AMC CBM+ Panel Presentation

DoD Maintenance Symposium 2017

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Agenda

- ✓ **Introduction**
- ✓ **AMCOM Perspective (Army Aviation Platforms)**
- ✓ **TACOM Perspective (Ground Vehicle Platforms)**
- ✓ **CECOM Perspective (Communications and Electronic Platforms)**
- ✓ **AMC Wrap-up**

Introduction

✓ **Within the Army, Life-Cycle Management Commands (LCMCs) tailor their CBM+ effort for their commodities**

✓ **Goals of CBM+ efforts are similar, to gain a clearer, more detailed status of our equipment in order to:**

- Minimize costs
- Maximize availability

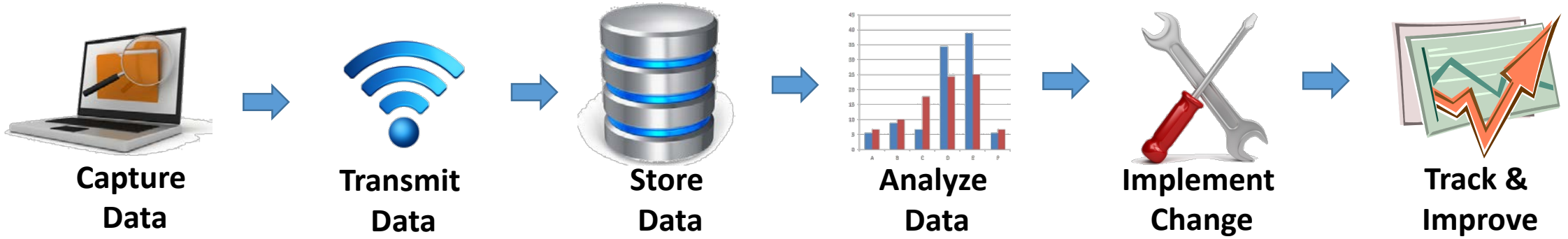
✓ **Ultimately, all CBM+ efforts drive toward one or both of those outcomes, both which result in enhanced materiel readiness**

✓ **An overview of the LCMC's approaches follows**

AMCOM CBM+

The CBM+ Lifecycle

AMCOM: The CBM+ Lifecycle



Three Focus Areas

Reliability **Availability** **Maintainability**

Objective: Lower Cost & Improve Readiness

CBM+ Enabling Aviation Readiness

- ✓ **FY05 – FY15 - AH64 Helicopter fleet extended 25 components as an outcome of CBM+ analysis, resulting in 450,000 flight hour additional component life.**
- ✓ **FY06 – FY15 - UH60 Helicopter units increased readiness by 5 percent, reducing NMCM and NMCS time.**
- ✓ **Data analytics is providing efficiencies at the Tactical, Operational and Strategic levels and a forecasted Cost Avoidance of $851M thru FY-30.**
  - **Supply Chain Cost Reduction(~$706.4M thru FY30), Maintenance Man-Hour cost avoidance (~$145.5M thru FY30)**
- ✓ **Condition Based Maintenance Plus Increases Readiness (7.3 percent increase in readiness and ~19 percent reduction in Msn Aborts) and Enhances Safety (avoidance of ~8 to 11 percent in material failure related mishaps resulting in ~$294.7M in mishap mitigation)**

CBM+ Related Cost Avoidance ~$1,146M thru FY30

***CBA Dtd 21DEC2012**

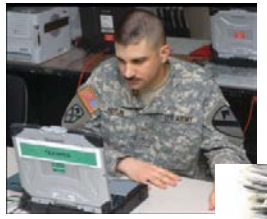
TACOM CBM+

CBM+ Value to the Army

TACOM: CBM+ Value to Army

AS-IS

Asset data is manually captured on the 5988/2404 forms, which drives maintenance & fleet management decisions from tactical to national levels



Motor sergeant has to sort through stacks of forms and manually re-enter asset data into GCSS-Army; Lack of condition data drives preventive and reactive maintenance practices

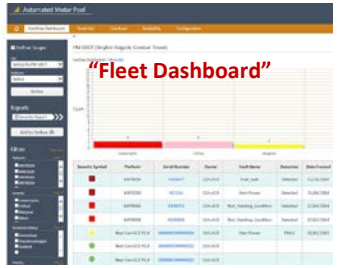
Enterprise users (Tactical to National) have latent and incomplete asset usage and health data to inform fleet management decision

Tactical

National

TO-BE

- Assets self-report sensor-based condition data
- Mobile devices used to locally capture and view asset data



"Fleet Dashboard" displays automated feeds of asset condition and maintenance status; Predictive analysis feeds mission planning.

