Lean Now Workshop

Presented By
LAI Lean Experts

January 2003
Agenda – Morning
LAI Lean Now Workshop

0800  Welcome
0805  Introductions - Ice Breaker
0815  NASCAR Video
0830  Fundamentals of Lean
0915  Break
0930  Lean Concepts and Tools
1030  Manzana Insurance Case
1150  Case for Action and Lunch Exercise
1200  Lunch
Agenda – Afternoon
LAI Lean Now Workshop

1300  Team Discussion - Lunch Exercise
1330  Lean Enterprise
1400  Big Picture
   • Lean Now Support Structure
   • Roles and Responsibilities
   • LAI Overview and Tools
1445  Break
1500  Leading Transformation
1530  Closing Comments
1600  Adjourn
Introductions – Ice Breaker
Introductions

• Name/location

• Position/background (current - be general)

• Lean expertise (1-5, 5 being high)

• Something about you that is unusual or not common knowledge
The “Burning Platform” - Value Creation

- Value stream focus
  - Create value
  - Eliminate waste
  - Adapt quickly to new challenges
- Expeditionary mindset and culture
  - Innovative, adaptive and responsive
- Get it faster with fewer resources
Lean is a process of eliminating waste with the goal of creating value for enterprise stakeholders.

- *Lean Enterprise Value*, Murman et al
NASCAR Video
Lean Works Everywhere

- **Export licensing:**
  - 56 steps to 21 steps
  - 52 handoffs to 5 handoffs
  - Cycle time from 60 days to 30 days
  - 50% 1st pass yield to >90% 1st pass yield

- **Payroll:**
  - Reduced non-value added steps by 50%
  - 15 forms to 1 form
  - Reduced signatures/approvals by 25%

- **Recruiting:**
  - Cycle time from 14 days to 48 hours
  - 50% reduction of paper resumes

- **Proposal:**
  - Cycle time from 30.6 days to 7 days

- **Program support:**
  - $3M savings

- **Interface management:**
  - Proposal, contract, billing, and collection steps
  - Generated $21M additional cash

- **Engineering order release:**
  - Cycle time from 76 to 4 days
  - Total queue time from 56 days to 60 minutes

- **Process definition:**
  - Work package completion cycle from 4 months to 3 weeks

- **Financial reporting:**
  - 13 weeks to 3 weeks
Fundamentals of Lean
Lean was Born out of Necessity

August 15, 1945 -- end of war with Japan

- Toyota faced a daunting challenge: How to succeed against Western mass production auto giants poised to enter Japanese market?
- Kiichiro Toyoda to Taiichi Ohno: “Catch up with America in three years.”
- Ohno’s challenge: How to design a production system exploiting central weaknesses of mass production model

Japan’s dilemmas

- Small & fragmented market, depleted workforce, scarce natural resources, little capital
- Lean evolved as a coherent response to this challenge over a number of decades -- a dynamic process of learning and adaptation later labeled as “lean production” by Western observers
Use Less, Offer Greater Variety, Higher Quality, and More Affordable Products in Less Time

- Best Japanese auto companies developed a fundamentally different way of making things
- These companies changed the dynamics of international competition
- New goals in manufacturing systems -- combined benefits of craft and mass production
  - Improved quality
  - High productivity
  - Efficiency at low volumes
  - Production flexibility
  - Rapid, efficient development cycle
  - Product mix diversity
- Lean production contrasts with traditional mass production paradigm
- Systemic principles are transferable
Lean Thinking: Eliminating Waste with the Goal of Creating Value

- **Customer-focused**: Customer needs and expectations “pull” enterprise activities
- **Knowledge-driven**: Draws upon knowledge and innovation from everyone - workers, suppliers
- **Eliminating waste**: Stresses elimination, not just reduction, of all types of waste
- **Creating value**: Puts premium on “growing the pie”, not just reducing costs, to benefit all stakeholders
- **Dynamic and continuous**: Pursues on-going systemic as well as incremental improvement - both innovation and continual improvement
Lean Provides Positively-Reinforcing Concepts, Practices and Tools

