Army Acquisition Executive/Vice Chief of Staff of the Army*. The November 7, 2001, letter (TAB D) from LTG Caldwell tasked the Program Executive Officer (PEO) Combat Support/Combat Service Support (CS/CSS) to comply with the RPB guidance. The PEO CS/CSS conducted a Decision Review of the M9 ACE Recapitalization Program and validated it pending final approval of the RPB by the Army Acquisition Executive/Vice Chief of Staff, Army (TAB B).

In accordance with the Army Recapitalization Management Policy, M9 ACE RPB, dated March 14, 2002, is approved for implementation. The PEO and Project Manager will execute all selected upgrades and rebuilds for the M9 ACE in accordance with the funding and schedule baselines documented in the RPB. The RPB will provide the basis for sound management and historical record from which to measure success.

It is imperative that we work together and establish close partnerships at all levels to ensure success. Our warfighters depend on this recapitalization effort to maintain system readiness, sustainability, and combat overmatch as we transform the Army.

Point of contact for this matter is Mr. Jose Rivera, 703 604-7244, jose.rivera@saalt.army.mil.

JOHN M. KEANE
General, U.S. Army
Vice Chief of Staff, Army

Claude M. Bolton, Jr.
Army Acquisition Executive

Enclosures

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M9 ARMORED COMBAT EARTHMOVER

Recapitalization Program Baseline

"Rebuild and Enhance the Legacy Force to Ensure Operational Readiness"

14 March 2002

RECAPITALIZATION PROGRAM BASELINE TABLE OF CONTENTS

1. Recapitalization Program Baseline Description

On 28 September 2001 the VCSA approved the recap program for the M9 ACE. The elements of this program are:

- Full recap of 374 ACEs. This number constitutes the entire fleet of 533 ACEs less 52 newer ACEs in the Counterattack Corps and 107 ACEs in Europe.
- Application of thicker hull bottom on all 533 M9s at depot or equivalent facility
- Installation of System Improvement Plan Phase 4 (SIP 4) enhancements to all 533 vehicles

Full Recap

M9 ACE recapitalization consists of rebuilding the vehicle chassis and overhauling all major components. In the process, the vehicle will be returned to near-zero hour condition and brought to the latest production configuration.

Rebuild will involve the following:

- Complete teardown to bare hull
- Apply any SIP 1, SIP 2 and SIP 3 items not already installed
- Replace or repair damaged items
- Mandatory replacement of wear items such as all hoses and seals
- Parts upgrades – items such as accumulators, heaters, roadwheels, roadarms and final drive breathers will be replaced with newer configurations
- Install actuator rings at all stations (front station applied during SIP 1)

The following major components will be torn down and completely overhauled:

- Main hydraulic accumulator
- Main hydraulic pump
- Cylinder assemblies – apron and ejector
- Apron
- Ejector
- Directional control valve
- Actuators – corner and intermediate
- Actuator accumulator
- Engine
- Transmission
- Transfer case
- Steer unit
- Final drive
- Winch, 35K

Thicker Hull Bottom

The purpose of the thicker hull bottom program is to increase the durability of the hull. This project involves cutting out the existing 3/8-inch thick hull bottom and welding in a new one-inch thick section. Also included is a rear steel skid plate and improved hull access plates. The work must be done at depot or equivalent due to special fixtures and need for complete vehicle teardown and hull preparation.

The thicker hull bottom is already on 52 ACEs in the Counterattack Corps (installed during production), and it is being installed as part of an ongoing USAREUR refurbishment program for their 107 ACEs. Thus, by applying the thicker hull bottom during full recap of 374 vehicles, all 533 M9s in the fleet will receive this improvement.

System Improvement Plan Phase 4 (SIP 4)

The M9 System Improvement Plan (SIP) is a series of continuous improvements to the ACE - primarily hardware oriented, OPA 3 funded and applied in the field through block modifications. The SIP is designed to improve performance, durability, readiness and MANPRINT characteristics of the M9. SIP 4 consists of the following projects:

- Hydraulic diagnostic center (HDC) - Project brings 33 critical hydraulic diagnostic points to a central location through embedded transducers and a data bus. The HDC lets the maintainer conduct 103 diagnostic tests at a central location.
- Powerpack removal improvements – Nine quick disconnects help prevent oil spills and reduce the time to remove the powerpack. This project also eliminates a mounting bolt that was very difficult to access.
- Steel apron with automatic blade folder - Current procedure for folding or unfolding the blade now takes up to 1/2 hour to perform, requires crew to be exposed and stops the ongoing mission. This project lets the operator remotely fold or unfold the dozer blade from the crew compartment. Steel blade and apron are also more durable and cost less than current aluminum blade and apron.
- Improved track tensioner - Proper track tension on the ACE is critical. The track must be tight enough to stay on the vehicle during operations in both sprung mode (travel) and unsprung mode (dozing). But the track needs sufficient slack to allow the operator to switch the suspension between these two modes. An improved track tensioner will help the operator maintain proper track tension and adjust tension when necessary.
- Improved final drive flanges - Existing flanges have become a recurrent cost and maintenance driver. The flange is cracking, resulting in lost mission time and a high cost to replace. The improved flange will eliminate the failure mode.
- Additional SIP 4 projects:
  - Force XXI electronics prep - Adds harnesses and brackets for future electronics packages
  - New crew cooling system - Much cheaper, more reliable, maintenance-friendly alternative to existing Microclimate Cooling System

- Non-Halon fire extinguisher - Brings ACE into compliance with Montreal Protocol
- New hatch hinge - Eliminates tendency of open hatch to pop off primary catch (still secured by secondary catch). Also eliminates fatigue failures at hatch mount.
- Backing auto-sprung (tentative project) - Eliminates need to manually shift from unsprung to sprung when backing up while dozing
- Dozing auto-steer disable (tentative project) - Disables steering while dozing so operator can't accidentally throw track (steering is accomplished by maneuvering blade)

The thicker hull bottom is also a component of SIP 4. Unlike the other projects, however, it cannot be applied at DOL or field units, and it is primarily OMA funded.