CBM+ Data integrated with GCSS-Army Data to enhance fleet insights across the Enterprise

CBM+ Enabled Decision Support Scenarios

1. **Usage Driven Readiness Decisions**
2. **Reducing Vehicle Downtime and Parts Costs**
3. **Enhanced Mission Planning via Predictive Maintenance**

Outcomes and Products

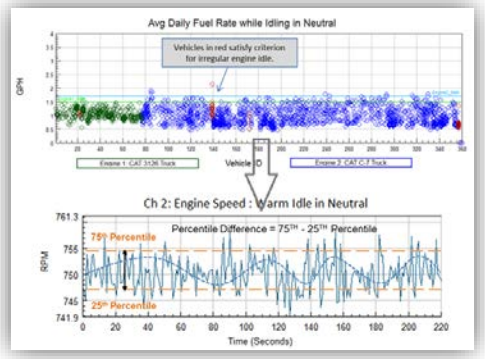
Soldier Level

- ❑ Vehicle Health Alerts (VHAs)
- ❑ Reduce misdiagnosis & improve troubleshooting
- ❑ Accident Investigation Reports
- ❑ Usage reports for mission planning

PM / Fleet Level

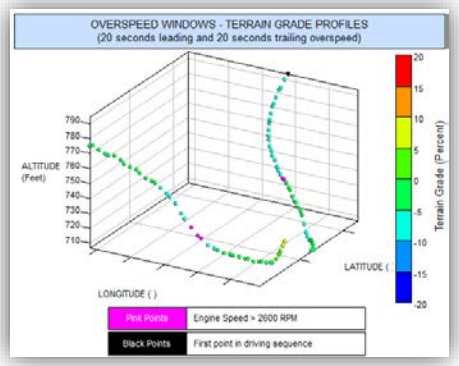
- ❑ Identify systemic issues on fleets for TM/training improvements
- ❑ Reduce scheduled services
- ❑ Condition Based RESET/Overhaul
- ❑ Improve vehicle design / Engineering Change Proposal (ECP)

Engine Idle Analysis

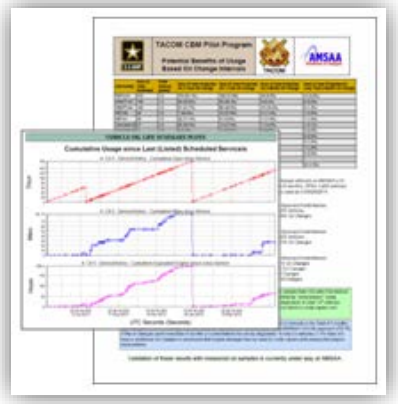


Vehicle Health Alerts

ECP



Oil Life Analysis



Multiple Examples of Cost Avoidances and Products to Support Data Driven Decision Making

Current & Future TACOM CBM+ Enabled Systems

Current CBM+ Enabled Systems

Stryker Pilot Program (Fort Carson and Fort Hood)
- ❑ Stryker = 1,000 assets (25% of Stryker Fleet)

AMSAA Cost of Training Readiness (CoTR)
- ❑ Over 2,000 vehicles equipped with Digital Source Collectors (DSC) which capture data from FMTV, LHS, HEMTT, L/H, HET, and PLS

PMCS Project (25th Infantry Division)
- ❑ 94 TWVs and 91 trailers equipped with DSCs and proving out extended oil change intervals using CBM+ data and analysis