- **Delivering just-in-time:** "Pull" based production
- **Striving for perfect quality:** Completely defect-free parts must flow to each subsequent process; quality designed-in, not based on inspection, mistake proofing
- **Flexibility and responsiveness:** Small processing sizes and quick set-up times; ability to respond to shifts in demand
- **Trust-based relationships:** Mutual commitments and obligations, internally and externally with suppliers
- **Continuous improvement (Kaizen):** Continuous improvement through work standardization, productive maintenance, root cause analysis, and worker training and empowerment
Five Lean Fundamentals

- **Specify value:** Value is defined by customer in terms of specific products & services
- **Identify the value stream:** Map out all end-to-end linked actions, processes and functions necessary for transforming inputs to outputs to identify and eliminate waste
- **Make value flow continuously:** Having eliminated waste, make remaining value-creating steps “flow”
- **Let customers pull value:** Customer’s “pull” cascades all the way back to the lowest level supplier, enabling just-in-time production
- **Pursue perfection:** Pursue continuous process of improvement striving for perfection

Lean Thinking is Linked to & Complements Other Systemic Change Initiatives

<table>
<thead>
<tr>
<th>Total Quality Management</th>
<th>Reengineering</th>
<th>Traditional Six Sigma</th>
<th>Lean</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td><strong>Meet Customer Expectations</strong></td>
<td><strong>Breakthrough Solutions</strong></td>
<td><strong>Reduce Variation in all Enterprise Operations</strong></td>
</tr>
<tr>
<td><strong>Focus</strong></td>
<td><strong>Product Quality</strong></td>
<td><strong>Business Processes</strong></td>
<td><strong>All Sources of Product Variation</strong></td>
</tr>
<tr>
<td><strong>Scope</strong></td>
<td><strong>Business Unit</strong></td>
<td><strong>Business Unit</strong></td>
<td><strong>Enterprise</strong></td>
</tr>
<tr>
<td><strong>Change Process</strong></td>
<td><strong>Incremental</strong></td>
<td><strong>Radical Change</strong></td>
<td><strong>Process-specific; continuous</strong></td>
</tr>
<tr>
<td><strong>Business Model</strong></td>
<td><strong>Improve Efficiency &amp; Shareholder Value</strong></td>
<td><strong>Increase Enterprise Performance &amp; Customer Value</strong></td>
<td><strong>Minimize Waste &amp; Increase Customer Satisfaction</strong></td>
</tr>
</tbody>
</table>
Only Understood Processes Can Be Improved

- Establish models and/or simulations to permit understanding
- Ensure process capability & maturation
- Maintain challenge of existing processes
Lean Concepts and Tools
Continuous Improvement Process

- Visualize
- Commit
- Prioritize
- Characterize
- Improve
- Achieve
Continuous Improvement Process

**Visualize:** Imagine the Future
- Define case for action
- Visualize desired future state
- Establish goals
- Align with department goals

**Commit:** to Change
- Secure sponsorship
- Define scope

**Prioritize:** Determine Improvement Priorities
- Define current state
- Understand undesirable effects
- Determine root causes
- Develop alternative solutions
- Select solution, secure authority to proceed

**Characterize:** Define Existing Process/Leverage Points
- Collect additional data, if needed to design solution
- Characterize control systems affected by the desired improvement
- Validate project goals, schedule and cost

**Achieve:** Hold the Gains, Celebrate Achievements, Build for Tomorrow
- Test for meeting established goals
- Recognize achievements
- Capture lessons learned
- Plan for further improvements

**Improve:** Design & Implement Improvements
- Design the new solution
- Design the control system and metrics
- Plan implementation
- Plan and conduct necessary training
- Implement
Value Stream Mapping or VSM

- Tool used to visualize a process in order to “see” the value
- Provides a systematic method to improve a process by eliminating waste
- Creates “as is” and “to be” depictions of a process
  - Where you actually are, where you want to be, and how to get there

A good reference:
M. Rother and J. Shook, *Learning to See*, Lean Enterprise Institute, 1998
What is a Value Stream?

A value stream is…

- ALL the activities that create value
- Starts with raw materials or initial information
- Ends with the end-customer
- Involve several businesses
- Typical only a portion of the overall value stream is analyzed

Value Flows Across Functions

Logistics  Program Management  Engineering  Contracting  Production Management

Product or Service

Material and Information

The Hands of the Warfighter
What Flows Through a Value Stream?

