Suitability . . . at what cost?

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Suitability . . . at what cost?

Typical IOT&E Evaluation Results:

EFFECTIVENESS: approximately 90% success rate

SUITABILITY: approximately 60 - 75% success rate

Typical Decision after IOT&E: Begin fielding ASAP, even before . . . .

Suitability problems are addressed

Reliability is improved

Maintenance procedures are mature

Training is complete

. . . .

. . . .

Why field before addressing these problems? Urgent Combat Need

The QUESTION: How much does it cost us to do business this way?

Suitability . . . at what cost?

DAU Research Study Proposal

- Investigate various types of systems
- Total of 5 or 6, several from each service
- Criteria:
  - Recently fielded
  - Evaluated to be Effective but not “fully” Suitable
- Examine performance of systems wrt suitability
- Determine suitability cost drivers
- Evaluate suitability trends

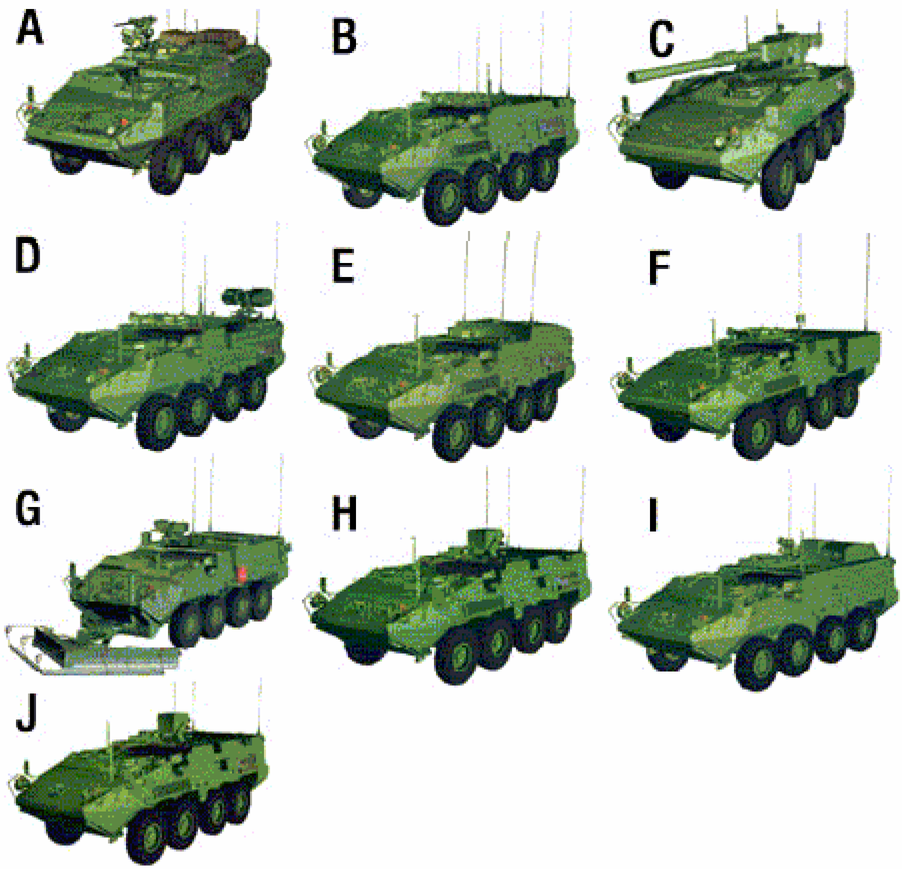
Sponsor Decision: Start with one program, work from there . . . . .

First Program Selected: STRYKER Family of Vehicles

Additional Study Candidates: TBD

STRYKER FAMILY OF VEHICLES

In service with the US Army

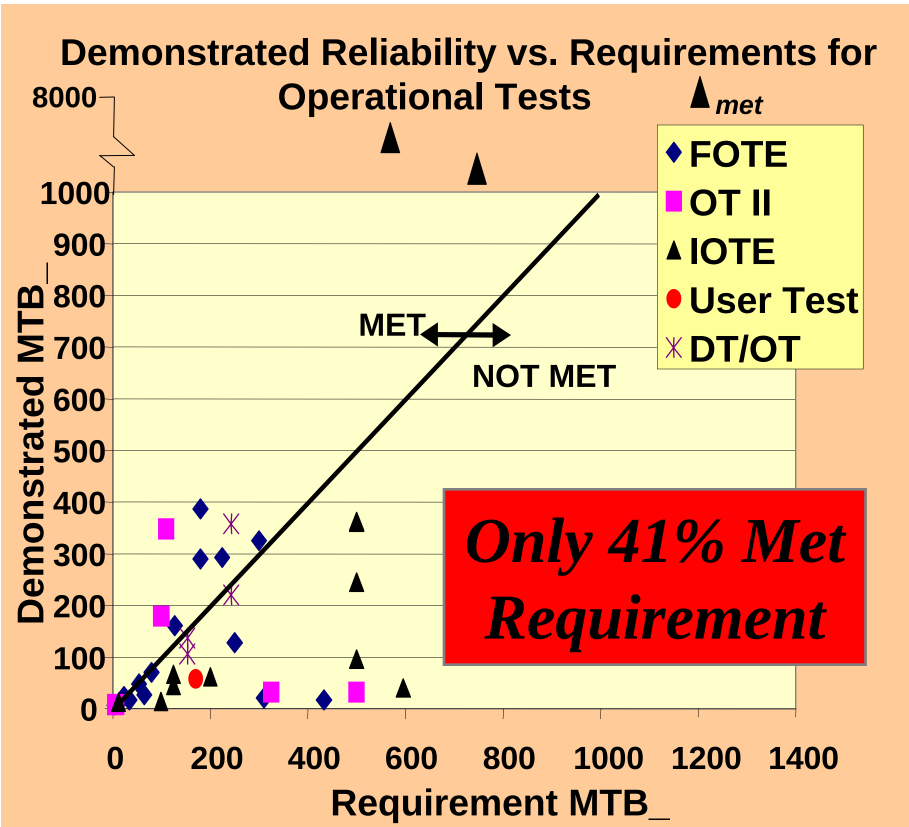


Legend

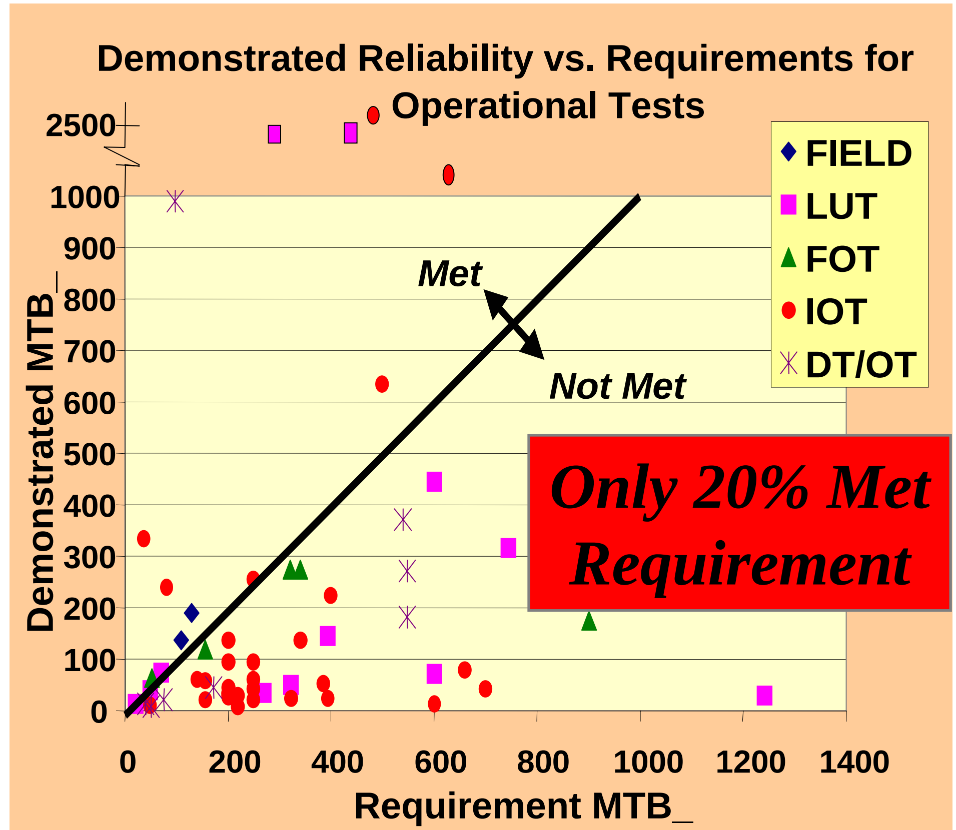
A. Infantry Carrier Vehicle	B. Command Vehicle	C. Mobile Gun System
D. Fire Support Vehicle	E. Medical Evacuation	F. Mortar Carrier
G. Engineer Squad Vehicle	H. Anti-tank Guided Missle	I. NBC Reconnaissance
J. Reconnaissance Vehicle		

Now, back to Suitability . . . .