Planned CBM+ Enabled Systems

- ❑ **Abrams Main Battle Tank** (Vehicle Health Management System)
  Ground Digital Log Book (GDLB) is needed in FY19
  - M1A2SEPV3: 285 FUE: FY21
- ❑ **JLTV** – FY19
- ❑ **UGV/Robotics** – FY18
- ❑ ***Paladin*** *– Focus after Abrams ~FY18+*
- ❑ ***Bradley*** *– Focus after Abrams ~FY18+*
- ❑ ***AMPV*** *– FY19+*
- ❑ ***MRAP*** *– FY19+*
- ❑ ***AWS*** *- TBD (MSV-L; new watercraft still early in development phase)*
- ❑ ***TWV*** *– TBD (Pending Digital Source Collector provisioning)*

TACOM CBM+ PROGRAM

Monitors & Tracks Weapon System Readiness Driver Systems & Components

To Identify Improvements

Expected GOAL Outcomes
- ❑ Increased Operational Availability (FMC)
- ❑ Reduced NMC-M & NMC-S time
- ❑ Smart Supply Chain Management
- ❑ Reduced vehicle services
- ❑ Fact-based Reset/Overhaul
- ❑ Reduced Total Life Cycle Costs

CECOM CBM+

Enabling Fleet Management

CECOM CBM+: Enabling Fleet Management

Problem Statement: Transitioning from Intuition-Based to Data Driven Decision Making

Program Efficiency
Realizing program efficiencies through a common data and decision environment that streamlines business processes and builds business intelligence

Operational Availability
Optimizing Operational Availability (Ao) by exploiting the availability-cost curve to maximize weapon system readiness at the lowest lifecycle cost

Weapon System Affordability
Minimize acquisition cost with modeling and simulation capabilities for performing tradeoff analysis

Fleet Sustainment
Improves decision making in support of Fleet Management through prioritization of limited resources based upon system performance

To effectively manage a fleet, fleet managers must understand the eight business areas

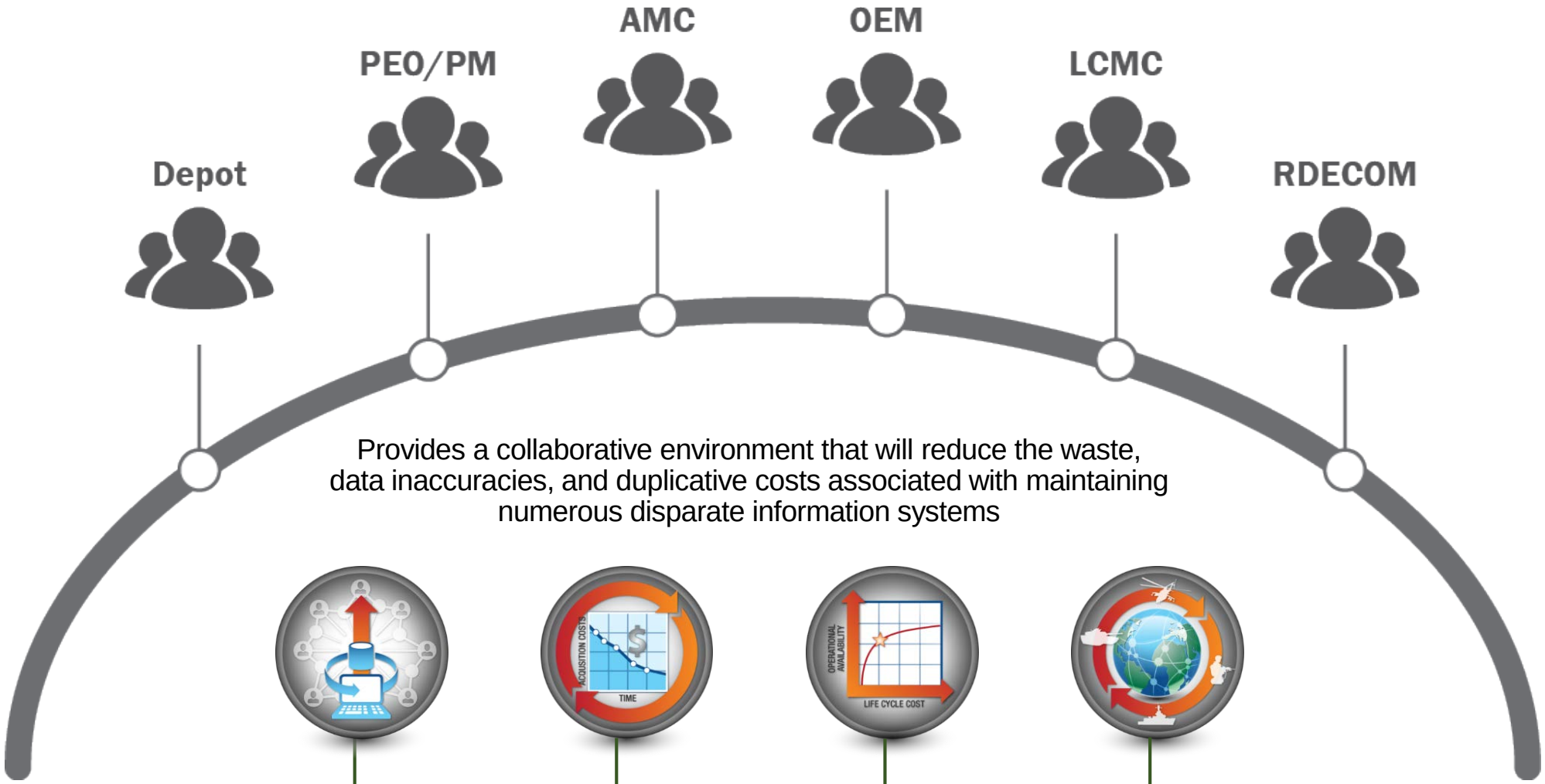
1. Army Acquisition Objective (AAO)
2. OPTEMPO
3. Readiness
4. Maintenance History
5. Cyclical Sustainment Maintenance
6. Total Ownership Cost (TOC)
7. Economic Useful Life (EUL)
8. Acquisition Sustainment & Budgeting (ASB)

