Joint Autonomic Sustainment

Accelerating CBM+ and CPI
across the Joint Operations Battlespace
to the DOD / OEM Industrial Base

DOD Maintenance Symposium
Great Ideas

October 23, 2006
Agenda

- The Vision – Focused Logistics / Sense & Respond Logistics
- The Capability Gap – Condition Based Maintenance
- The Solution – Joint Autonomic Sustainment Capability
- The Value – Warfighter, Business & Taxpayer Value
- The Great Idea – Joint Autonomic Sustainment System (JASS)
The Warfighting Mission Area (WMA) capabilities vision.
The Business Mission Area (BMA) capabilities vision.
The DOD Information Technology Modernization and Recapitalization vision.

Current Configuration

Islands of Automation
~19,000 apps, ~1,700 systems

2012 Target Configuration

Legacy and Service Group Mix
~10,000 apps, ~700 systems

20XX Objective Configuration

Interoperable Service Groups
~10,000 apps, ~700 systems

End Proprietary Approaches
Limited interoperability…*Stove-piped functional solutions*
High custom development costs…*Stand-alone services*

Field Open, Scaleable Solutions
Greater interoperability…*Common data standards*
Reduce costs…*Share & reuse…build once use many*

Exploit COTS solutions first…then modify or build only as needed to save $8B+

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What are the differences in capability enablers (process and technological)?

**PLM**

- CAD, CAM, CAE, PDM

*PDM systems are “component” centric and use “transaction” based workflows*

*The Authoritative Source of Logical (As-Designed) Configuration (CM_{LS} & CM_{LF}) is a Blueprint.*

**ERP**

- HR, SCM, MRPII, FI/CO, ABC

*ERP systems are “order” centric and use “transaction” based workflows*

*The Authoritative Source of Resources: people, skills, qualifications, materiel, locations, tools, and money.*

**SLM**

- Off-Board RCM, RBS, CMMS
- Near-Board CBM, IETM, ATE, IUID
- On-Board EFB, MFOQA, PHM

*SLM systems are “component” centric and use “role based” workflows*

*The Authoritative Source of Physical (As-Operated) Configuration (CM_{PS} & CM_{PF}) is the Aircraft.*

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**ERPs do not have the full maturity (range and depth) of PLM or SLM capabilities.**
What is the current “As Planned” state according to BTA ETP Appendix J dtd March 2006?

COCOMs in the battlespace are facing four GCSSs and a multitude of CBM tools.
What is the Joint Capability Gap of Focused Logistics & Sense & Respond Logistics?

DOD does not have

a **joint**
industry standards based
Net-Centric Operating Environment architecture compliant
end-to-end capability in place
to gather, track, transform and disseminate
on, near board and off-board asset service management and condition data
into accurate decision knowledge which supports
the warfighters’ real time
sustainment, readiness and process improvement needs
at the point of operations and maintenance
and systems engineering commands’
reliability centered engineering,
product lifecycle management and
continuous process improvement analysis needs
within programs and across asset classes.
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Joint Autonomic Sustainment at the point of maintenance would address the current Service Lifecycle Management capability gaps in CBM, PHM, RBS, CPI and PBL.

**Joint Autonomic Sustainment** is:

- Collector of Condition Based Maintenance Data
- Forecaster of Prognostic Based Asset Health
- Distributor of System & Asset Health
- Analyzer of Component Degradation Trends
- Manager of Multiple Dimensions of Configuration
- Creator of Mission Support Readiness Knowledge
- Facilitator of Continuous Process Improvement
- Enabler of Readiness Based Sparing
- Enabler of Performance Based Logistics
- User of A&D Industry Data Standards
- User of Technology Industry Standard Protocols

ISO 13374 MIMOSA, S1000D, MFOQA

ISO 10303 STEP, PL / PCS, SCORM
Where would a Joint Autonomic Sustainment System fit in the DOD logistics structure?