ATEC Reliability Track Record



1985-1990



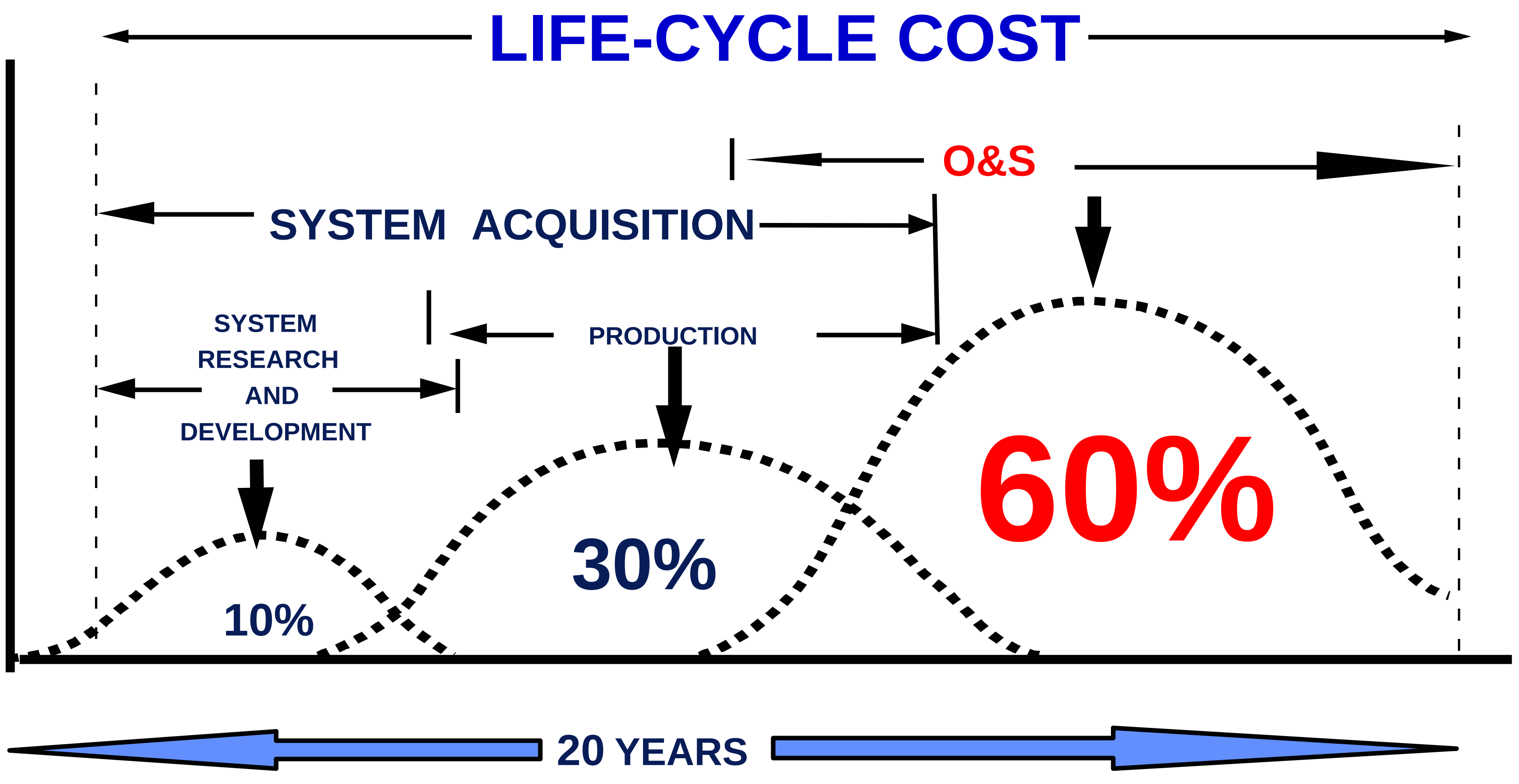
1996-2000

Most Of Our Systems Fail To Achieve Reliability Requirements In OT

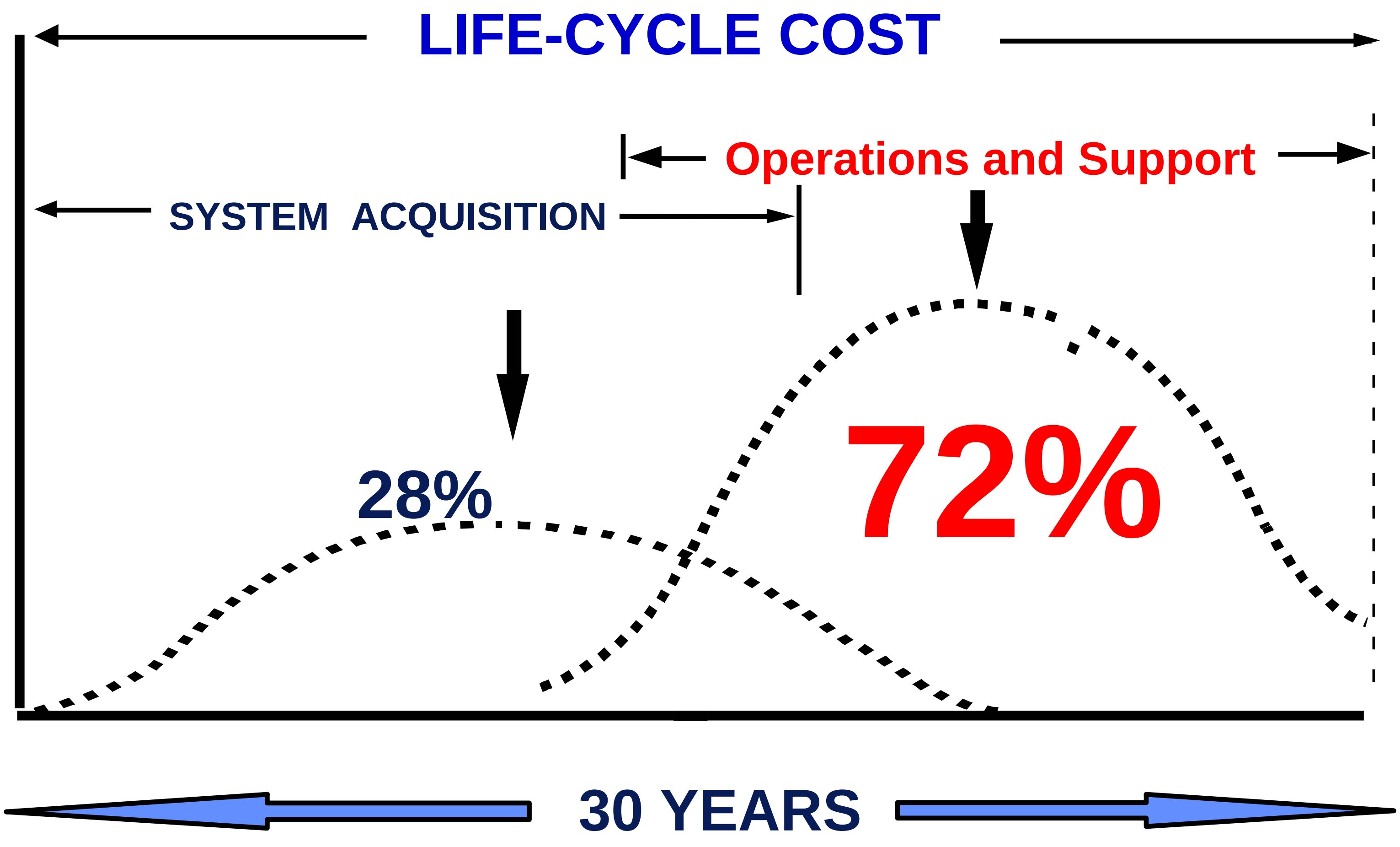
. . . And The Trend Appears To Be Continuing Downward