A fleet manager must be able to answer five questions related to the eight business areas

1. What is my fleet?
2. How is the fleet configured (single or multiple configurations)?
3. How is the fleet distributed?
4. How is the fleet performing?
5. What is the total ownership cost (TOC) of my fleet?

To answer the five questions, fleet managers will leverage five key capabilities

Enabling Partnerships



Provides a collaborative environment that will reduce the waste, data inaccuracies, and duplicative costs associated with maintaining numerous disparate information systems

Increase Efficiency

Minimize Cost

Optimize Availability

Improve Readiness

CBM+ Enabled Fleet Management Capability Set

Primary Objective: Streamline the delivery of logistics and sustainment capabilities, driving efficient weapon system management by providing the enterprise with key information to make impactful business decisions

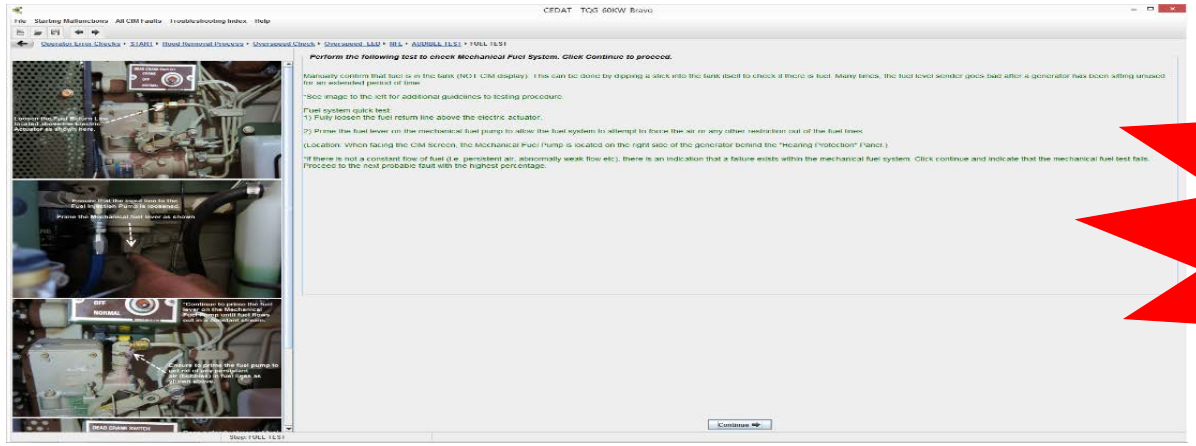
Fleet Management enables the use, merger, and analysis of multiple data streams to identify evolving trends, and monitor key statistical triggers to control costs and increase the reliability and availability of weapon systems