In Manufacturing… materials are what flows

"Material Flow"

In Services… internal and external customer needs and information are what flows

"Information Flow"

Identify and Remove Impediments to Flow
Why is VSM a Useful Tool?

• Helps visualize interactions and flows
• Helps identify not only wastes but their sources as well
• Provides a common language for talking about a process
• Makes decision flows apparent
• Forms the basis of an implementation plan
• Shows the linkages between information and material flows
• Identifies the constraint(s) - any resource whose capacity is less than customer demand

Source: M. Rother and J. Shook, *Learning to See*, Lean Enterprise Institute, 1998
Basic Steps to VSM

1. Define the boundaries
2. Define the value
3. “Walk” the process
   • Identify tasks and flows of material and information between them
4. Gather data
   • Identify resources for each task and flow
5. Create the “Current State” map
6. Analyze current conditions
   • Identify value added and waste
   • Reconfigure process to eliminate waste and maximize value
7. Visualize “Ideal State”
8. Create the “Future State” map
9. Develop action plans and tracking
Tips for Creating a VSM

- Involve entire team
- Actually walk the process - follow the material and information through the process, starting at the beginning
- Use post-it notes and butcher paper
- Use symbols or icons that are meaningful to the process but common enough to be understood by all involved
Administrative Process Value Stream Map - Current State

- Process Steps: 56
- Handoffs: 52
- Cycle Time: 60 days
- 1st Pass Yield: 50%

Source: Raytheon
Administrative Process Value Stream Map - Future State

Process Steps:
21
62% reduction

Handoffs:
5
90% reduction

Cycle Time:
30 days
50% reduction

1st Pass Yield:
100%
100% improvement

Source: Raytheon
Keys for Success with VSM

Follow the Process

• Remember that value stream mapping & analysis is a process
• Avoid short-cuts…the steps are important!
• Remind yourself and your team to be disciplined

"We can skip this step"
"We already know how we want to make this"
"Let’s not worry about that for now"

Learn by Doing!

This Process Works!!
### Value-Added Activities
- An activity that transforms or shapes material or information
- And the customer wants it
- And it’s done right the first time

### Non Value-Added – Needed Activities
- Activities causing no value to be created but which cannot be eliminated based on current state of technology or thinking
- Required (regulatory, customer mandate, legal)
- Necessary (due to non-robustness of process, currently required; current risk tolerance)

### Non Value-Added Activities
- Activities that consume resources but create no value in the eyes of the customer
- Pure waste
- If you can’t get rid of the activity, it turns to yellow
The Goal is to Eliminate Waste

Types of Waste

- Defects
- Over Production
- Transportation
- Movement
- Waiting
- Inventory
- Over Processing
### The Seven Types of Waste In Business Processes

<table>
<thead>
<tr>
<th>Type</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defects</td>
<td>incorrect data entry</td>
</tr>
<tr>
<td>Over Production</td>
<td>preparing extra reports, reports not acted upon, multiple copies in data storage</td>
</tr>
<tr>
<td>Transportation</td>
<td>extra steps in the process, distance traveled</td>
</tr>
<tr>
<td>Movement</td>
<td>extra steps, extra data entry</td>
</tr>
<tr>
<td>Waiting</td>
<td>processing monthly, not as the work comes in (i.e. closings)</td>
</tr>
<tr>
<td>Inventory</td>
<td>transactions not processed</td>
</tr>
<tr>
<td>Over Processing</td>
<td>sign-offs</td>
</tr>
</tbody>
</table>
What is Cycle Time?

- Cycle time is the time required to execute activities in a process
- This could be:
  - A single process
  - A single task or activity
  - A group of tasks or activities
  - Customer order to customer delivery
- Cycle time includes actual processing time, as well as any waiting time (in calendar days)

**Dynamic Cycle Time (Little’s Law)**

\[
\text{Cycle Time} = \frac{\text{work in process (WIP)}}{\text{throughput rate}}
\]
What Makes Cycle Time High?

