Logistics Engineering

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Presented by:
Lou Sciaroni
Chief, Logistics Engineering Group
U.S. Army Aviation and Missile Research, Development, and Engineering Center

16 Oct 13
Shadow 200 System
Not Just an Air Vehicle!

System
Air Vehicles with Payloads x 3

Ground Data Terminal x 2

- Portable Ground Control Station & Data Terminal
- One System Remote Video Terminal x 4

- Ground Control Stations x 2
- Portable Ground Control Station & Data Terminal
- One System Remote Video Terminal x 4

Arresting Net

10kw TQG x 2

- Personnel/Equipment Transport x 3 (1152/1165)
- Personnel/Equipment Transport (1152)
- Equipment Trailer x 1

Air Vehicle Transport & Launcher Trailer

Personnel
1 x 35D (Platoon Leader)
1 x 150U (UAV Warrant Officer)
1 x 96U/35K/15W (Platoon Sergeant)
12 x 96U/35K/15W (Air Vehicle Operators)

Equipment Trailer x 1

- Personnel
  4 x 33WU2/15JU2
  3 x 52DU2/15BU2

Maintenance Section
Air Vehicle

- Maintenance Section Multifunctional
- Equipment Trailer x 2
- Personnel/Equipment Transport (1152)
Logistics Engineers Bridge the Gap between Engineering & Logistics

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**Logistics Engineering (LogE)**

“**The GAP**”

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**Engineering**

**Logistics**

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**“IS”**

**Engineering**

**Logistics**

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**“To BE”**

**Engineering**

**Logistics**

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**AMRDEC**

**Engineering**

**Logistics**

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**RDECOM**

**Engineering**

**Logistics**

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**AMCOM**

**Engineering**

**Logistics**

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**Logistics Engineers Bridge the Gap between Engineering & Logistics**
Logistics Engineering Workshops

Logistics Advisory Council

Clarification Requests
Proposed Strategy
Clarification/Suggestion
Strategy Feedback