The following table summarizes the elements that constitute the M9 ACE recap program. Also shown are per-vehicle program costs. These are further explained in Section 2, Funding.

Recap Element	Cost	Benefits
Vehicle rebuild (OMA)	.341	R/M/S, TOCR, Service life
Component overhaul (OMA)	.055	
Engine		R/M/S, TOCR, Service life
Steer unit		R/M/S, TOCR, Service life
Actuators		R/M/S, TOCR, Service life
Transmission		R/M/S, TOCR, Service life
Cylinders, pumps, valves, etc		R/M/S, TOCR, Service life
Thicker hull bottom (SIP 4 OMA)	.005	R/M/S, TOCR, Service life
Unit OMA Cost Total (FY02)	**$.401M**	
SIP 4 other than hull bottom (OPA 3)	.069	
Hydraulic diagnostic center		R/M/S, TOCR
Powerpack quick disconnects		R/M/S, TOCR
Steel apron with blade folder		Capability, Service life
Improved track tensioner		Capability, R/M/S, TOCR
Improved final drive flanges		R/M/S, TOCR, Service life
Additional projects		R/M/S, TOCR, Service life
Unit OPA 3 Cost Total (FY02)	**$.069M**	

2. Recapitalization Program Baseline Funding

OMA funding

The $.401M unit cost for rebuild, component overhaul and thicker hull bottom is in FY02 dollars. This figure basically covers depot labor and hardware costs. The unit cost is an estimate based on actual M9 ACE overhaul programs at Anniston, adjusted to account for the recap Scope of Work. Actual unit cost will not be known until completion of the first few vehicles. Based on actual unit cost, the projected quantities may change.

ASIOE costs are not included in the M9 ACE recap program baseline. These items need to be separately funded for and provided. Per-vehicle costs for required ASIOE and other items not funded by the ACE program are:

NSN	Item	Cost
1005-01-107-7501	Launcher, Grenade Smoke, M259	$ 365
4240-00-994-8750	Mask, Protective Tank, M42A2	$ 124
5855-00-228-0937	Night Vision Goggles, AN/PVS-7B	$ 3,578
5820-01-451-8248	Radio Set, AN/VRC-87F	$ 6,532
5895-01-469-3352	Master Control Station/Light (VIS-3 component)	$1531
5830-01-382-3218	Full Function Crew Station (VIS-3 component)	$941

Source: see Appendix

Other expenses which are funded include COSIS, SDO, SDT and Support Equipment. This last category includes five items associated with the VIS-3 system.

OPA 3 Funding

The PAA portion of the ACE recap program, as shown in the spreadsheet below, consists of $28.62M OPA 3 spread over FY02-05. These costs include SIP 4 hardware for all 533 M9s, technical data, field application, and other costs such as program management salary. However, because SIP 4 funding was in place before recap, the actual cost of SIP 4 includes sunk costs of $8.41M incurred in FY01 and prior. This accounts for the final cost of $.069M per vehicle (source: see Appendix).

The figures shown under "Quantities, PA (SIP 4 Enhancements)" are really only place-holders to reflect the fact that SIP 4 will be applied to all 533 ACEs. As explained in Section 1 above, SIP 4 consists of numerous projects. Each has its own developmental timeline, and as each matures it will be applied to ACEs either at the depot during recap or directly to vehicles in the field via Modification Work Order. This point is further explained in Section 3, Schedule.

M9 ACE Recap Funding

Required	FY02	FY03	FY04	FY05	FY06	FY07	FY03-07 POM	EPP	Total POM & EPP
RDTE	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
PA									
Weapon Systems	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
MWOs	$12.08	$11.08	$3.98	$1.49	$0.00	$0.00	$28.62	$0.00	$28.62
Training Devices	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Initial Spares	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
STS	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
OMA									
Recapitalization	$10.41	$13.79	$14.03	$14.28	$14.55	$14.83	$81.90	$82.15	$164.04
SSTS (Recap)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
COSIS	$0.03	$0.03	$0.04	$0.04	$0.04	$0.04	$0.20	$0.21	$0.41
SDO	$0.10	$0.14	$0.14	$0.14	$0.15	$0.15	$0.82	$0.82	$1.64
SDT	$0.10	$0.14	$0.14	$0.14	$0.15	$0.15	$0.82	$0.82	$1.64
PPSS	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Initial Spares	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Support Equipment	$0.04	$0.05	$0.05	$0.05	$0.05	$0.05	$0.30	$0.30	$0.60
Training Devices	$0.00	$0.02	$0.06	$0.02	$0.00	$0.00	$0.10	$0.00	$0.10
Other									
Training	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Manning	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Munitions	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
CLS	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Installation Support Costs	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total Funding Required	$22.76	$25.26	$18.43	$16.16	$14.93	$15.22	$112.76	$84.29	$197.05
Quantities									
PA (SIP 4 Enhancements)	200	200	100	33	0	0	533	0	533