Product flow variability

Complexity of processes

Inventory or work in progress (WIP)
Time Value Charts

Cycle Time

Task to In Box

First Task

In Process

Work Completed

In Box Wait Time

In the Mail

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Components of Cycle Time
- An Example -

Total actual cycle time 43 days

Processing Time:
Value added processing 3 days
Non-value added processing 9 days

Wait Time:
For processing 31 days

The big cycle time savings comes from the reduction of time product spends waiting in front of these operations.
Takt Time - Measure of Customer Demand

Takt Time is…

- from the German word for meter which establishes the pace or beat
- a reference number that provides a drum beat for the process

\[
\text{Takt Time} = \frac{\text{available time}}{\text{customer demand rate for available time}}
\]
## Level Loading Work

### Incoming Order Requests

<table>
<thead>
<tr>
<th></th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Tuesday</td>
<td>0</td>
<td>1</td>
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<tr>
<td>Thursday</td>
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<td>2</td>
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</tr>
<tr>
<td>Friday</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

### Average Order Requests Per Day

- **Week 1**: \( \frac{10}{5} = 2 \) per day
- **Week 2**: \( \frac{8}{5} = 1.6 \) per day
- **Week 3**: \( \frac{12}{5} = 2.4 \) per day
- **Week 4**: \( \frac{10}{5} = 2 \) per day

### Diagram

- Level Load: 2 per day

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Standard Work

- Best process currently known, understood, and used today

- Tomorrow it should be better based on continuous improvement
  - Standard work must be revised to incorporate improvements
Case Study – Manzana Insurance
Observations Discussion

• Group discussion (30 minutes)
• Each group identify possible reasons for Manzana’s difficulties in reducing turn-around times
• Consider possible solutions based on lean tools discussed this morning
• Group Report Out
Process Discussion

Some Reasons for long turnaround time:

• Varying priorities
• Work load distribution
• Poor scheduling
• Process variation
• Waste
Discussion - Takt Time

Is one-day turnaround (as promised by competitor), even feasible at Fruitvale Branch?

• Takt Time calculations
  • 40 requests per day (RUNs, RERUNs, RAINs, RAPs)
  • 7.5 hr/day X 60 minutes/hr = 450 available minutes per day
  • Takt Time (T/T) = available time/requests
  • T/T = 450/40 = 11.25 minutes per request

T/T = 11.25 minutes
Discussion - Process Capability

“As-Is” Operations Flow (Exhibit 2)

*Average Standard Turnaround Time (Exhibit 4)

\[(x) = \text{Headcount}\]
Discussion - Standard Work Sheet

“As-Is” Standard Work Sheet

Distribution: 11.4 min, 45.6 min/4
Underwriting: 10.6 min, 31.9 min/3
Rating: 9.2 min, 73.5 min/8
Policy Writing: 11.0 min, 54.8 min/5

T/T = 11.25 min

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Suggested Changes

What changes would need to be incorporated to accomplish one-day turnaround time?

- Process redesign “Lean Flow” (perform to takt)
- Utilize true FIFO (no need to schedule due dates)
- Utilize RERUNs to level-load demand if necessary
- Distribute underwriting work evenly by abolishing dedicated teams (balance line)
- Use standard work to reduce process time variations
- Other?
Transition to New Process

How could the transition to the new process be accomplished?

- Leadership
- Communication
- Managing the cut-over to the new process
  - Starting at the end of the process
  - Phased approach to minimize disruption
  - Managing the backlog
Case For Action
## Insert Prototype Name

### Prototype Description:
One or two sentences that describe the team’s task.

### Preliminary Objectives:
The objectives are the measurable outcomes that the sponsor desires from the prototype. Usually two or three measurable objectives along the lines of reducing cycle time, handoffs, approvals, defects and/or costs are included.

### Value:
The Value to the end customer is...

The portion of the value-added by this prototype area is...