CEDAT VLAR Overview

CECOM Equipment Diagnostic Analysis Tool Virtual Logistics Assistance Representative (CEDAT VLAR)

Expert diagnostic capability utilizing Bayesian Belief Network (BBN) technology to quickly fault isolate to lowest level of repair

- Currently deployed for HARC radios, Tactical Quiet Generators (30&60kW TQGs) and WIN-T STT Quick Reference Guide (QRG)
- Ongoing initiatives include fuel optimization study, and WIN-T STT diagnostics
- CEDAT VLAR enables the shift away from FSR-intensive sustainment strategies while maintaining equipment availability



135-140
VLARs in use
worldwide

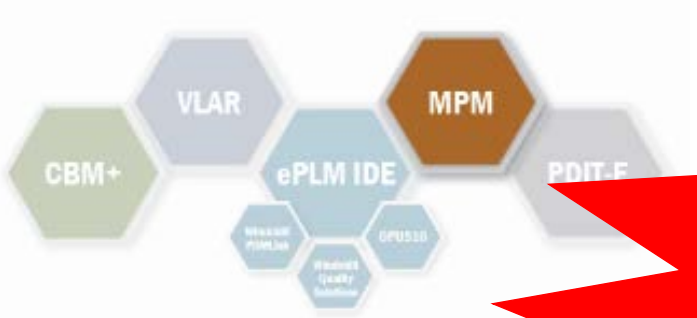
Maintenance Prioritization Model (MPM) Overview

DESCRIPTION

Assists with prioritizing weapon systems for sustainment maintenance based on six data driven variables that rank/score the fleet by serial number. MPM challenges the status quo decision-making process of selecting candidates based solely on fleet age and/or availability of assets.

FUNCTION

Designed to optimize the decision-making process of determining fleet asset candidates, by serial number, to satisfy Core Depot requirements for a given fiscal year.



MPM

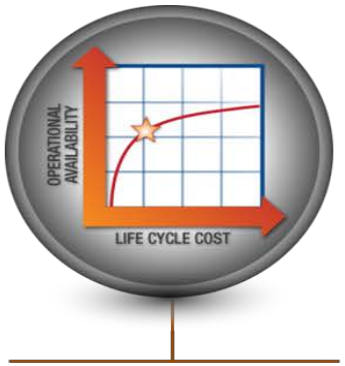
In use on SICPS, CPP, RWS, TQGs and ESV systems

CBM+ Enabled Fleet Management

- ✓ **Increased data fidelity and analytics to enable the development and implementation of more efficient maintenance and supply supportability strategies that achieve operational mission requirements**
- ✓ **Capacity to assess actual cost of system maintenance and supply against planned life cycle cost to determine TOC, forecast support budgets (OPS-29), and provide decision support associated with economic feasibility of investment**
- ✓ **Access to authoritative logistics and engineering technical data from a centralized source that reflects fleet asset configuration and distribution by serial number**
- ✓ **Measurements of weapon systems performance and related trends by application of metrics and key performance indicators**