Source: see Appendix

3. Recapitalization Program Baseline Schedule

In April 2002, Anniston Army Depot will induct the first M9s for the FY02 depot recap program. First vehicles will be completed in late 2002. The FY02 program is scheduled to consist of 26 vehicles. From FY03 through FY12, we plan to recap an additional 348 ACEs. The planned induction and fielding schedule is:

	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	F010	FY11	FY12	FY13
Induct	26	34	34	34	34	34	36	36	36	35	35	
Field		26	34	34	34	34	34	36	36	36	35	35

Distribution of recapped ACEs is as follows:

Counterattack Corps				Active Component						RC
4ID	1CD	3ID	3ACR	2ID	1AD CONUS	1ID CONUS	TNG BASE	APS	OTHER	ARNG
40	53	53	6	44	22	22	26	42	26	40

Per VCSA guidance, the ACE recap program is exempt from Unit Set Fielding because there is just one vehicle configuration and the ACE is not being upgraded to a new model. The requirement is to field to the Counterattack Corps first.

As each SIP 4 project completes development, the hardware will be procured and the enhancement will be added to the depot scope of work. Two SIP 4 projects will be included in the FY02 depot recap scope of work – powerpack removal improvements and non-Halon fire extinguishers.

Once all SIP 4 projects are developed, they will also be applied in the field (except for the thicker hull bottom) via Modification Work Order. Therefore, any given vehicle may receive SIP 4 either at the depot, in the field, or through a combination. The intent is to complete application of SIP 4 (except thicker hull bottom) by end of FY06.

4. Recapitalization Program Baseline Performance

The M9 ACE recap program has four metrics: reduce fleet age, improve durability, reduce annual O&S costs, and enhance vehicle performance and maintainability. The following table summarizes these four metrics; Appendix A contains a detailed description of each.

Metric	Objective	Data Source
Formula	**Performance Measurement**	
Legend		
1. Reduce Fleet Age	9.7 years by FY12	Annual Recap records
Example (for FY04): [R04 X 0 + R03 X 1 + R02 X 2 + (533-Cum04) X (RY+10)] / 533	Compare actual quantity recapped each year with planned quantity	
RNN is number recapped in FYNN RY is recap year (FY02=1, FY03=2, FY04=3, etc.) CumNN is cumulative number recapped through FYNN		
2. Improve Durability	10% of fleet CVE qualified at end of each fiscal year	TACOM and USAREUR databases of vehicle recaps and refurbishments
Thick hull Percent CVE =[TkCVE / (Prod+Europe+Recap)] X 100 Thin hull Percent CVE =(TnCVE / quantity] X 100	After each FY, assign each CVE qualified vehicle into either thick or thin hull category. Compute Percent CVE for each category.	
TkCVE is number of CVE qualified vehicle with thick hull bottom TnCVE is number of CVE qualified vehicle with thin hull bottom		
3. Reduce Annual O&S Costs	O&S cost of $40 per hour (in FY00 dollars)	OSMIS
Standard OSMIS queries and calculations, plus weighted averages	Calculate average annual cost per hour each year, when OSMIS database is updated	
4. Enhance Vehicle Performance and Maintainability	Determine if ACE performs "better" and is "easier" to maintain	Sample Data Collection through AMSAA, soldier feedback
Measurement of task times, number of wholesale requisitions, subjective evaluations	Measure improvements in task times, contact unit personnel, use OSMIS and AMSAA databases	

5. Recapitalization Interfaces

Depot and Industry Partnerships

There will be no formal partnership for actual recap of the M9 ACE. Vehicle rebuild and component overhaul are 100% organic to Anniston Army Depot (ANAD). Minor portions of the effort may be contracted out by ANAD. An example is overhaul of the intermediate and corner actuators. Anniston performs disassembly, overhaul and reassembly, but they also contract with the actuator manufacturer, Rolls Royce (Bird Johnson) for as-needed repair of sub-components and complete actuators.

Contract Agreements:

There will not be a formal contract for actual recap of the M9 ACE. TACOM receives the required OMA dollars, and funds ANAD on an annual basis for a given program. The program scope of work and required funding is renegotiated as required.

TACOM is under contract with MTS Technologies, Inc. (partnering with UDLP) for writing the Depot Maintenance Work Requirements (DMWRs) and National Maintenance Work Requirements (NMWRs) for the recap effort. The following table lists these documents:

Accumulator, Actuator	NMWR
Accumulator, Main Hydraulic	NMWR
Actuators, Corner and Intermediate	DMWR
Cylinder Assembly, Apron	NMWR
Cylinder Assembly, Ejector	NMWR
Ejector	NMWR
Engine	DMWR
Final Drive	DMWR
M9 ACE, End Item	DMWR
Pump, Main Hydraulic	DMWR
Steering Unit Assembly	DMWR
Transfer Case	DMWR
Transmission	DMWR
Valve, Directional Control	NMWR
Winch, 35K	NMWR

MTS is also responsible for specific efforts associated with the SIP 4 element of Recap. These efforts include development, prototype hardware, testing and logistics for the various projects. SIP 4 production hardware for the fleet of 533 M9s will either be requisitioned from DLA or procured through hardware contracts.