Developed Strategy

Logistics Engineering Strategy and Action Plan

Training Needs
Training Priorities

Logistics Engineering Training Plan and Modules
## LogE Mission Development

### Logistics Engineering Activity/Responsibilities

<table>
<thead>
<tr>
<th>Document / Activity Name</th>
<th>LogE Readiness Level</th>
<th>Life Cycle Activities</th>
<th>Manager</th>
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<td>SRL1</td>
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<td>Use Study Analysis</td>
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<td>Analysis of Alternatives (System) Supportability Analysis</td>
<td>Performs Activity</td>
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<td>Request for Proposal (RFP) Preparation</td>
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<td>Proposal Evaluations</td>
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<td>Software support analysis</td>
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<td>Qualitative &amp; Quantitative Personnel Requirements Information (QQPRI)</td>
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<td>Maintenance Allocation Chart</td>
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<td>Technology Readiness Assessment</td>
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<td>Industrial Capabilities Assessment (ICA)</td>
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<td>Transportability Plan</td>
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<td>Built-in Test (BIT) Development</td>
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<td>Standardization Analysis/Opportunities</td>
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<td>Test and Evaluation Master Plan (TEMP)</td>
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<td>Operational Test &amp; Eval</td>
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<td>Review/Assessment (PRR/PRA)</td>
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<td>CRITICAL</td>
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<td>Missile Systems Fundamentals to include rockets, GSE, etc.</td>
<td>LogE Specialized Training</td>
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<td>Aviation Systems Fundamentals</td>
<td>Other avenues/certifications</td>
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<td>Airworthiness Concepts</td>
<td>Performance Metrics</td>
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<td>Condition Based Maintenance Concepts</td>
<td>Oral Communications</td>
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<td>LOGSA Tools</td>
<td>Disruptive Technology</td>
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<td>Clockwork</td>
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<td>COMPASS</td>
<td>Production/Inventory Systems</td>
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<td>Maintenance Systems</td>
<td>Technical Data Management, Interface Management</td>
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<td>Problem Solving tools (e.g., pareto analysis, modeling and simulation tools, root cause analysis, scatter diagrams, histograms, fishbone diagrams, Deming’s 14 points, etc.)</td>
<td>Enterprise Integration</td>
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<td>Experiential Knowledge</td>
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<td>Cost and Scheduling</td>
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<td>Cost and Risk Mitigation</td>
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<td>PBL Concepts</td>
<td>Product and Process Design and Improvement</td>
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<td>Systems Engineering Toolkit</td>
<td>Value Engineering Methodology</td>
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<td>Requirements Analysis</td>
<td>Transportation/Distribution</td>
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<td>Systems Engineering Management</td>
<td>System Maturity Process</td>
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<td>Supportability Readiness Levels</td>
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<td>Technology Readiness Levels</td>
<td>Tech Loop Process</td>
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<td>Manufacturing Readiness Levels</td>
<td>Quality Management Process to include QDR/PQDR</td>
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<td>Logistics Engineer Role in Weapons system life cycle</td>
<td>Inventory Management</td>
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<td>Missile Maintainer</td>
<td>Flight line, e.g. Ft. Campbell</td>
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<td>Tech Manuals and IETMs</td>
<td>Risk Assessment and Analysis</td>
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<td>Financial Management</td>
<td>Logistics Modernization Program Utilization</td>
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<td>Data Mining</td>
<td>LOGSA</td>
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<td>IMM</td>
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<td>Supportability KPPs</td>
<td>LOGSA &amp; Aviation Contractor: Log and Production</td>
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<tr>
<td>Logistics Support Analysis (LSA) including Hands on concepts</td>
<td>PM Rotations</td>
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<td>ILS Process</td>
<td>ED divisions</td>
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<td>LogE Role in the Weapons System Life Cycle</td>
<td>RAM</td>
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<td>LORA/SORA</td>
<td>PIF</td>
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<td>Supportability Strategy</td>
<td>Engineering Support (TPS/Prognostics/Diagnostics)</td>
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<td>Product Support Package</td>
<td>Supply Chain</td>
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<td>Log Demos Planning and Results</td>
<td>Logistics Engineer Role in Weapons system life cycle</td>
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<td>Discrete Simulation—stochastic rather than 6-DOF continuous</td>
<td>LOGE Specialized Training</td>
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<td>Analysis of Alternatives</td>
<td>Other avenues/certifications</td>
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<td>Interfacing with TRADOC</td>
<td>Management Concepts</td>
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<td>Life Cycle Management</td>
<td>RAM Concepts</td>
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<td>DOTMLPF (Doctrine/Organization/Training/Materiel/Leadership/Personnel/Facilities)</td>
<td>RAM Tools</td>
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<td>FMECA Design</td>
<td>FMECA Design</td>
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<td>Root Cause Analysis</td>
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<td>Statistics</td>
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Moving From Acquisition to Life Cycle Management Framework

Traditional Acquisition Perspective

1. Materiel Solution Analysis
2. Technology Development
3. Engineering and Manufacturing Development & Demonstration
4. Production & Deployment
5. Operations & Support

Life Cycle Management Perspective

1. Materiel Solution Analysis
2. Technology Development
3. Engineering and Manufacturing Development & Demonstration
4. Production & Deployment
5. Operations & Support

Supportability Influence

- Integration of Acquisition and Sustainment into LCM
- Focus on Materiel Readiness
- One set of metrics throughout the System Life Cycle
- Sustainment Maturity Levels
- Strengthened Governance
**Background**

- New blade cost = $127K (9600hr life limit)
- Sikorsky Cat IV program repairs MRBs considered “beyond DMWR” at $97k/per
  - Current program requires only 1100hrs useful life remaining
  - Still life limited by spar after repair
- Study needed to determine beyond economic repair criteria

**Project Savings**

- $6.44M over 10 Years

**Accomplishments**

- Analyzed 2410 data to build age distribution models of the blade fleet
- Developed Monte Carlo Simulation to optimize screening point
- Optimal screen adjusted to 3600hrs useful remaining life (+2500FHs)
- Recommendation incorporated into FY2010 M&O SOW for MRB

**Path Forward**

- Project Complete
- Use similar methodology on other AMCOM M&Os
UH-72A Engine Coking

**Description**

- Engine seizing (after shutdown only) due to coking at Ft. Polk, LANG-Pineville, and TXNG-Austin. 69 total engine manifolds affected (multiple repeat coking events). $35,000 per manifold (minimum).
- Initiatives to mitigate engine coking events and effects while root cause is investigated and corrective action is developed.
  - +100 use (not effective at preventing coking)
  - “Piston Kleen” engine wash
- #1 Sustainment issue for PM LUH.