Increase Efficiency

Minimize Cost



Optimize Availability

Improve Readiness

Army CBM+: Materiel Readiness Wrap-up

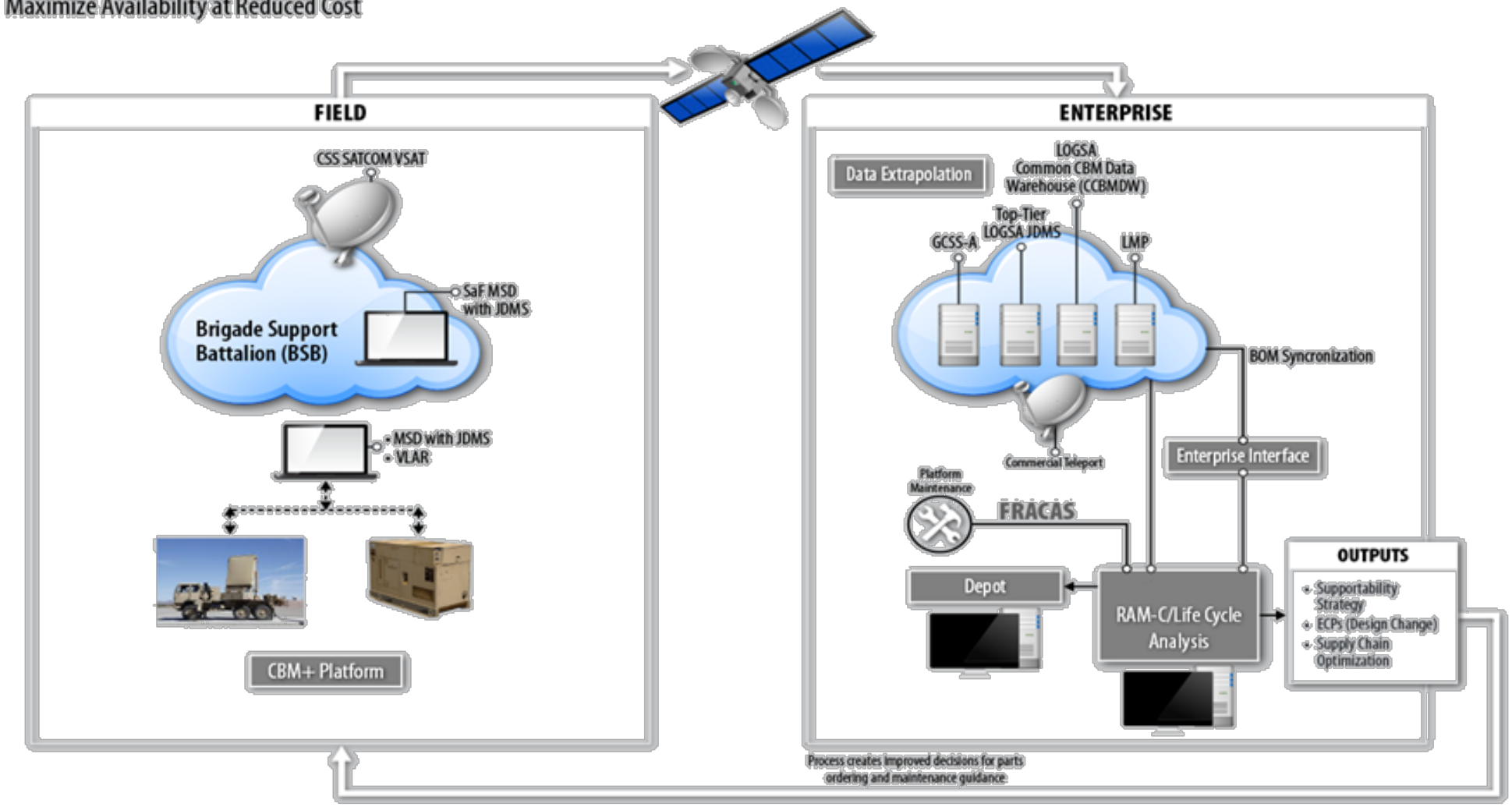
- ✓ **Each LCMC is in different stages of CBM+ implementation**
- ✓ **All have CBAs demonstrating reduced costs through the execution of their CBM+ approach**
- ✓ **All Pilot Programs and studies also demonstrate or forecast improved materiel readiness in various ways**
- ✓ **Historically, CBM+ has been a grass-roots effort originating within LCMCs and PM offices rather than being Requirements-driven from Army leadership down**
- ✓ **As CBM+ continues to gain senior leader visibility and understanding, the budget outlook for CBM+ implementation improves and initial successes will breed more CBM+ investment**