Test Community

The thicker hull bottom underwent durability testing in Europe in February–March 2001. Purpose of the test was to prove out UDLP's design and Europe's installation process.

APM M9 ACE conducted a durability test in July 2002. The purpose of the test was to verify the durability of various SIP 4 projects. The test was successfully conducted at Ft. Indian Town Gap, Pennsylvania. The test proved out and verified the durability of various SIP 4 projects.

There is no funding, and thus no current program, to perform any side-by-side comparison test of recapped versus non-recapped ACEs. We will rely on the four Performance Metrics discussed above to determine effectiveness of the ACE recap program.

Appendix A

Program Baseline Performance Details

1. *Metric – Reduce Fleet Age*

- Objective – The fleet is 11 years old at the end of FY02. Without any recap program, the fleet age in FY12 will be 21 years. The approved recap program will result in a fleet age of 9.7 years by FY12.

- Data Source – Data source is simply the record of how many ACEs are recapped each year. Information will be readily available from APM M9 ACE, TACOM Commodity Business Unit (CBU), or Anniston Army Depot.

- Baseline Formula – The following table shows the fleet age per year under the planned recap program. The baseline age of the fleet at the end of FY01 is ten years old. This fleet age is derived from the average age of each vehicle based on its DD250 production acceptance date. The approved recap program is shown in row 5.

	A	B	C	D	E	F	G	H	I	J	K	L
1		FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12
2	M9 ACE - new fieldings	0	0	0	0	0	0	0	0	0	0	0
3	Existing fleet density	533	533	533	533	533	533	533	533	533	533	533
4	Average fleet age without RECAP	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
5	Annual RECAP quantity	26	34	34	34	34	34	36	36	36	35	35
6	Cumulative RECAP quantity	26	60	94	128	162	196	232	268	304	339	374
7	**Average fleet age with RECAP**	**10.5**	**10.7**	**10.9**	**11.0**	**11.0**	**11.0**	**10.8**	**10.6**	**10.4**	**10.0**	**9.7**

Formulas for each year in row 7 are:

FY02 =(B5*0+(533-B6)*11)/533

FY03 =(C5*0+B5*1+(533-C6)*12)/533

FY04 =(D5*0+C5*1+B5*2+(533-D6)*13)/533

FY05 =(E5*0+D5*1+C5*2+B5*3+(533-E6)*14)/533

FY06 =(F5*0+E5*1+D5*2+C5*3+B5*4+(533-F6)*15)/533

FY07 =(G5*0+F5*1+E5*2+D5*3+C5*4+B5*5+(533-G6)*16)/533

FY08 =(H5*0+G5*1+F5*2+E5*3+D5*4+C5*5+B5*6+(533-H6)*17)/533

FY09 =(I5*0+H5*1+G5*2+F5*3+E5*4+D5*5+C5*6+B5*7+(533-I6)*18)/533

FY10 =(J5*0+I5*1+H5*2+G5*3+F5*4+E5*5+D5*6+C5*7+B5*8+(533-J6)*19)/533

FY11 =(K5*0+J5*1+I5*2+H5*3+G5*4+F5*5+E5*6+D5*7+C5*8+B5*9+(533-K6)*20)/533

FY12 =(L5*0+K5*1+J5*2+I5*3+H5*4+G5*5+F5*6+E5*7+D5*8+C5*9+B5*10+(533-L6)*21)/533

As an example, in FY04 34 vehicles will be 0 years old, 34 vehicles will be 1 year old, 26 vehicles will be 2 years old, and the remaining 439 will be 13 years old, for a weighted average age of 10.9 years old.

- Performance Measurement – Each fiscal year has a planned recap quantity. At the end of each year's program we will determine how many vehicles in fact were recapped. In reality, such information will be available early in the year, once the unit funded cost is determined. If the actual quantity recapped differs from the plan, the expected fleet age in FY12 will be recalculated.

2. *Metric – Improve Durability*

- Objective – As of the end of FY01, there are 116 vehicles qualified through the Combat Vehicle Evaluation (CVE) process for depot overhaul or recap, almost exclusively due to hull bottom damage. This figure constitutes 22% of the worldwide fleet of 533 ACEs. Vehicles with the thicker hull bottom should exhibit improved durability. The objective is to have 10% of the fleet CVE qualified as of the end of each fiscal year.

- Data Source – TACOM sends personnel to all units to inspect vehicles that the units report as requiring depot repair. If the team agrees that the vehicle meets the pre-determined criteria, the vehicle is deemed to be CVE qualified. TACOM CBU maintains records by vehicle serial number of all these M9s. Knowing the serial number, TACOM will know whether the vehicle has a thick hull bottom or a thin hull bottom. Based on unit readiness rates, force priorities, and depot funding and schedules, TACOM determines which vehicles will be sent for recap, and when. As an additional data source, DCSLOG Europe will provide serial numbers of ACEs that have undergone the USAREUR refurbishment program and thus received the thicker hull bottom.

- Baseline Formula – The intent is to track the percentage of CVE-qualified vehicles, both thick-hulled and thin-hulled, using the following table. The table is based on the fielding schedule in Section 3, and accounts for other ACEs with the thicker hull bottom.