**Path Forward**

- “Piston Kleen” periodic maintenance alignment.
  - Storage, shipping, frequency, HAZMAT
- Develop long-term solution (manifold design, coatings).
  - Work in tandem with PM LUH SE to minimize impacts to ILS elements / Fleet Management

**Accomplishments**

- +100 Program
  - Eliminated storage / HAZMAT issues
  - Developed redundant +100 initiation procedures to disallow inadvertent fueling of transient A/C
  - Simplified use, training, and calibration by selecting electronic pump and coordinating on-site training by OEM
- Used engineering test data and Logistics fuel consumption data to show manifolds at Ft. Polk coked on in-specification fuel.
- Cleared Piston Kleen for use at Ft. Polk
- Projected PM LUH 10 year cost savings - $13.52M

**LogE Barometer**

<table>
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<th>Life Cycle Phase</th>
<th>MSA</th>
<th>TD</th>
<th>EMD</th>
<th>P&amp;D</th>
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</table>

- Data Mining/Analysis
- Develop Supportability Strategies
- Design Impact
- Cost benefit analysis
- Provide meeting/IPT support
Logistics Engineering Timeline

- Nov 08: Executive Committee Meeting
- Nov 08: UH-60 Pilot Agreed to by Executive Committee
- June 10: Logistics Engineering Becomes Top 10 ED Core Function
- July 09: UAS
- May 09: Blackhawk
- Mar 10: Lakota
- Sep 10: Cargo
- July 10: JAMS
- Aug 10: CCWS
- Aug 11: SE2T Pilot Begins
- July 11: LogE Team Formed
- Jul 2012 First LogE II Course
- Sep 2012 LogE Group Formed
- Feb 13 NSRWA
- Aug 13: SE2T Graduation
- Jan 2013 AMCOM Express LogE Contract Awarded
- Dec 11: DOD Defense Log Award Finalist
- Jul 12: ALC
- Jan 11: Apache
- 15 Dec 08: First Advisory Council
- Nov 08: UH-60 Pilot Agreed to by Executive Committee

**Workshop**

**Milestone**

**Project Office Added**
Logistics Engineering

Influence Design for Sustainment

- Reduce Total Ownership Costs and Logistics Footprint
- Increase Readiness
- Reduce Maintenance Burden
- Improve Supply Chain Performance

Collaboration - Provide capability that fosters collaboration between Logistics and Engineering
• Pilot - 2009
• Formal Team – Jul 2011
• IO Group – Sep 2012
• Growth:
  • From 2 Eng in Blackhawk
  • To 16 organic and 6 Contractors in 9 organizations.
• Team Meetings
  • Efforts Peer Reviewed Twice a Month
• Workshops
1 – 11  Defining, Developing, and Implementing Logistics Engineering
12 - June 2011  Inventory Management/ Supply Chain/ Production Planning
13 - September 2011: Reliability Centered Maintenance - Fleet Management, CBM, RCM, CTR
14 - December 2011: Cost Analysis & EPDM - CBA, CASA, ePDM, Performance Metrics, Data Modeling, Knowledge Management, System Improvement, Cost Engineering, & Rights in Technical Data
15 - March 2012: Analysis Tools - LORA, COMPASS, Inventory Modeling, Predictive Logistics Enterprise Solutions,
16 - June 2012: Projects IPT - Obsolescence Management, RIP, PIPP &
17 - October 2012: Test Measurement Diagnostic Equipment (TMDE), USATA Overview, ESD Overview, & Logistics Engineering Training Modules Training: Learning Teams
18 - February 2013: Technical Publications
Site Visits: Intermodal Center, SESI, Ft Campbell
19 - August 2013: Packaging, Handling, Storage & Transportability
LogE CAREER MANAGEMENT