source: ATEC

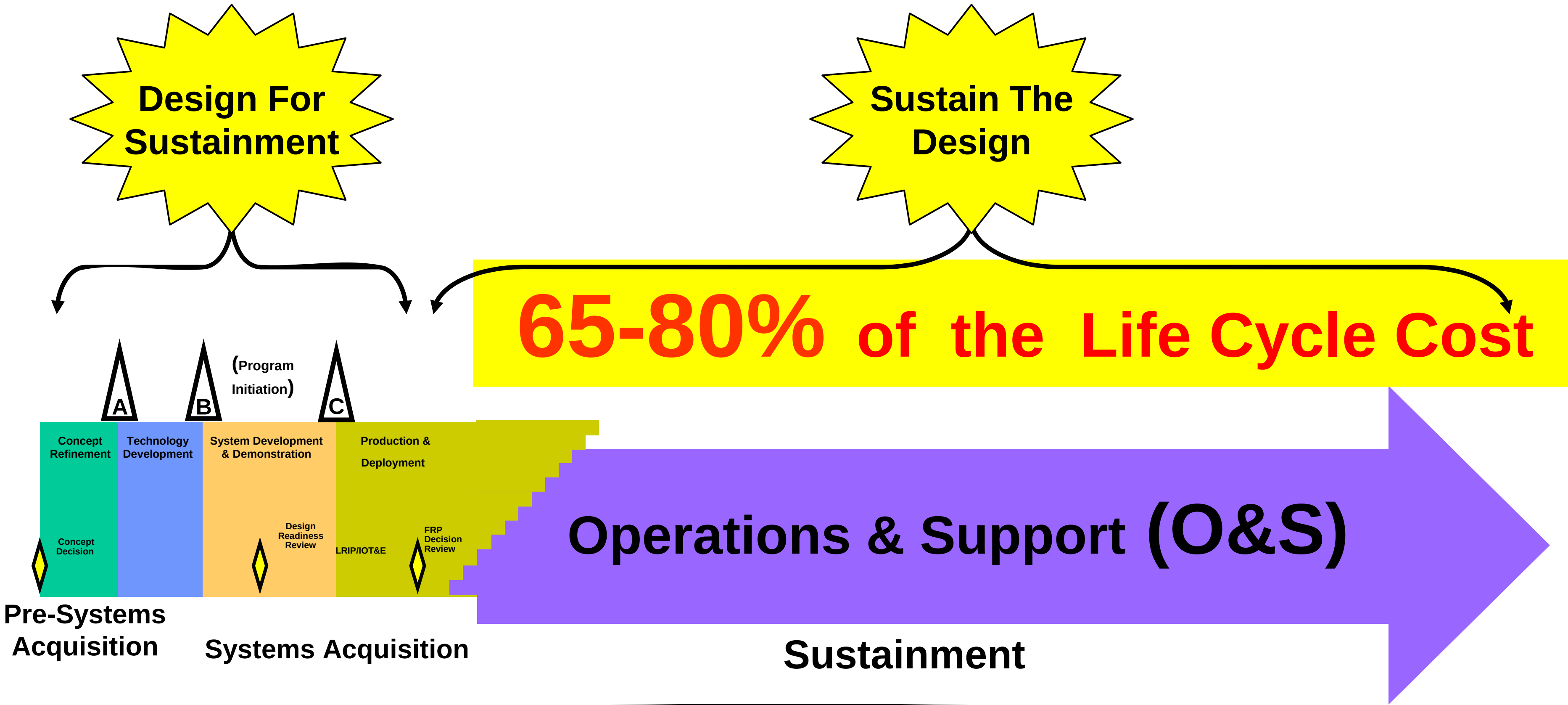
LCC Distribution



LCC Distribution



Life Cycle Management



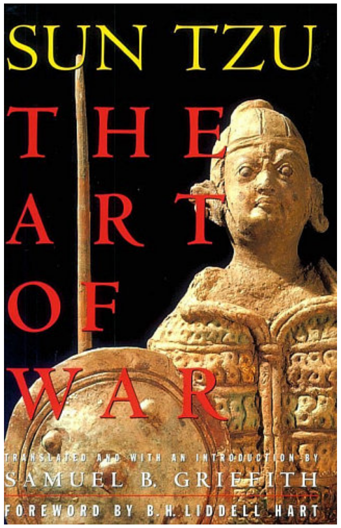
O&S Costs Are Determined Early In The Acquisition Phase

USD(AT&L) FY 07 Strategic Goals (#4) Emphasize Sustainment Outcomes Throughout The Life Cycle Management Process

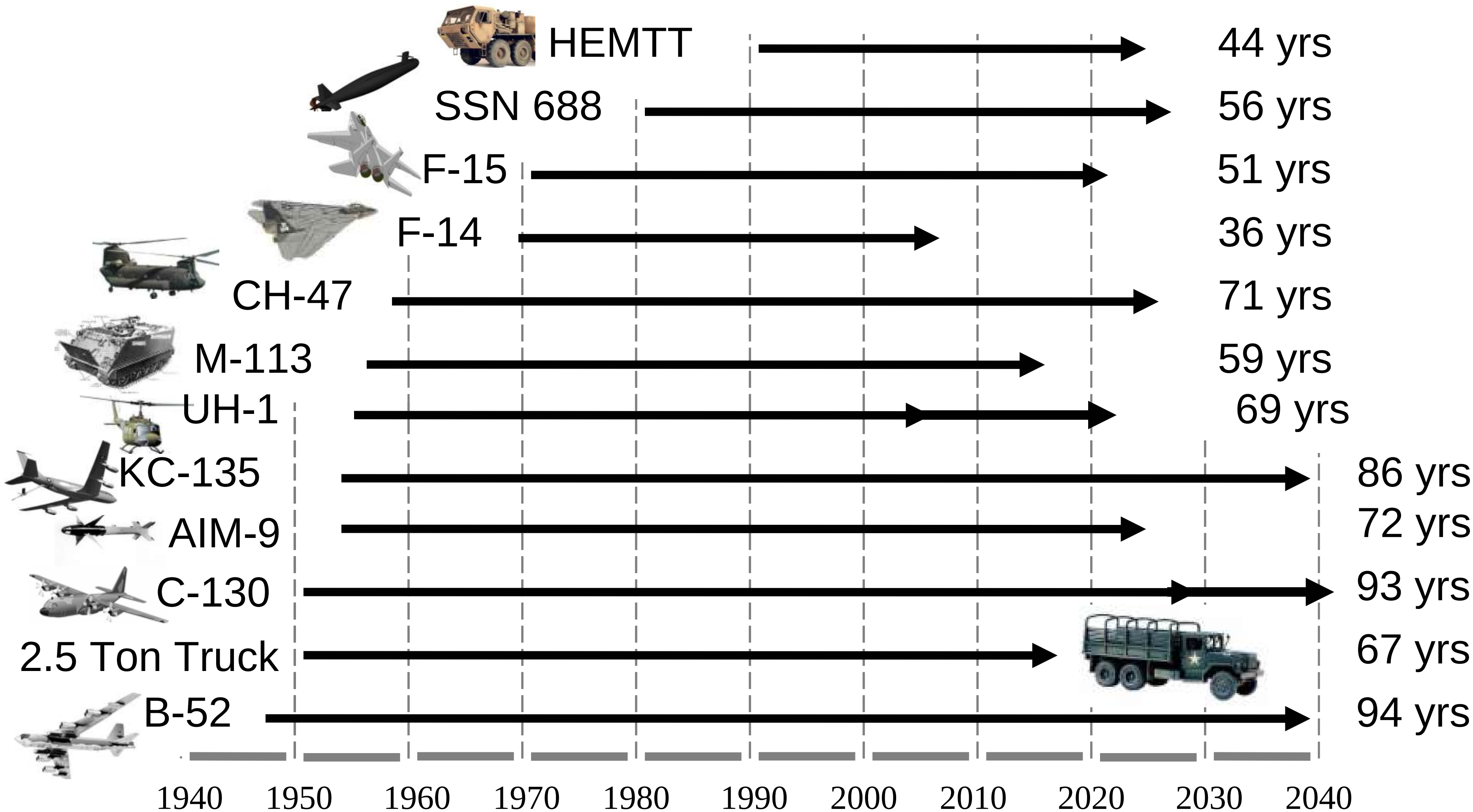
Life Cycle Costing Considerations

"As Government expenditures, those due to broken down chariots, worn-out horses, armor and helmets, arrows, and crossbows, lances, hand and body shields, draft animals and supply wagons will amount to 60% of the total."

Sun Tzu (The Art of War, 6th Century B.C.)



Defense System Life Cycles



SOURCE: John F. Phillips DUSD (L)

DoD Directive
(5000.1)

"PMs shall consider supportability, life cycle costs, performance, and schedule comparable in making program decisions."