Thick hull: Percent CVE = [Number CVE / (Prod + Europe + Recap)] X 100

Thin hull: Percent CVE = [Number CVE / Quantity] X 100

	Thick Hull					Thin Hull		
	Prod	Europe	Recap	Number CVE	Percent CVE	Quantity	Number CVE	Percent CVE
FY02	52	70	0			411		
FY03	52	107	26			348		
FY04	52	107	60			314		
FY05	52	107	94			280		
FY06	52	107	128			246		
FY07	52	107	162			212		
FY08	52	107	196			178		
FY09	52	107	232			142		
FY10	52	107	268			106		
FY11	52	107	304			70		
FY12	52	107	339			35		
FY13	52	107	374			0		

- Performance Measurement – At the end of each fiscal year, we will review the CVE database and assign each CVE qualified M9 into either the thick hull or thin hull category. The total number of CVE candidates in each category will be entered into the above table, enabling us to calculate the Percent CVE.

3. *Metric – Reduce Annual O&S Costs*

- Objective – As calculated from the table below, the average cost per hour to operate and maintain the ACE from FY97 through FY00 was $55.18. The objective is to lower this cost to $40.00 (based on FY00 dollars).

- Data Source – The web-based OSMIS (Operating and Support Management Information System) database is the data source. The table below is derived from this database, using the filters shown at the top of the table. Unnecessary columns were deleted to improve readability.

- Baseline Formula – Since OSMIS returns the cost by quarter, the annual cost must be derived. This is done by adding the four quarters for "Net Total" and for "Activity" and dividing the latter into the former (shaded boxes under each year). The four year weighted average is calculated similarly. OSMIS provides the capability to show costs by division or theater. We'll use this feature to compare recapped with non-recapped ACEs once all vehicles within a division or theater are recapped. Although not specifically part of this metric, we will also extract various other OSMIS data such as top cost drivers and number of wholesale requisitions of major component.

Current Filter: LIN = W76473 AND Macom = % AND Start Year = 1997 AND End Year = 2000 AND Quarter = 1-4 AND AMDF Year = 2000 AND AMDF Quarter = 2

FY	QTR	MACOM Name	CONS	REPS	Net Reps	Net Total	Density	AVG Cost / SYS($)	Activity	AVG Cost / HOUR or MILE($)
1997	1	ALL SUMMARY	1,368,181.64	1,182,519.29	556,900.92	1,925,082.56	457	4,212.43	51,837	37.14
1997	2	ALL SUMMARY	1,312,664.74	924,136.13	435,202.24	1,747,866.98	461	3,791.47	40,722	42.92
1997	3	ALL SUMMARY	1,326,337.37	1,241,134.21	584,509.69	1,910,847.06	480	3,980.93	59,716	32.00
1997	4	ALL SUMMARY	2,094,677.21	1,953,971.49	920,265.47	3,014,942.68	471	6,401.15	41,933	71.90
						8,598,739.28			194,208	44.28
1998	1	ALL SUMMARY	1,334,258.55	2,924,047.68	1,377,120.73	2,711,379.28	491	5,522.16	63,717	42.55
1998	2	ALL SUMMARY	1,318,223.25	2,645,416.65	1,245,859.51	2,564,082.76	484	5,297.69	36,987	69.32
1998	3	ALL SUMMARY	1,501,230.41	2,144,667.30	1,010,037.41	2,511,267.81	484	5,188.57	50,408	49.82
1998	4	ALL SUMMARY	1,297,246.84	1,487,911.03	700,750.73	1,997,997.58	466	4,287.55	44,779	44.62
						9,784,727.43			195,891	49.95
1999	1	ALL SUMMARY	1,523,552.90	2,448,047.96	1,152,919.67	2,676,472.57	474	5,646.57	50,910	52.57
1999	2	ALL SUMMARY	1,588,180.94	2,308,048.45	1,087,001.68	2,675,182.62	470	5,691.88	36,663	72.97
1999	3	ALL SUMMARY	1,705,003.33	3,983,058.49	1,875,820.55	3,580,823.88	477	7,506.97	37,414	95.71
1999	4	ALL SUMMARY	2,330,885.78	3,534,506.13	1,664,609.73	3,995,495.51	480	8,323.95	55,043	72.59
						12,927,974.58			180,030	71.81
2000	1	ALL SUMMARY	1,297,211.19	1,864,111.00	877,887.08	2,175,098.27	515	4,223.49	47,929	45.38
2000	2	ALL SUMMARY	1,926,116.11	2,776,302.54	1,307,552.13	3,233,668.24	496	6,519.49	43,638	74.10
2000	3	ALL SUMMARY	1,437,194.76	2,355,263.77	1,109,246.30	2,546,441.06	487	5,228.83	61,074	41.69
2000	4	ALL SUMMARY	1,961,913.63	3,387,323.60	1,595,320.99	3,557,234.62	486	7,319.41	53,362	66.66
						11,512,442.19			206,003	55.88
		Four year weighted average				42,823,883.48			776,132.00	55.18

- Performance Measurement – OSMIS data for each fiscal year are usual available about six months into the next fiscal year. As each year's database is posted, we will run the above query and calculate the annual average cost per hour.

4. *Metric – Enhance Vehicle Performance and Maintainability*

- Objective –This metric is designed to assess the effectiveness of the SIP 4 enhancements. The objective of this metric is to see if a recapped ACE performs "better" and is "easier" to repair than the current design. Only some of the enhancements are measurable, however. Others are subjective in their effect on operators and maintainers. Hence, this is largely a subjective metric.