### Process Information:
Should include:
- Prototype boundaries (where does this process begin & end)
- Any commandments or monuments
- Listing of available process data

### Start Date:

### Team Leader:
Person responsible for pre & post work follow up.

### Co-Leader:

### Team Members:
People that need to participate on the team

### Process Owner:
Person(s) who owns the process

### LAI Lean Expert:
Person who will facilitate the event

### Case For Action:
One or two sentences that describe the problem the team is addressing and answers the “Why This Prototype, Why Now?” question
Contract for Change

We, the Leadership, pledge to support the Lean transformation through the following actions:

• We will write and communicate a vision and strategy for the area which makes the Lean Transformation
• We shall appoint a “Core Team” which will figure out the specific approach to Lean for this area
• We shall participate in the Value Stream Analysis by attending the daily or weekly outbriefs, consensing on major opportunities and improvement approaches and finally signing the contract for change
• We shall lead the improvement process through our work on the Steering committee and shall assign appropriate resources to ensure that the transformation is successful

__________________________  _________________________  _______________________
__________________________  _________________________  _______________________
__________________________  _________________________  _______________________

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Contract for Participation

- I will focus my energy for the next 3 months on doing a complete and thorough analysis to help determine the path to the future
- I will work cross-functionally and keep an open mind
- I will solicit participation from other key stakeholders and do a good job of communicating the intent to all who input to the process
- I will seek to rely on “facts” to guide the decisions that the team recommends
Lunch Exercise
## 5 and 5

<table>
<thead>
<tr>
<th>5 Opportunities</th>
<th>5 Obstacles</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>1.</td>
</tr>
<tr>
<td>2.</td>
<td>2.</td>
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<tr>
<td>3.</td>
<td>3.</td>
</tr>
<tr>
<td>4.</td>
<td>4.</td>
</tr>
<tr>
<td>5.</td>
<td>5.</td>
</tr>
</tbody>
</table>

### Monuments
Agenda – Afternoon
LAI Lean Now Workshop

1300  Team Discussion - Lunch Exercise
1330  Lean Enterprise
1400  Big Picture
   • Lean Now Support Structure
   • Roles and Responsibilities
   • LAI Overview and Tools
1445  Break
1500  Leading Transformation
1530  Closing Comments
1600  Adjourn
Team Discussions - Lunch Exercise

Goal: Identify 5 and 5 for the team
Developing an Enterprise View
“The Lean Enterprise”
Enterprise Defined

“One or more organizations having related activities, unified operation, and a common business purpose”

Source: Blacks Law Dictionary, 1999

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Program Value Stream
Multi-Program Value Stream
National and International Value Stream
<table>
<thead>
<tr>
<th>Level</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program</td>
<td>F/A-22</td>
</tr>
<tr>
<td>Multi-Program</td>
<td>Boeing, USAF, Lockheed Martin</td>
</tr>
<tr>
<td>National or International</td>
<td>Primes, Suppliers, Government</td>
</tr>
</tbody>
</table>
JSF Example of a Program Enterprise

Centralized Control

Decentralized Execution

Status at a Glance Metrics

Supply Chain Management

UK Ownership

BAE Systems

NG ACS

LM Aero

LMIS

Training

Support

Airframe

Vehicle Systems

Mission Systems

Major Critical Suppliers

World Class Team

Rapid Decision Making

Flexible Repositioning


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Air Force Acquisition Enterprise

“Any group or individual who can affect or is affected by the achievements of the organization’s objective”

Source: Freeman, Strategic Management: A Stakeholder Perspective, Pittman, 1984

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Define Enterprise in a Lean Context

“A lean enterprise is an integrated entity that efficiently creates value for its multiple stakeholders by employing lean principles and practices.”

Source: Murman et al., Lean Enterprise Value, Palgrave, 2002
Identify the Focus of Lean Enterprises

- Waste minimization
- Responsiveness to change
- Right thing at right place, and in right quantity
- Effective relationships within the value stream
- Continuous improvement
- Quality from the beginning
LEM Overarching Practices
Address People and Process

**People Practices**
- Promote lean leadership at all levels
- Relationships based on mutual trust and commitment
- Make decisions at lowest appropriate level
- Optimize capability and utilization of people
- Continuous focus on the customer
- Nurture a learning environment

**Process Practices**
- Assure seamless information flow
- Implement integrated product and process development (IPPD)
- Ensure process capability and maturation
- Maintain challenges of existing processes
- Identify and optimize enterprise flow
- Maintain stability in changing environment
Identify Principles Applicable to Lean Enterprises

- Create lean value by doing the job right *and* by doing the right job.
- Deliver value only after identifying stakeholder value and constructing robust value propositions.
- Fully realize lean value only by adopting an enterprise perspective.
- Address the interdependencies across enterprise levels to increase lean value.
- People, not just process, effectuate lean value.
Lean Thinking Focus on Enterprise, Process, Lifecycle