Department of Defense
DIRECTIVE

NUMBER 5000.1
May 12, 2003

USD(AT&L)

SUBJECT: The Defense Acquisition System

References:

(a) DoD Directive 5000.1, "The Defense Acquisition System," October 23, 2000 (hereby canceled)
(b) DoD Instruction 5000.2, "Operation of the Defense Acquisition System," May 12, 2003
(c) DoD 5025.1-M, "DoD Directives System Procedures," current edition
(d) Title 10, United States Code, "Armed Forces"
(e) Section 2350a of title 10, United States Code, "Cooperative Research and Development Projects: Allied Countries"
(f) Section 2751 of title 22, United States Code, "Need for international defense cooperation and military export controls; Presidential waiver; report to Congress; arms sales policy"
(g) Section 2531 of title 10, United States Code, "Defense memoranda of understanding and related agreements"
(h) Federal Acquisition Regulation (FAR), current edition
(i) Section 1004, Public Law 107-314, "Bob Stump National Defense Authorization Act for Fiscal Year 2003," "Development and Implementation of Financial Management Enterprise Architecture"
(j) DoD Directive 8500.1, "Information Assurance (IA)," October 24, 2002
(k) DoD Directive 4630.5, "Interoperability and Supportability of Information Technology (IT) and National Security Systems (NSS)," January 11, 2002
(l) DoD Directive 2060.1, "Implementation of, and Compliance with, Arms Control Agreements," January 9, 2001

1. PURPOSE

This Directive:

1.1. Reissues reference (a) and authorizes publication of reference (b).

1.2. Along with reference (b), provides management principles and mandatory policies and procedures for managing all acquisition programs.

2. APPLICABILITY AND SCOPE

2.1. This Directive applies to the Office of the Secretary of Defense, the Military Departments, the Chairman of the Joint Chiefs of Staff, the Combatant Commands, the Office of the Inspector General of the Department of Defense, the Defense Agencies, the DoD Field Activities, and all organizational entities within the Department of Defense (hereafter collectively referred to as "the DoD Components").

2.2. The policies in this Directive apply to all acquisition programs.

AT&L Memo: **22 Nov 2004**

(Subj: Total Life Cycle Systems Management (TLCSM) Metrics)

Emphasizes use of PBL (Performance-Based Logistics) for all weapons

Provides Specific Definitions (and Formulas) for the following metrics:

1. **Ao (Operational Availability)**
2. **Mission Reliability**
3. **TLCS Cost per Unit of Usage**
4. **Cost per Unit of Usage**
5. **Logistics Footprint**
6. **Logistics Response Time**

THE UNDER SECRETARY OF DEFENSE

3010 DEFENSE PENTAGON
WASHINGTON, DC 20301-3010

ACQUISITION, TECHNOLOGY AND LOGISTICS

NOV 2 2 2005

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
(ATTN: SERVICE ACQUISITION EXECUTIVES)

SUBJECT: Total Life Cycle Systems Management (TLCSM) Metrics

The Defense Business Board recommended to the Deputy Secretary of Defense that the Department aggressively pursue implementation of Performance-Based Logistics, for all its weapons, new and legacy.

In a memorandum dated August 16, 2004, my predecessor directed measuring performance in terms of Operational Availability, Mission Reliability, Cost per Unit of Usage, Logistics Footprint, and Logistics Response time. For consistency, this memorandum provides specific definitions of those metrics for use across the Department (attached). I direct their use as the standard set of metrics for evaluating overall TLCSM.

I also direct the TLCSM Executive Council to develop a "TLCSM Metrics Handbook," with specific metrics, formulas and calculation methodologies. It will be used in performance-based contracts and for sustainment oversight. The handbook will also define supporting data requirements that should be incorporated into emerging logistics information systems.

The principal point of contact for administration of the handbook is Mr. Lou Kratz, Assistant Deputy Under Secretary of Defense (Logistics Plans and Programs), 703-614-6327, Louis.Kratz@osd.mil.

Kenneth J. Krieg

Attachment:
As stated

JROC Memo: **17 Aug 2006**

(Subj: Key Performance Parameters Study Recommendations and Implementation)

1. **Endorsed Mandatory "MATERIEL AVAILABILITY" Key Performance Parameter (KPP) for all MDAPs and Select ACAT II and III**

   With 2 Supporting Key System Attributes (KSAs):

   A. Materiel Reliability KSA

   B. Ownership Costs KSA

2. **Endorsed ENERGY EFFICIENCY KPP for selected programs, as appropriate**

3. **Endorsed TRAINING KPP for selected programs, as appropriate**

4. **Did <u>not</u> endorse requirement for mandatory KPPs for these criteria:**

   COST

   TIME and/or SCHEDULE

   SUSTAINMENT

   COALITION INTEROPERABILITY

   FORCE PROTECTION AND SURVIVABILITY

THE JOINT STAFF
WASHINGTON, D.C. 20318-8000

JOINT REQUIREMENTS
OVERSIGHT COUNCIL

JROCM 161-06
17 August 2006

MEMORANDUM FOR: Under Secretary of Defense for Acquisition, Technology, and Logistics
Commander, US Joint Forces Command
Vice Chief of Staff, US Army
Vice Chief of Naval Operations
Vice Chief of Staff, US Air Force
Assistant Commandant of the Marine Corps

Subject: Key Performance Parameter Study Recommendations and Implementation

1. The Joint Requirements Oversight Council (JROC) approved the Key Performance Parameter (KPP) Study recommendations. The JROC endorses the implementation of a mandated Materiel Availability KPP with supporting key system attributes of materiel reliability and ownership cost for all Major Defense Acquisition Programs (MDAPs) and select ACAT II and III programs. The JROC also endorsed selectively applying an Energy Efficiency KPP and a System Training KPP, as appropriate.

2. To better ensure the correct KPPs are selected, the JROC endorsed the use of KPP reference sheets produced as part of this study. The KPP reference sheets will be used as an aid in the process of identifying and validating potential KPPs for any acquisition program.

3. Implementation of the study recommendations will be concurrent with the publishing of the next revision of CJCS 3170-series documents. The revision will incorporate the details of the execution and will be coordinated for final release by 31 October 2006. Specific JROC implementation due backs and approved recommendations are enclosed.

E. P. Giambastiani

E. P. GIAMBASTIANI
Admiral, US Navy
Vice Chairman
of the Joint Chiefs of Staff

Enclosure

JROC Approved Mandatory Sustainment KPP and KSAs*

- **<u>Single KPP:</u>**
  - **Materiel Availability** $\left(= \frac{\text{Number of End Items Operational}}{\text{Total Population of End Items}}\right)$
- **<u>Mandatory KSAs:</u>**
  - **Materiel Reliability** (MTBF) $\left(= \frac{\text{Total Operating Hours}}{\text{Total Number of Failures}}\right)$
  - **Ownership Cost** (O&S costs associated w/materiel readiness)

- **For mission success, Combatant Commanders need:**
  - Correct number of operational end items <u>capable</u> of performing the mission when needed
  - Confidence that systems will perform the mission and return home safely without failure
- **Ownership Cost provides balance; solutions cannot be availability and reliability "at any cost."**

****JROC Approval Letter JROCM 161-06 Signed 17 Aug 06; Revised CJCS 3170 will put into Policy***

Proposed Life Cycle Sustainment Outcome Metrics

- **Materiel Availability (KPP*)**
  - A Key Data Element Used In Maintenance And Logistics Planning
- **Materiel Reliability (KSA*)**
  - Provides A Measure Of How Often The System Fails/Requires Maintenance
  - Another Key Data Element In Forecasting Maintenance/Logistics Needs
- **Ownership Cost (KSA*)**
  - Focused On The Sustainment Aspects Of The System
  - An Essential Metric For Sustainment Planning And Execution
  - Useful For Trend Analyses – Supports Design Improvements/Modifications
- **Mean Downtime**
  - A Measure Of How Long A System Will Be Unavailable After A Failure
  - Another Key Piece Used In The Maintenance/Logistics Planning Process
- **Other Sustainment Outcome Metrics May Be Critical To Specific Systems, And Should Be Added As Appropriate**

* Sustainment KPP & KSAs Included In Revised Draft CJCSM 3170

These 4 Life Cycle Sustainment Outcome Metrics Are Universal Across All Programs And Are Essential To Effective Sustainment Planning

DUSD AT&L Metrics Evolution

TLCSM Metrics (Nov 05)	Life Cycle Sustainment Metrics (Feb 07)
• *Operational Availability (A_o)*	• **Materiel Availability** • *Key Performance Parameter (KPP) (per Aug 06 JROC Memo)*
• *Mission Reliability*	• **Materiel Reliability** • *New Key System Attribute (KSA) (per Aug 06 JROC Memo)*
• *Total Life Cycle System Cost per Unit of Usage* • *Cost Per Unit of Usage*	• **Ownership Cost** • *New Key System Attribute (KSA) (per Aug 06 JROC Memo)*
• *Logistics Footprint*	• *No Corresponding New Metric*
• *Logistics Response Time (LRT)*	• **Mean Down Time (MDT)**

DAU Stryker Suitability Study

- **Interim Progress Report #2**
  - Objectives
  - Process
  - Progress & Plans
  - Findings & Observations
  - Data Analysis
  - Reliability Measurement Issue
  - Challenges
  - Recommendations

DAU Stryker Suitability Study

- **Objectives**
  - To conduct a research study to quantify the difference between projected O&S (associated with the RAM requirement) and the actual costs associated with the achieved level of operational suitability. That is, quantify the costs of not achieving adequate levels of operational suitability.