- Data Source – The Army Materiel Systems Analysis Activity (AMSAA) is separately funded to perform recap Sample Data Collection; we will work with them to develop a methodology for measuring performance or maintainability. There is currently no defined program for use of contact memory buttons on vehicle components for purposes of tracking maintenance actions. Finally, there will be no requirement for soldiers to keep unique records to track vehicle performance or maintenance actions. Without specific direction from their chain of command, soldiers cannot assume the extra burden of tracking any aspect of recap for the APM M9 ACE.

- Baseline Formula – SIP 4 projects which have quantifiable benefits are:
  - Automatic blade folder – measure actual task times for current blade folding procedure and for the automatic blade folder
  - Improved final drive flange – use CCSS or OSMIS database to count wholesale requisitions for old versus new flanges
  - Powerpack removal improvements – measure actual task times for old versus new procedures

  With AMSAA's assistance, we will assess performance of the new hatch, improved track tensioner, new crew cooling system, backing auto-sprung, and dozing auto-steer disable. We will also ask United Defense LP (UDLP) field service representatives (FSRs) and TACOM logistics assistance representatives (LARs) to gauge effectiveness of these projects.

  The non-Halon fire extinguisher and the Force XXI electronics have no level of performance to measure. We have no reason to believe that these items won't perform as intended when they are used.

  Of all the SIP 4 projects, the hydraulic diagnostic center (HDC) should provide the greatest benefit to the ACE mechanic. Unfortunately, we won't be able to quantify the improvement. There is no specific task time for diagnosing and fixing each of the 103 diagnostics tests which the HDC will be able to perform. It is impractical to attempt to insert faults into the system and then measure task time with and without the HDC, since each mechanic diagnoses the vehicle differently based on their skill and experience. Unit maintenance records will record how long, in days, an M9 is down for maintenance, but will not show how much of that time is specifically spent troubleshooting hydraulic problems. In the end, informal feedback from soldiers will provide the best indication of the value of the HDC.

- Performance Measurement – As part of the engineering efforts, actual "before and after" task times for powerpack removal improvements and automatic blade folder have already been or will be documented by mid-2002. Final drive flange wholesale requisition data will be documented at the end of each fiscal year, or when the OSMIS database for each fiscal year becomes available. Approximately six months to one year after a unit receives a recapped vehicle, APM PM ACE, UDLP FSR or TACOM LAR will contact unit personnel to assess whether or not the M9 performs "better" and is "easier" to repair than the current design

Appendix B

Data Sources for Cost Validation

Page 6 – OMA funding, ASIOE and other items

NSN	Item	Cost	Source
1005-01-107-7501	Launcher, Grenade Smoke, M259	$ 365.00	PM estimate
4240-00-994-8750	Mask, Protective Tank, M42A2	$ 121.00	21 Feb 02 AMDF
5855-00-228-0937	Night Vision Goggles, AN/PVS-7B	$ 3,578.00	PM estimate
5820-01-451-8248	Radio Set AN/VRC-87F	$ 6,532.00	21 Feb 02 AMDF
5895-01-469-3352	Master Control Station/Light (VIS-3 component)	$1530.54	21 Feb 02 AMDF
5830-01-382-3218	Full Function Crew Station (VIS-3 component)	$940.80	21 Feb 02 AMDF

Page 6 – OPA 3 funding

Other	$1,725,000	Sunk costs
FY00	$3,759,000	Sunk costs
FY01	$2,930,000	Sunk costs
FY02	$12,077,000	15 Jan 02 Pres Budget
FY03	$11,081,000	15 Jan 02 Pres Budget
FY04	$3,979,000	15 Jan 02 Pres Budget
FY05	$1,486,000	15 Jan 02 Pres Budget
Total	$37,037,000	

Divided by 533 vehicles = $69,488 per vehicle. This cost includes hardware, program management, engineering, logistics, test and application

Page 7 – Funding spreadsheet

PA MWOs: 15 Jan 02 Pres Budget

OMA: All OMA costs are inflated each year per the following table:

2002	1.0000
2003	1.0130
2004	1.0302
2005	1.0488
2006	1.0687
2007	1.0890
2008	1.1097
2009	1.1308
2010	1.1523
2011	1.1741
2012	1.1965

OMA Recapitalization: The dollars shown are based on a recap cost of $400,500 per vehicle for the OMA portion of the FY02 recap program. This base for this figure is the known unit cost of $343,000 per overhaul in FY01. This cost is then increased to account for the greater scope of work involved in recap:

Overhaul - Repair and replacement as necessary, with selected mandatory replacement parts. Major components are inspected and tested; if fully functional, they are reinstalled without further work being done.

Recap - More mandatory replacement parts, plus complete overhaul of all major components

Any learning would be offset by the reasonable expectation that recap costs will increase slightly in the first few years as additional requirements are identified.

The figures in the spreadsheet reflect requirements, and differ from the current OMA budget for recap. The budget figures are as follows (source: DMOPS, 20 Feb 02):

Year	$M	Qty
FY02	10.413	26
FY03	13.247	34
FY04	13.843	34
FY05	14.067	34
FY06	14.311	34
FY07	14.581	34
FY08	15.459	36

OMA COSIS: PM estimate of $1000 per vehicle in FY02

OMA SDO: TACOM CBU estimate of $4000 per vehicle in FY02

OMA SDT: TACOM CBU estimate of $4000 per vehicle in FY02

Support Equipment: Shown in FY02 dollars. Costs are inflated each year in the spreadsheet.