JASS accelerates battlespace focused logistics via sense & respond capabilities.
How does Autonomic Sustainment enable Continuous Process Improvement (CPI)?

Lifecycle tracking of utilization and maintenance - facilitates determination of causality.
Commercial airlines build in-flight, real time, reliability centered, condition based, nose-to-tail, MRO capabilities through agile collaborative networks integrated to operations centres.
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Delta Air Lines Technical Operations Case

**Business Challenge**

In 2000, Delta needed a program for increasing maintenance capacity through labor productivity to prevent investing in new infrastructure capacity while reducing maintenance costs per flight hour, managing service parts more effectively and improving the efficiency of maintenance-related regulatory compliance. To make these improvements happen, Delta TechOps and their consultancy designed a new set of interlocking capabilities to optimize maintenance operations globally. The result was a initiative consisting of a master "MRO Maintenance Plan" and a series of "Bay 8" pilots to validate the Master Plan’s capabilities and concept of operation.

<table>
<thead>
<tr>
<th>Innovations Delivered</th>
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<td>Developed the NextGen MRO Business Architecture – an integrated business process and technology architecture for aviation maintenance that encompasses:</td>
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<tr>
<td>• Line, heavy, component and engine maintenance</td>
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<tr>
<td>• Reengineered maintenance processes for engineering, configuration management, planning, packaging, scheduling, supply chain management, customer relationship management, document &amp; task card management and lean - six sigma</td>
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<tr>
<td>• An EAI &amp; BPM rules based, event driven SOA built on the Delta Nervous System technical architecture</td>
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<tr>
<td>Design and execution of a series of “Bay 8” pilots to:</td>
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<tr>
<td>• Validate key tenets of the NextGen MRO capabilities</td>
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<tr>
<td>• Test specific operational metrics and improvements</td>
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<td>• Assess overall labor productivity &amp; cost effectiveness</td>
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<tr>
<td>Eleven US/EU patents covering the eight dimensions of configuration management &amp; three effectivity dimensions over the service lifecycle management of complex assets.</td>
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<th>High Performance Results</th>
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<tr>
<td>Confirmed opportunity to reduce HMV-check costs by $200 thousand dollars per plane (Delta performs 60-70 HMV-checks per year). Savings are the result of pilot programs that demonstrated:</td>
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<tr>
<td>• 64 percent decrease in job interruptions</td>
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<td>• 42 percent decrease in materiel utilization</td>
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<tr>
<td>• 26 percent increase in work order labor productivity</td>
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<tr>
<td>• 16 percent reduction in maintenance cycle time</td>
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<tr>
<td>• 100 percent regulatory compliance visibility</td>
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<td>Five year NPV of $182M plus $400M additional revenue</td>
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*Delta’s MRO has the second highest labor rate but second lowest labor cost.*
NAVAIR F/A-18 OIF / OEF Mission Readiness Case

Scale:
- Fleet of over 1000 aircraft and 2200 GE engines (F404 and F414)
- Operated from more than 120 separate sites and 12 aircraft carriers

Functions:
- Configuration management
- Engineering change management
- Life usage tracking
- Planning & Scheduling
- Electronic log book
- Electronic integration with airframe and engine OEMs

Results:
- Operation Enduring Freedom Sortie rate for VFA-115 was 97.5%
- Operation Iraqi Freedom VFA-115 Averaged over 55 Flight Hours/day
- Depot Turn-around-Time and awaiting parts backlog reduced from 90-45 days
- F404 Engine Availability went from 55% to a current 85%

*Boeing’s support of the F/A-18 is the most successful PBL initiative in the DOD.*
Service Lifecycle Management (SLM) is a key capability enabler of the F-35 JSF Autonomic Logistics Information System (ALIS) and Global Sustainment Center.

By 2012, 100% of the Navy’s Strike fleet will be sustained by Mxi Technologies.
Swedish Defense Force’s Network Based Defense (NBD) initiative is to create a Joint Autonomic Sustainment capability across air, land and sea assets.