Process

- **Phase 1- Initial Program (Stryker)**
  - **a. Understand the problem**
  - **b. Define detailed study objectives**
  - **c. Collect data**
  - **d. Analyze data and build models**
  - **e. IPR at T&E Conference - Hilton Head**
  - **f. Acquire additional data as needed**
  - **g. Draft report**
  - **h. Finalize report**

- **Phase 2 - Analysis of 5 additional programs covering multiple types**

Data Collection:

Phase 1 Sources

– Stryker PM Team (TACOM Warren, MI)
– AEC RAM Directorate (APG)
– OTC Reps (Ft. Hood)
– AT&L Rep
– IDA
– LMI
– GDLS CDRL Data
– Ft. Lewis Stryker Team

Findings & Observations

- **Warfighters very satisfied with Stryker performance in-theatre**
- **Brigade Commanders extremely happy with ICLS**
- **High Operational Readiness Rates, but ORR is prioritized over support costs**
- **Op Temp in-theatre far exceeds planned usage rates (X10, X15, X30 ?)**
- **Operational Environment much different than expected**
- **Combat configurations add excessive weight to vehicle (affecting reliability and performance)**
- **Army did not buy Tech Data Pkg – "Prohibitively expensive" . . . risk to government**

Findings & Observations

- **Operational Readiness Rate not necessarily consistent with traditional A_o (Operational Availability)**
  - RAM issues can be masked by ORR
- **Mission Completion vs. Subsystem Failure**
  - Possibly leads to overestimating system reliability due to non-reporting on individual subsystem (component) failures
  - Multi-mission vehicle – with subsystem failures, system can still perform alternate missions
- **Reporting Criteria Issue:**
  - ORR vs. MTBF of individual subsystems

Reliability Issues

- **Reliability requirement as defined in ORD**
  - **4.3.1.3. The Stryker (vehicle only, excluding GFE components/systems) will have a reliability of 1000 mean miles between critical failure (i.e., system aborts).**
- **Reliability issues and cost drivers found during DT/OT correlate well with fielded experience**

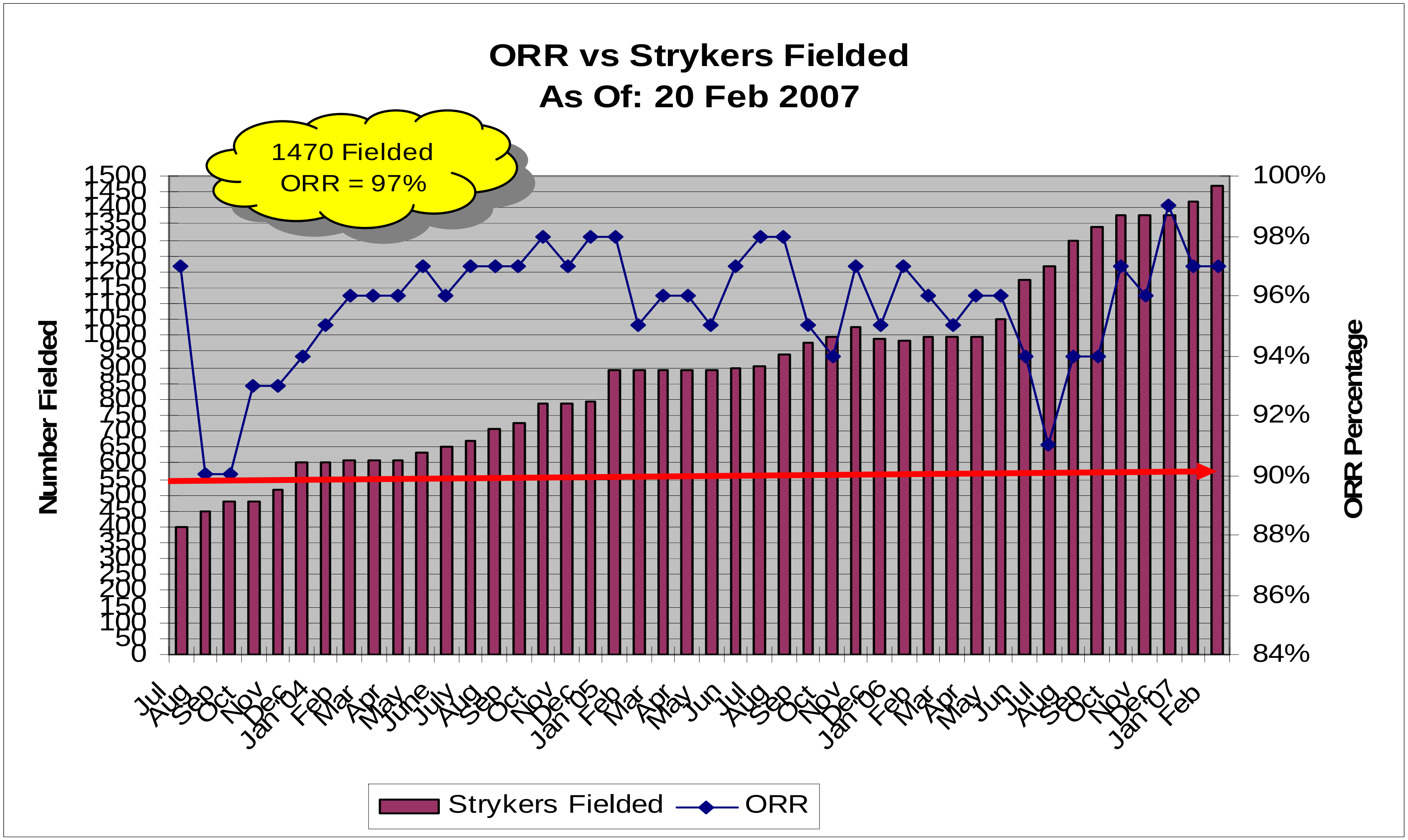
Operational Environment

- **Field usage much harsher than planned**
  - e.g., higher tire pressure, roads, curbs, weight (armor, sandbags)
- **Mission Profile says 80% XCountry, 20% Primary Roads**
  - in-theater mission just the opposite . . . most missions in urban environment (police action) on paved roads
- **OpTempo very high (>10X)**
  - High OpTempo may improve reliability numbers, but beats up equipment
  - With low usage, seals can dry up, humidity can build up in electrical components
- **Changes in mission & configuration are putting excess stress on vehicle: armor/sandbags, over inflated tires, going over curbs**
  - replacing 9 tires/day (>3200 tires/yr)
  - wheel spindles developing fatigue cracks
  - drive shafts breaking
  - prescribed tire pressure is 80 PSI, however, with slat armor/sandbags – must maintain >95 PSI
  - 95 PSI is a logistics burden on operators
    - Must be maintained by the soldier (tire inflation system can't do it)
    - Soldiers must check tire pressure more than 3 times per day to maintain 95 PSI

Tactical Considerations

- **Slat Armor design (additional 5000 lb) is effective for many RPG threats, but negatively impacts circumference, weight and performance of Stryker**
  - **Causes multiple problems for safe and effective operation**
    - **Slat armor on rear ramp too heavy - greatly strains lifting equipment**
      - **Occasionally, crews must assist raising/lowering ramp**
    - **Bolts on rear ramp break off frequently with normal use**
    - **Slat armor bends with continued ops . . . can cover escape hatches and block rear troop door in ramp**
    - **Slat armor interferes with driver's vision**
    - **Slat armor difficult for other traffic to see at night . . . Safety hazard in urban environment**
    - **Slat Armor prohibits normal use of exterior storage racks**
  - **Significantly impacts handling/performance in wet conditions**
    - **Adds excessive strain on engine, drive shafts, differentials**
  - **Impairs off-road ops**
- **Though not designed primarily for the urban fight (MOUT), Stryker is well-suited for it**
  - **Unlike M-1, Stryker is "ghostly" quiet . . . tactical advantage**
- **Stryker overall OIF performance significantly better than HUMVEE, BRADLEY or M-1 in this environment**

Stryker Fleet Readiness



Operational Readiness Rate (ORR)

- **Contractual requirement: ORR $\geq$ 90%**
  - **Does not include GFE (base vehicle configuration only)**
- **Stryker consistently above requirement**
  - **Current ORR 97% (20 Feb 07)**
- **Cost-plus-fixed-fee contract motivates GDLS to meet ORR . . . .**
  - **However, contract does <u>not</u> incentivise controlling costs . . . risk to government**
  - **Example – to repair cracked hyd res in power pack, whole power pack is replaced in field**

Cost Per Mile (CPM)

- **CPM is a planning tool used to project future budget requirements**
- **No specific value of CPM required by contract**
- **Govt/Kr both calculate CPM independently, and use results to negotiate parts cost forecasts to determine purchasing requirements**
- **For this research project, DAU is doing our own independent computation of CPM (garrison and deployed units) to validate other data and our methodology**

Cost Per Mile (CPM) Estimates

- CPM estimate - $17.19 (GAO 04-925, including labor, parts & repair)
- CPM estimate - $18.78 (Stryker R-TOC Brief)
- CPM estimate - $18.23 (based on M113 methodology w/Stryker adjustments)
- CPM estimate - $14.53 (based on initial 4 month deployment data)

- CPM estimate (GDLS) - $13.52 garrison
  $ 8.88 deployed
- DAU CPM estimate – $ 13.30 garrison
  $ 7.95 deployed

- Note 1 - We need to understand the basis for these estimates more thoroughly (assumptions, models, configurations, limitations . . .)
- Note 2 - Figures above are averages across all variants (deployed or garrison)
- Note 3 - CPM higher for garrison than deployed stryker ???