NSN	Item	Cost	Source
5965-01-453-2684	PI-CVC Headset	$1026.06	21 Feb 02 AMDF
5995-01-452-4309	Power Cable	143.08	21 Feb 02 AMDF
5995-01-452-4310	Radio Cable	106.82	21 Feb 02 AMDF
5995-01-392-6196	Highway Cable	102.81	21 Feb 02 AMDF
5995-01-386-9109	Bailout Cable	77.42	21 Feb 02 AMDF

Training Devices: PM estimated cost to conduct operator and maintenance training on SIP 4 enhancements to key personnel

Costs for FY08-12, not shown on spreadsheet:

	FY08	FY09	FY10	FY11	FY12
Recapitalization	$16.00	$16.30	$16.61	$16.46	$16.77
COSIS	$0.04	$0.04	$0.04	$0.04	$0.04
SDO	$0.16	$0.16	$0.17	$0.16	$0.17
SDT	$0.16	$0.16	$0.17	$0.16	$0.17
Support Equipment	$0.06	$0.06	$0.06	$0.06	$0.06
Quantity – OMA	36	36	36	35	35

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
ACQUISITION LOGISTICS AND TECHNOLOGY
103 ARMY PENTAGON
WASHINGTON DC 20310-0103

REPLY TO
ATTENTION OF
SAAL-SI

07 NOV 2001

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: **Recapitalization Program Baseline**

This memorandum sets forth guidance that should be followed to document and track the Army's Recapitalization effort. Enclosed is the template that will be used to develop and execute the individual systems Recapitalization Program Baseline. The Program/Project/Product Manager of the systems that have already been approved by the Army Acquisition Executive/Vice Chief of Staff, Army (AAE/VCSA) will be afforded 90 days from the date of this document to follow and complete the Recapitalization approval process laid out in this Recapitalization Program Baseline guidance. Future candidate systems that have not been seen by the AAE/VCSA will be afforded 60 days after an option is adopted, to complete the process of creating a baseline. All recapitalization systems will obtain validation, within afforded time frames, of the Baseline Cost Data, Cost Benefit Analysis and Trade Off Analysis from the Cost and Economic Analysis Center.

The point of contact for this matter is COL Jim Wells, DSN: 224-3993 or 703-614-3993.

JOHN S. CALDWELL, JR.
Lieutenant General, GS
Military Deputy to the
Assistant Secretary of the
Army (Acquisition, Logistics
and Technology)

Enclosure

DISTRIBUTION:
ASSISTANT SECRETARY OF THE ARMY (ACQUISITION, LOGISTICS AND TECHNOLOGY), ATTN: SAAL-ZR, SAAL-RP
ASSISTANT SECRETARY OF THE ARMY (FINANCIAL MANAGEMENT AND COMPTROLLER), ATTN: SAFM-BUI

DEPARTMENT OF THE ARMY
PROGRAM EXECUTIVE OFFICE
COMBAT SUPPORT & COMBAT SERVICE SUPPORT
6501 E. ELEVEN MILE ROAD
WARREN, MICHIGAN 48397-5000

REPLY TO
ATTENTION OF

SFAE-CSS

29 July 2002

DECISION MEMORANDUM

SUBJECT: M9 ACE Recapitalization Program Baseline (RPB) and Recapitalization Decision Review

1. In accordance with the direction dated 28 September 2001, the Vice Chief of Staff, Army (VCSA) approved the Recapitalization Program for M9 ACE vehicles in the Counter Attack Corps (CATK). The M9 ACE RPB guidance was developed and dated 14 March 2002. I have conducted a Decision Review of the M9 ACE Recapitalization Program and approval of same pending final approval of the RPB by the Army Acquisition Executive/VCSA.

2. On 28 September 2001, AAE/VCSA approved the General Officer Working Group recommended option 3b which procures full Recapitalization of 374 vehicles with thicker hull bottom and System Improvement Plan 4 enhancements on all vehicles.

3. The original Acquisition Plan for the M9 ACE was approved February 1977; Revision B is dated February 1986. The Plan covers procurement from 1986 through 1991. This Acquisition Plan is not relevant to recap because no additional ACEs are being procured. System Acquisition Strategy, March 2000, documents the M9 ACE System Improvement Plan Phase 4, an element of recap.

4. In addition, I have reviewed and concurred with the following documents: 1) The M9 ACE RPB; 2) The AAE/VCSA approved M9 ACE Recapitalization Brief including the cost benefit and tradeoff analysis for the M9 ACE Recapitalization Program; 3) Army Cost and Economic Analysis Center and the Anniston Army Scope of Work.

ROGER A. NADEAU
Brigadier General, USA
Program Executive Officer
Combat Support & Combat Service Support

DEPARTMENT OF THE ARMY
COST AND ECONOMIC ANALYSIS CENTER
1421 JEFFERSON DAVIS HWY SUITE 9000
ARLINGTON VA 22202-3259

REPLY TO
ATTENTION OF

SFFM-CA-ZA (11-18a)

26 APR 2002

MEMORANDUM FOR THE PROGRAM EXECUTIVE OFFICER, COMBAT SUPPORT AND COMBAT SERVICE SUPPORT, ATTN: SFAE-CSS, WARREN, MI 48397

SUBJECT: M9 Armored Combat Earthmover Recapitalization Baseline Cost Sufficiency Review

1. The Army Cost and Economic Analysis Center has reviewed the cost presented by the Program Manager for the M9 Armored Combat Earthmover, dated 14 March 2002. Our review focused only on the recapitalization investment cost estimate. Per our agreement with Office of the Assistant Secretary of the Army Acquisition, Logistics, and Technology (OASAALT), we did not examine the potential savings or affordability of the recapitalization program. The submission provided a reasonable estimate of the total recapitalization baseline cost.