**Maintenix at Swedish Defence Force Logistics (FMV):**

- Mxi recently contracted for all large asset service lifecycle configuration and maintenance management requirements (Air, Land and Sea).
- Multi-year complex competitive analysis & selection process that included the assessment of Maintenix in comparison to IFS, Intentia, SAP as well as an internally built system.
- Maintenix going live Oct 2006 on 400+ Fixed & Rotary Wing Aircraft (including C-130J) followed by all land and sea assets.

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**Sweden's NBD will sustain all asset classes on a common CBM solution.**
Empirical results of Autonomic capabilities in commercial aviation are significant.

Stakeholders:

- Operators (Warfighter) = increased asset availability (readiness)
- Customers = increased on time travel at reduced costs
- Shareholders (Taxpayers) = Total Shareholder Return = Revenue Growth + EVA
- Regulators = safe, compliant and reliable asset operation with full lifecycle documentation
- Employees = stable wages and job security through increased competitive productivity
- Management = increased risk adjusted EVA and ROIC as well as Continuous Process Improvement

<table>
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<th>Empirical Value Proposition Ranges</th>
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<tr>
<td><strong>↓ Total MRO costs</strong></td>
<td>10% to 25%</td>
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<td><strong>↑ Labor productivity</strong></td>
<td>20% to 40%</td>
</tr>
<tr>
<td><strong>↓ Unplanned &amp; non-routine maintenance</strong></td>
<td>40% to 60%</td>
</tr>
<tr>
<td><strong>↓ Heavy maintenance cycle times</strong></td>
<td>10% to 25%</td>
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<tr>
<td><strong>↓ Inventory costs</strong></td>
<td>15% to 35%</td>
</tr>
<tr>
<td><strong>↓ Rework &amp; scrap</strong></td>
<td>35% to 60%</td>
</tr>
<tr>
<td><strong>↓ Unplanned downtime</strong></td>
<td>5% to 15%</td>
</tr>
<tr>
<td><strong>↓ Work-in-progress</strong></td>
<td>10% to 30%</td>
</tr>
<tr>
<td><strong>↑ Compliance visibility</strong></td>
<td>100%</td>
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**JASS also increases ROIC by reducing integration & training - risks & costs.**
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The Great Idea – Build a Joint Autonomic Sustainment initial capability...

The H-60 variants represent the most widely operational “joint” aircraft globally.
... leveraging prior, current and future committed investments and existing technologies ...

Purpose:

Leverage commercial capabilities & DOD previous, current and future programmed investments in CBM:

1. Joint H-60x Integrated Vehicle Health Management System (IVHMS)
2. NAVAIR F/A-18 Automated Maintenance Environment (AME)
3. Joint Strike Fighter F-35 Autonomic Logistics Information System (ALIS)
5. TACOM Automated Configuration Management Systems (ACMS)
6. TACOM Stryker Brigade Tactical Logistics Data Digitization (TLDD)
7. Army CBM Data Warehouse and Aviation Digital Exploitation Capability (ADEC) initiatives
8. Joint Aeronautical Logistics Commanders (JALC) H-60 configuration mapping initiative

Outcomes:

1. An immediately fieldable Joint Autonomic Sustainment capability which enables CBM and PBL
2. Joint Autonomic Sustainment Initial Capabilities Document (ICD)
3. Joint Autonomic Sustainment Analysis of Alternatives (AoA) (ERP + Best of Breeds COTS)
4. Joint TV-1 Data & Computing Standards (ISO 10303, AP 239, ISO 13374, S1000D, SOAP, J2EE, IPv4, ...)
5. Joint Autonomic Sustainment Technology Development Strategy (TDS)
6. Phased funding in parallel to spiral capability maturity development & operational deployment
... which accelerates the current 2012 / 2020 vision and value to TODAY.
Questions