Why? A. While deployed, non-essential maintenance can be delayed until absolutely necessary . . . intervals between reported failures increases, CPM decreases

B. Maintenance more accessible/available in garrison – follow the book closer

C. Higher mi/day deployed . . . less labor/mi

Other Findings . . . cont.

- **Stryker initial deployment/fielding was extremely accelerated to meet urgent combat need**
  - **Result was that Army was doing these things concurrently:**
    - **Testing**
    - **Producing**
    - **Fielding**
    - **Conducting combat operations**
- **The threat and the operational environment were different than anticipated**

Other Findings . . . cont.

- **Immature Maintenance Procedures- many procedures have not been validated in IETMs (interactive electronic tech manuals) lead to:**
  - **"*Tribal System Maintenance*" from experienced crews (". . . that new book isn't any good . . . . this is the way it worked on the M113, so do it like this")**
- **With Kr support to maintain vehicles, soldier crews develop "*rental car mentality*" . . .**
  - **Lack of ownership mentality . . . overly dependent on contractor**
  - **Sometimes they forget the basics (oil check)**
  - **One vehicle lost because pre-mission checks were ignored**

DATA ANALYSIS

Phase 1 – March 2007

Data Collected

- CDRL A003 (Aug 2006)
  - Parts Consumption Report (for ~ 1 yr)
  - Good quality data (possibly some errors in mileage or dates)
- CDRL A004 (Aug 2006)
  - Repairable Items Repair Cost Summary
  - Most repair items have estimates or quotes

Cost Per Mile Analysis

$$\text{Cost Per Mile} = \frac{\text{Labor + Replacement Parts + Part Repair}}{\text{Total Vehicle Mileage}}$$

Labor : $4.73M per brigade (average value)

Replacement Parts : from CDRL A003 Consumption Report

Part Repair : No historical data for many parts

Variability in Part Repair

Existing data from CDRL A004

(Repairable Items Repair Cost Summary

Vehicle Mileage : Does not exist for all vehicles

Questionable accuracy

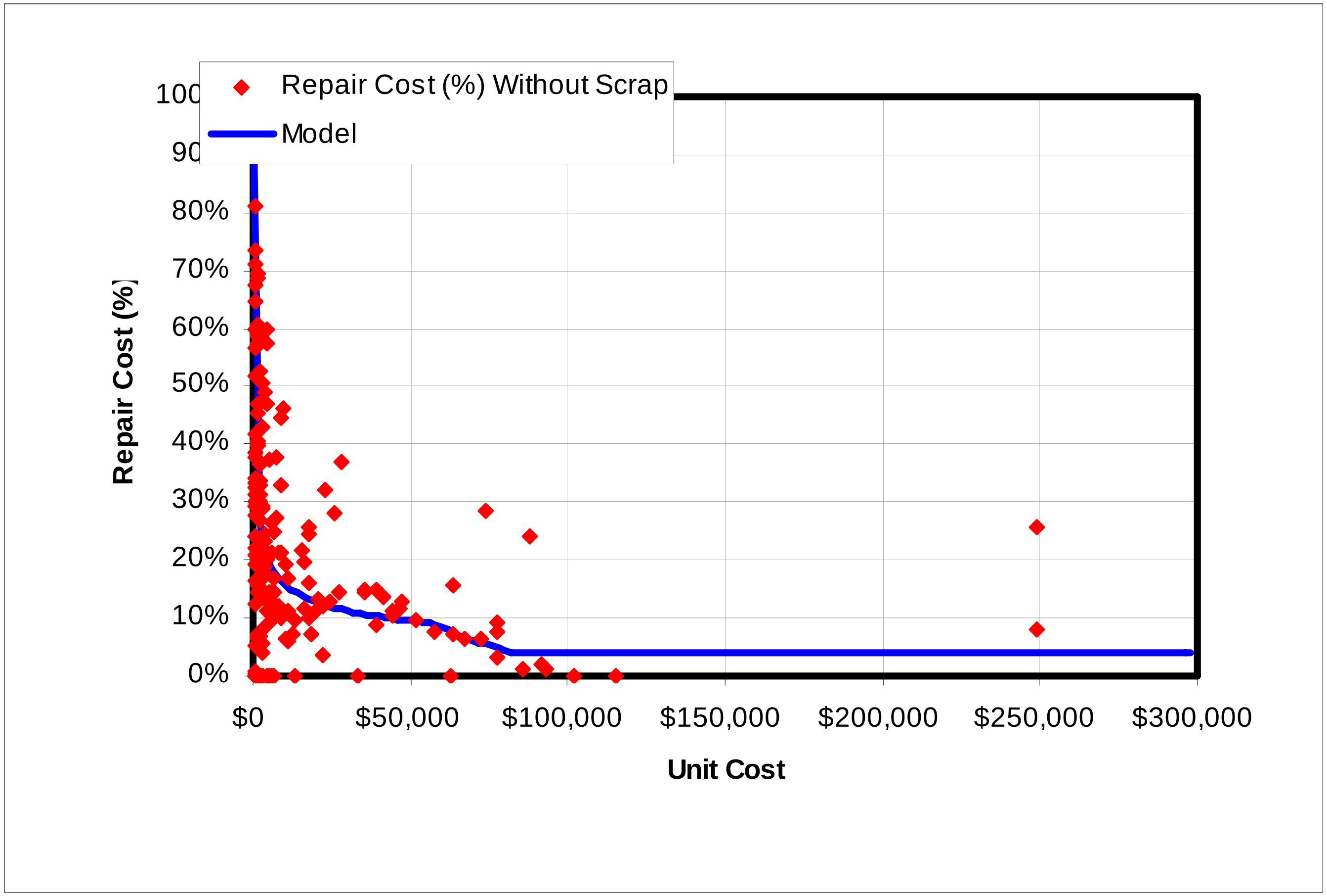
Determining the Average Repair Cost

- Repair Cost data only exists for ~ 26% of total consumable parts
  - Determine the Average Repair Costs for Repairable Parts listed in CDRL A004*
  - Determine Average Scrap Rates for Repairable Parts listed in CDRL A004
- For remaining consumables (~74%):
  - Use Parametric Models developed from CDRL A004 data

* CDRL A004 Repairable Items Repair Cost Summary)