2. The U.S. Army Cost and Economic Analysis Center points of contact are: Mr. Pete Stemniski, (703) 601-4191 or DSN 329-4191, and Mr. Bob Conley, (703) 601-4173 or DSN 329-4173.

Robert W. Young

ROBERT W. YOUNG
Director

Encl

CF:
Project Manager - M9 ACE
ASA (ALT), ATTN: SAAL-SI

FUNDING AND SCHEDULE SUBMISSION, DATED 14 MARCH 2002

Recapitalization Program Funding. The Recapitalization funding profile for the M9 ACE is in the table below. Table 1 is expressed in TY$M.

Required	FY02	FY03	FY04	FY05	FY06	FY07	FY02-07 POM	EPP	Total POM & EPP
ROTE									
PA									
Weapon Systems									
MWOs	12.08	11.06	3.68	1.49			$28.62		$28.62
Training Devices									
Initial Spares									
STS									
OMA									
Recapitalization	10.41	13.79	14.03	14.28	14.55	14.83	$81.90	82.15	$164.04
SSTS (Recap)									
COSIS	0.03	0.03	0.04	0.04	0.04	0.04	$0.28	0.21	$0.49
SDD	0.18	0.14	0.14	0.14	0.15	0.15	$0.82	0.82	$1.64
SDT	0.18	0.14	0.14	0.14	0.15	0.15	$0.82	0.82	$1.64
PPSS									
Initial Spares									
Support Equipment	0.04	0.35	0.05	0.05	0.05	0.05	$0.30	0.30	$0.60
Training Devices		0.02	0.06	0.02			$0.10		$0.10
Other									
Training									
Manning									
Munitions									
CLS									
Installation Support Costs									
Total Funding Required	$22.76	$25.28	$18.43	$16.16	$14.93	$15.22	$112.76	$84.29	$197.06

Recapitalization Program Schedule. All M9 ACEs will receive the SIP 4 with 200 vehicles starting in 2000. In April 2002, Anniston Army Depot will induct the first M9s for the FY02 depot Recap program. First vehicles will be completed in late 2002. The FY02 program is scheduled to consist of 26 vehicles. From FY03 through FY12, PM M9 ACE plans to recap an additional 348 ACEs. The planned induction and fielding schedule is:

	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	Total
SIP 4	200	200	100	33								533
Recap	26	34	34	34	34	34	36	36	36	35	35	374

Office, Assistant Secretary of the Army (ALT)
SUMMARY OF ACTION

To: VCSA **Thru:** AAE **Thru:** MILDEP	**ACTION OFFICER:** José Rivera **OFFICE SYMBOL:** SAAL-ZCS **PHONE NO:** 604-7244 **DATE/TIME:** 19 August 02/0930 hrs	**SUSPENSE DATE** **CONTROL NO.** 21001516

SUBJECT: M9 Armored Combat Earthmover (ACE) Recapitalization Program Baseline (RPB) Approval

RECOMMENDATION: AAE/VCSA sign M9 Armored Combat Earthmover (ACE) Recapitalization Program Baseline (RPB) Approval Memorandum

	ACTION		INFO	DRIVE LOCATION	

SUMMARY OF ACTION: LTG Caldwell tasked the Program Executive Officers (PEO) of the Recap systems approved by the VCSA to comply with the RPB guidance. PEO Combat Support/Combat Service Support (CS/CSS) conducted a Decision Review of the M9 ACE Recapitalization Program and validated the Recap Baseline pending final approval by the Army Acquisition Executive/Vice Chief of Staff, Army.

TAB A – MIL DEP recommendation to approve, sign and forward the approval memorandum to the AAE/VCSA.
TAB B – AAE/VCSA approval letter
TAB C – RPB
TAB D – MIL DEP Recapitalization Guidance Letter
TAB E – PEO validation letter

MILITARY DEPUTY ACTION		G-4 ACTION	
[Approved]	[Recommend Approval]	[Approved]	[Recommend Approval]
[Disapproved]	[Recommended Disapproval]	[Disapproved]	[Recommend Disapproval]
PSM	**Noted**	**PSM**	**Noted**
Comments:		**Comments:**	

COORDINATION

CC	NCC	OFFICE	NAME	PHONE
X		OGC	Paul Hancq	697-5120
X		SAFM-BUI	Pamela Roe	614-8157
X		PEO-CS/CSS	Teresa Ratlif	(586) 574-5675
✓		SAAL-SI	COL James Wells	614-3993
✓		[illegible]	[illegible]	614-8295
✓		DAPR-FDD	LTC Brumfield	692-6465

APPROVALS

	A	D	INT. Date		A	D	INT. Date
DASA				ZXA			
Asst. DASA	✓		20 Aug 02	DIR	✓		21 Aug 02
DIV				DEP DIR			
DASA XO	✓		10 Oct 02	DIR XO			
Asst. G4				DIV	✓		
XO, G4				CACO			
Sec. DASA Format Review	✓			*Sec. DIR Format Review*			

CC = Concur NCC = Nonconcurr A = Approved D = Disapproved

MS Word SAAL FORM 5

Version Dated 20 March 2002