Backup Slides

Operational View

Repeatable business processes improve data fidelity and facilitate supportability analyses that optimize engineering, maintenance, and supply chain management to best utilize resources and promote readiness of our fleets of weapon systems

Overall Objective:
Maximize Availability at Reduced Cost



MPM Example

Tactical Quiet Generator (TQG) – MEP-805B

IDE Maintenance Prioritization Model - (MEP-805B LIN G74575)

Step 1: Rank importance of criteria by assigning weights to each

Criteria	C1 System Age	C2 RUL	C3 Last Reset	C4 Last Overhaul	C5 Annual Usage	C6 Readiness	C7 Work Orders	Total Weight
Weight	20%	0%	25%	30%	10%	10%	5%	100%

Step 2: Input Core Overhaul Requirement

Core Requirement	47	Active Army	47
Target Overhaul Age	10	ARNG/USAR	0

Update

Step 3: Consider serial numbers with "X" in overhaul column as top candidates for overhaul

Rank	Serial No.	Criteria Scores C1	C2	C3	C4	C5	C6	C7	Score	Overhaul	Available	COMPO
1	HX36919	0.48	0.04	0.04	0.04	1.00	1.00	0.40	0.40	X	1/15/2016	1 - AA
2	RZH-00181	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1/16/2016	2 - NG
3	HX36995	0.48	0.04	0.04	0.04	1.00	1.00	1.00	1.00		1/17/2016	2 - NG
4	HX39231	0.33	0.34	0.34	0.34	1.00	1.00	1.00	1.00		1/18/2016	2 - NG
5	3Q0181N3	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1/19/2016	2 - NG
6	HX38618	0.19	0.62	0.62	0.62	1.00	1.00	1.00	1.00	X	1/20/2016	1- AA
7	RZH00730	0.48	0.04	0.04	0.04	1.00	1.00	1.00	1.00		1/21/2016	3 - AR
8	3Q0181N4	0.19	0.62	0.62	0.62	1.00	1.00	1.00	1.00		1/22/2016	3 - AR
9	HX38746	0.44	0.13	0.13	0.13	1.00	1.00	1.00	1.00	X	1/23/2016	1 - AA
10	HX39226	0.35	0.30	0.30	0.30	1.00	1.00	1.00	1.00	X	1/24/2016	1 - AA
11	HX38635	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	X	1/25/2016	1 - AA
12	HX38255	0.28	0.45	0.45	0.45	1.00	1.00	0.80	0.80	X	1/26/2016	1 - AA
13	3535N8	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	X	1/27/2016	1 - AA
14	FZ70694	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	X	1/28/2016	1 - AA
15	HX37129	0.22	0.56	0.56	0.56	1.00	1.00	1.00	1.00	X	1/29/2016	1 - AA
16	RZH01304	0.40	0.20	0.20	0.20	1.00	0.96	1.00	1.00	X	1/30/2016	1 - AA

System Age (yrs)	
20.00	0.00
18.00	0.10
16.00	0.20
14.00	0.30
12.00	0.40
10.00	0.50
8.00	0.60
6.00	0.70
4.00	0.80
2.00	0.90
0.00	1.00

RUL (yrs)	
20.00	1.00
18.00	0.80
16.00	0.60
14.00	0.40
12.00	0.20
10.00	0.00
8.00	0.20
6.00	0.40
4.00	0.60
2.00	0.80
0.00	1.00

Annual Usage (hrs/yr)	
912535.20	0.00
821281.68	0.10

Readiness	
100%	1.00
90%	0.90

Summary | Data | Raw Data | Sheet1 | Notes | PBUSE Asset Visibility | AE2S Epuip Books | WEBLIDB PM Assets | WEBLIDB Readiness | ARFORGEN Cycle Viewer | WEBLIDB Open Work Orders | WEBI ...