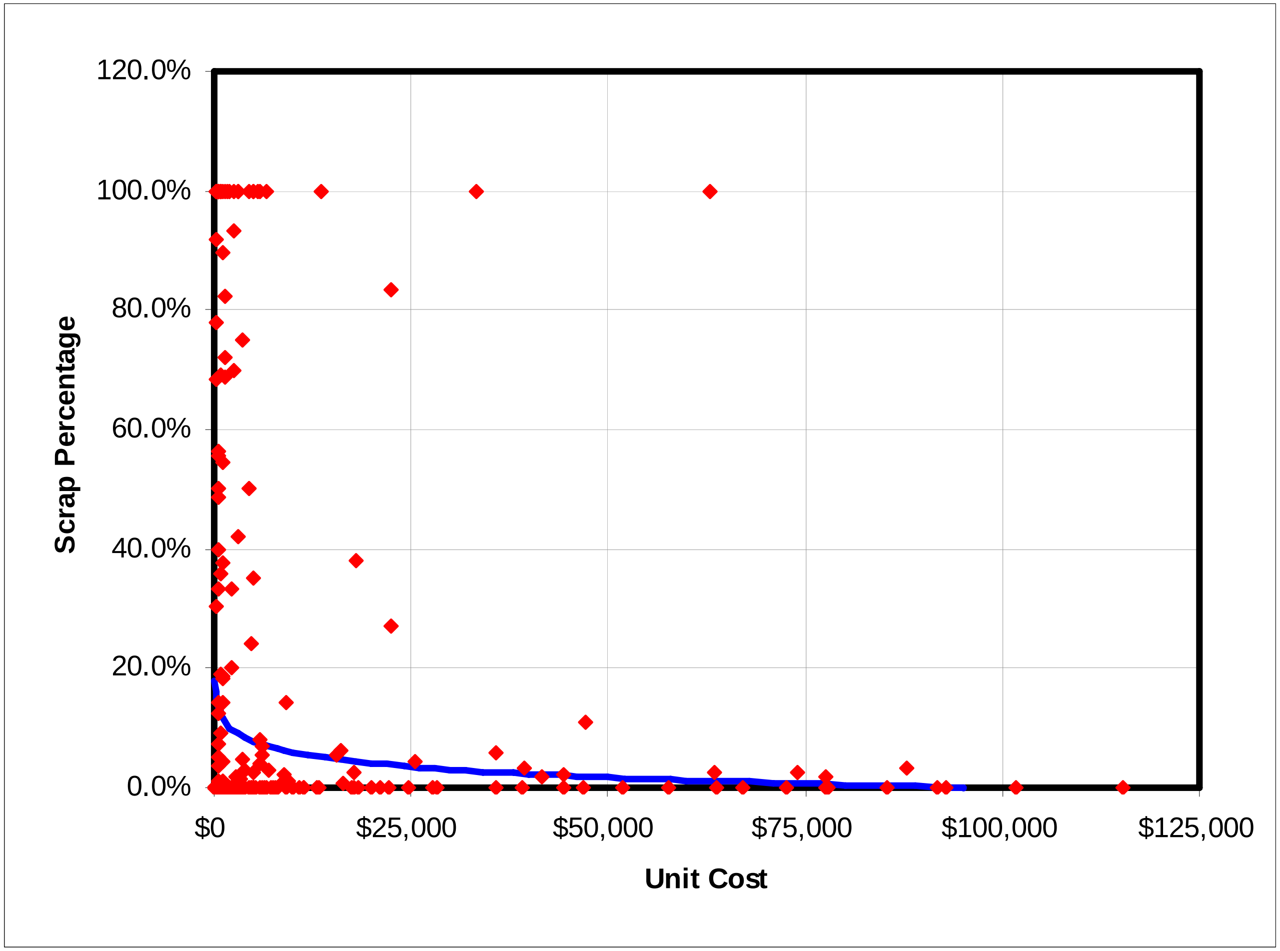
Repair Costs Parametric Model

- Data from CDRL A004
- Uncertainty for parts or assemblies costing more than $50k
- Repair of Powerpack set to 30%
- Did not factor in warranty items



Scrap Rate Parametric Model

- Model Used For Parts not in CDRL A004
- High statistical variance for some parts due to small sample size
- 100% data points ignored in the model



Total Vehicle Mileage

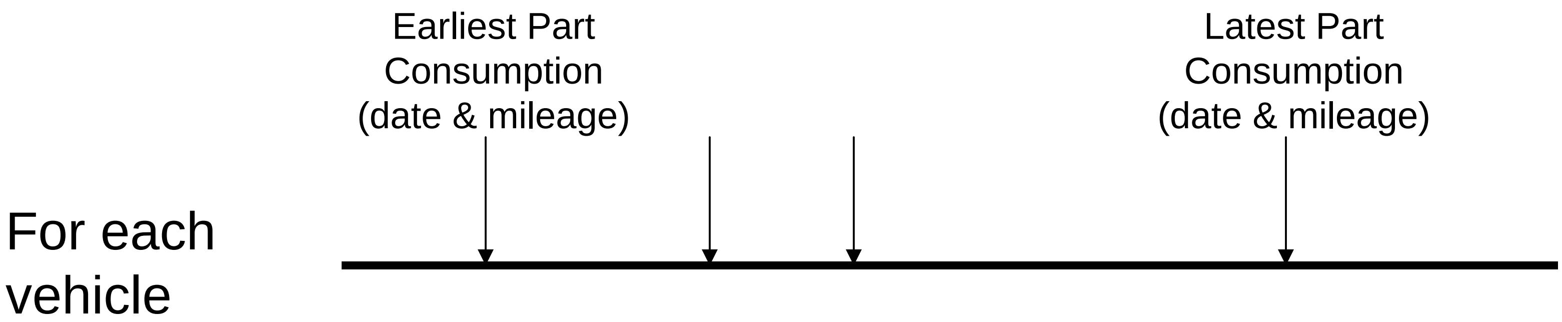
$$\text{Cost Per Mile} = \frac{\text{Labor + Replacement Parts + Part Repair}}{\text{Total Vehicle Mileage}}$$

Vehicle Mileage : Does not exist for all vehicles

Questionable accuracy

- Extreme values discarded.
- Miles/day calculated for every vehicle in the database
- Average miles/day from the database assumed to apply to all Brigade vehicles

Estimating Miles Per Day

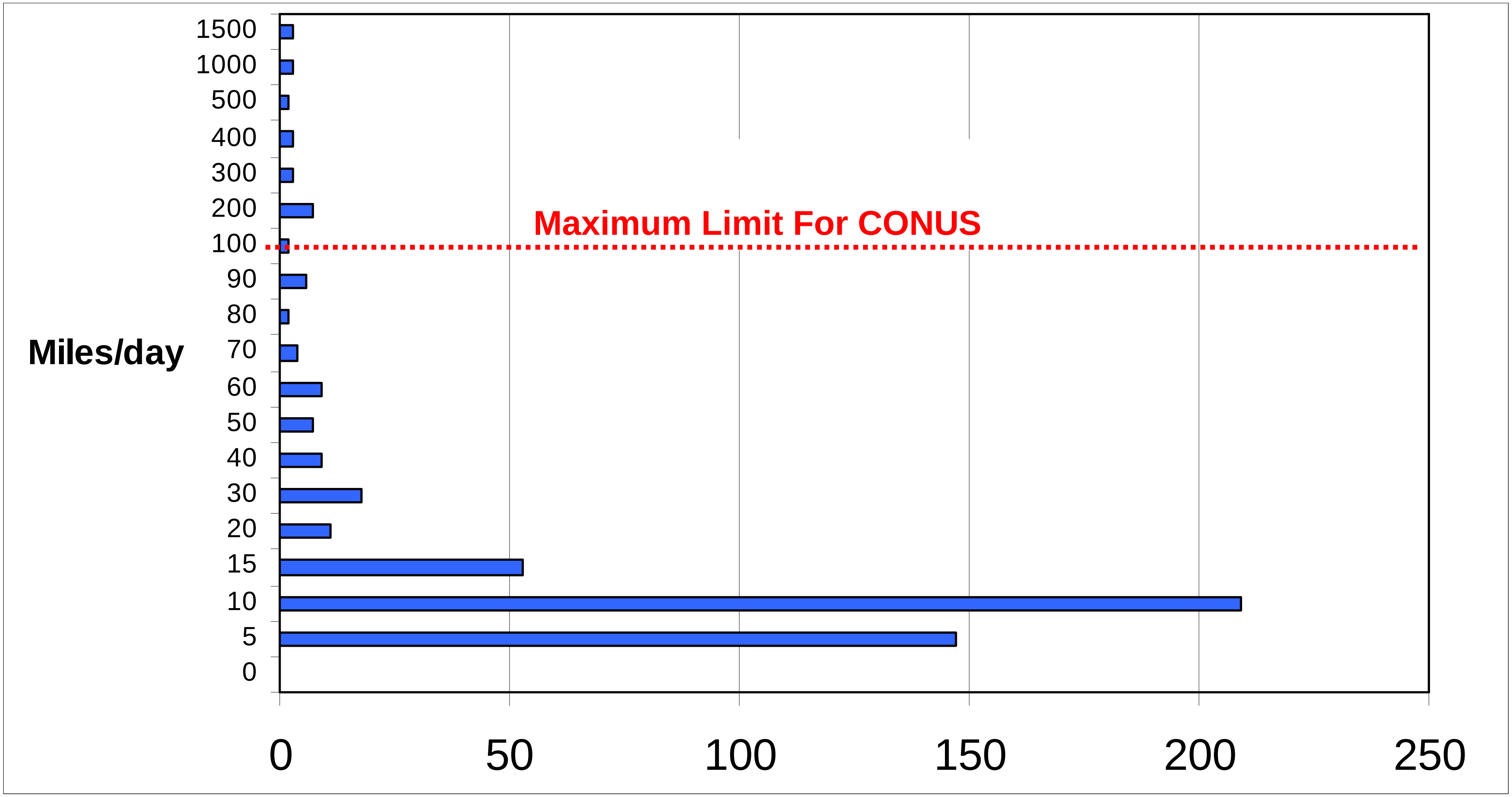


Vehicle miles per day ~ $(Miles_L - Miles_E)/(Day_L - Day_E)$

- Miles/day computed for each vehicle
- Downtime not factored into the estimation.