LogE Career Progression

1. Specialty Engineering Education and Training Program (SE2T)
2. Technical Training/Development Assignments
3. Acquisition Level III Certification/Corps
4. Masters/PHD Programs

Developmental Assignments

- Flight line/Missile Maintainer assignments
- Schoolhouse rotations
- LOGSA rotations
- IMMC rotations
- Supply Chain Certificate (UAH)
- CCAD/LEAD assignments

SPRDE w/LCL Acquisition Certification

- Systems Engineering
  - SYS 101
  - SYS 202/3
  - SYS 302
- Acquisition
  - ACQ 101
  - ACQ 201A/B
- Functional Training
  - LOG 101/2
  - CLE 003
  - CLL 008
  - CLE 008/301
  - LOG 103/200/204
  - LOG 201/235A/236B

1 Year Experience 2 Years Experience 4 Years Experience

SPRDE

Level I Level II Level III
Year One

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“Core” Specialty Engineering Courses

✓ Engineering Management
✓ Math Stat I and II
✓ Software Quality Engineering
✓ Reliability Engineering I and II
✓ Quality Engineering
✓ Operations Research
✓ Project Management
✓ Logistics Engineering I and II
✓ Multivariate Analysis for Engineers I and II
✓ Theory of Maintained Systems

• DAWIA Certification Lvl II
• Senior Speakers Forum
• Financial Mgt
• Army Writing
• Risk Management
• Config Mgt/ Tech Data
• Test and Evaluation Eng
• Professional Presentations

Year Two

Auburn, MS Industrial & Systems Eng. Fall 2012, Spring and Summer 2013

Training Facility Student Work Area

ALLC Distance Learning Studio
Front End Analysis

- Developing Product Support Performance Requirement’
- Conduct Functional Requirements Analysis
- Mission Hardware, Software, & Support System Standardization
- Analyzing support systems for similar systems
- Technological Opportunities
- Supportability Related Design Factors

• Design/Supportability Trade-offs
  - Assessing Alternatives For Meeting Design Requirements

• Logistics Product Development
  - Technical Manuals, Maintenance Allocation Charts, Bill of Materials, Provisioning Lists, etc.
Product Support Analysis

GEIA-STD-0007 – Logistics Product Data
• Updated in May 2013
• Identifies
  • Data Relationships
  • XML Tags for Data Transfer

Handbooks
• GEIA-HB-0007 - Logistics Product Data Handbook
• TA-HB-0007-1 - Logistics Product Data Reports Handbook
  • May 2013
Product Support Manager’s Guidebook

- Lays out roles of Product Support Manager – whose role is to integrate product support elements in DOD Acquisition Programs.
- Includes Guidance on:
  - Life Cycle Sustainment Plan
  - Sustainment Maturity Levels
Army Guidance

- DA Pam 700-28 – Independent Logistics Assessments –
  - June 2013
  - Calls for independent assessments of Army programs to ensure logistics considerations are being addressed throughout the lifecycle.
  - First Army document to call out the aforementioned GEIA and TA standards.
Army Regulation and Guidance

AR 700-127 – Integrated Product Support (ILS)
- Being revised to reflect latest changes to the product support area
- Currently in Staffing
- Lays out Army’s roles and activities related to Product Support Management
- Includes the aforementioned GEAI /TA documents:
  - GEIA-STD-0007 and TA-STD-0017
- Includes adherence to the Sustainment Maturity Levels!

DA PAM 700-127-1 – Integrated Product Support (ILS) -
- Additional Guidance on
  - PSM Roles
  - Metrics
  - Contracting for product support
Summary

• How does the AMRDEC help to integrate Logistics into the design process?
  – Follow OSD, Army, and Industry regulations, standards, and guidance
  – Integrate Systems Engineers into Logistics Organizations (Logistics Engineers)
  – Created Logistics Engineering career roadmap and training programs
  – Established formal AMRDEC Logistics Engineering group to manage program, coordinate efforts, build/maintain the functional Logistics Engineering discipline