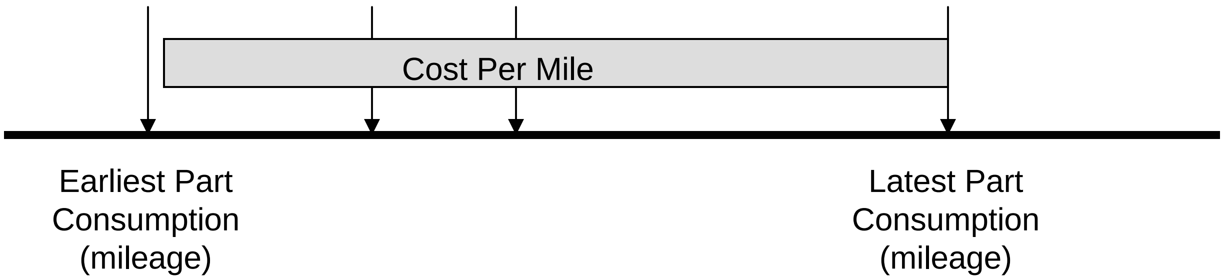
Vehicle Miles Per Day From A003

(CONUS)



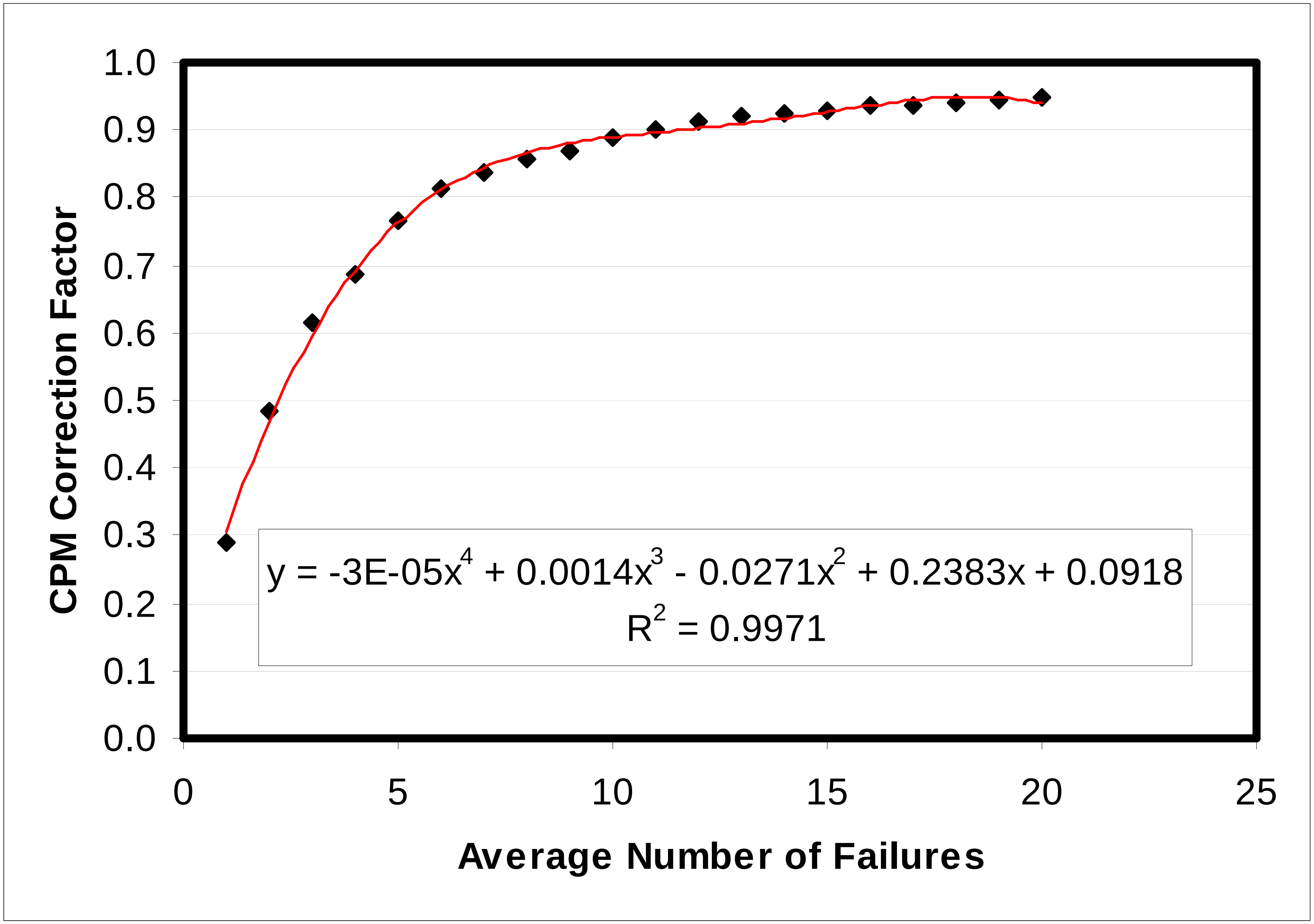
Estimating the Repair Cost per Mile

For each vehicle



- Above computation over estimates cost/mile because it doesn't include any mileage before the first or after the last part consumption
- The error is a function of the number of failures (i.e., as the failures increase, the error decreases)
- Numerical simulations were performed to develop a correction factor to be applied to the computed repair costs per mile

Correction Factor for the Estimated Repair Cost Per Mile



CONUS Cost Per Mile

- **CPM based on vehicles with:**
  - Maximum total miles < 5,000
  - Maximum Miles/Day < 100
- **Models:**
  - Parametric Repair Cost Model
  - Parametric Scrap Rate Model
  - Cost per Mile Correction
- **Assumptions**
  - 300 Strykers Per Brigade (all operational)
  - Power Pack repair = 30% unit cost

CONUS Cost/Mile

ICLS Labor, Replacement Parts, Part Repair

Vehicle Type	No. Vehicles	Repair Cost in Computation	Total Mileage in Computation	Spares/ Repair Parts Cost/mile	Miles Per Day	Total CPM
ICV	345	$1,581,641	218,138	$7.25	7.56	$9.41
MCV	101	$279,921	22,504	$12.44	5.39	$14.59
ATGM	43	$172,499	20,200	$8.54	6.67	$10.69
ESV	29	$395,797	28,970	$13.66	9.51	$15.82
FSV	33	$165,540	18,558	$8.92	6.90	$11.08
MEV	35	$66,682	17,405	$3.83	6.16	$5.99
RV	161	$559,520	110,313	$5.07	7.32	$7.23
All vehicles	**747**	**$3,221,599**	**436,088**	**$7.39**	7.31	$13.30

Assumptions: Each vehicle < 5k total miles, < 100 miles/day average, 30% repair cost for Power Pack

Deployed Cost Per Mile

- **CPM based on vehicles with:**
  - Maximum total miles < 20,000
  - Maximum Miles/Day < 400
- **Models:**
  - Parametric Repair Cost Model
  - Parametric Scrap Rate Model
  - Cost per Mile Correction
- **Assumptions**
  - 300 Strykers Per Brigade (all operational)
  - Power Pack repair = 30% unit cost

Deployed Cost/Mile

ICLS Labor, Replacement Parts, Part Repair

Vehicle Type	No. Vehicles	Repair Cost in Computation	Total Mileage in Computation	Spares/ Repair Parts Cost/mile	Miles Per Day	Total CPM
ICV	315	$8,225,102	1,108,756	$7.42	36.93	$9.57
MCV	70	$765,983	120,708	$6.35	22.08	$8.50
ATGM	52	$1,393,062	218,260	$6.38	43.50	$8.54
ESV	28	$587,658	134,119	$4.38	64.33	$6.54
FSV	27	$486,028	95,890	$5.07	36.94	$7.22
MEV	38	$223,414	79,945	$2.79	25.70	$4.95
RV	126	$2,303,741	317,632	$7.25	31.72	$9.41
All vehicles	**656**	**$13,984,989**	**2,075,310**	**$6.74**	35.59	$7.95

- Model assumes $4.73M per brigade
- Higher miles/day for Deployed vehicles results in lower Total Cost Per Mile

Assumptions: Each vehicle < 20k total miles, < 400 miles/day average, 30% repair cost for Power Pack

Sensitivity Analysis
(CONUS)

- Using an Overall Average Repair Cost (based on CDRL A004) Instead of the Parametric Models drops the CPM by 2%
- Increasing the limit on Miles Per Day (from 100 to 300) drops the CPM by 3%
- Increasing the limit on Maximum Miles (from 5,000 to 10,000) drops the CPM by 4%

Challenges

- Validity of comparisons
- Baseline assumptions
- Missing Data
- Quality of data

Recommendations

- Continue Research
  - Complete Stryker analysis
- Feedback from sponsor
- Feedback from community
- Determine path ahead
- Develop methodology for conducting suitability studies on other systems
- Look at other programs for comparison
  - Other services, other types of systems