- Enterprise perspective
- Process focus
- Functional integration
- Lifecycle orientation

Value Flows Across Functions

Product or Service
Big Picture
Leverage and Institutionalize the Findings

Intent for Each Program
(facilitated by LAI SMEs)
- Determine "current reality"
- Compare to LEM practices
- ID Gaps & Set Req'd Outcomes
- Gap Closure Plan
- Implement
- Show Results

F/A-22 (Test and Evaluation)
Lead LAI SME - LM
LAI SME Coaching Team
- Boeing
- AF SME

F-16 (Contract /Closeout)
Lead LAI SME - LM
LAI SME Coaching Team
- AF SME
- DCMA
- TBD (Spiral 2)

Global Hawk (Alpha Contracting)
Lead LAI SME - NG
LAI SME Coaching Team
- Raytheon
- AF SME

LAI ExBd
How to institutionalize the key results?

Project Coordination Network

- Spiral 1
- Spiral 2
- Spiral 3
- Spiral 4

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The LAI Lean Experts
... As of Nov 02

- Spiral 1 to focus on three projects/processes
- Four Lean Experts from industry on board
  - Boeing
  - Lockheed Martin
  - Northrop-Grumman
  - Raytheon
- Each Lean Expert is an experienced expert in transition and lean
- Committed to one year assignment with LAI Lean Now Change agent, mentor and trainer
- AF committed to providing four Lean Expert candidates
- Other LAI member companies stand ready to help
Initial Engagement Plan
Based on F/A-22 Prototype

- Pre Workshop Event(s)
- AF Lean Expert Training/Certification
- Communication – reviews/status
- Final report out
  - Results
  - Benefits
  - Sustaining The Gain
- ID next project(s) for continuing improvement
Roles and Responsibilities
LAI Lean Experts

- Coach/Sensei
- Facilitate
- Train/Certify
- Mentor
- Lean knowledge experts
- Feedback
  - To Air Force
  - To LAI
- Network across projects (Support system)
- Communicate
- Follow the process
- Establish certification criteria

Long Term Commitment to Lean Transformation

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Roles and Responsibilities
Air Force Lean Experts

- Become a Coach/Sensei
- Facilitate
- Become trained and certified
- Mentor projects as needed
- Become a lean knowledge expert
- Provide feedback to Air Force
  - To LAI
- Network across projects (support system)
- Train next wave of AF Lean Experts
- Become a change agent
- Communicate
- Follow the process

Long Term Commitment to Lean Transformation
Air Force Prototype Team Lead

- Be a collaborative leader
- Communicate
  - Progress
  - Metrics
- RAA (Responsibility, Authority, Accountability)
- Assign and follow-up on action items
- Manage scope
- Be a team member (see other roles)
- Rely on Lean Experts for guidance
Prototype Team Members

- Plan and manage project
- Supply process expertise
- Collect process data
- Generate/supply improvement ideas
- Advocate change
- Be a team player
- Follow through with implementation
- Learn
- Become lean advocates
- Communicate
- Keep smiling and have fun!
LAI Overview
Lean Aerospace Initiative
Consortium

- Airframe, engine, avionics, missile and space companies
- Air Force agencies and System Program Offices (C-17, F-22, JSF, Training)
- NASA, Army, Navy, NRO
- Pentagon - OSD, AF HQ
- International Association of Machinists
- MIT
The LAI Community

Avionics/Missiles
- BAE Systems North America
- Northrop Grumman ESSS
- Raytheon Systems Co.
- Raytheon Systems and Electronics Sector
- Rockwell Collins, Inc.
- Textron Systems Division

Space
- Boeing Space & Communications
- GenCorp Aerojet
- Lockheed Martin Space & Strategic Missiles
- Northrop Grumman ESSS Space Sector
- Spectrum Astro
- TRW Space and Electronics

Airframe
- Boeing Military Aircraft & Missiles
- Boeing Commercial Airplane Group
- Boeing Phantom Works
- Lockheed Martin Aeronautical Systems
- Northrop Grumman ISS
- Raytheon Aircraft Co.
- Sikorsky

MIT
- Center for Technology, Policy, and Industrial Development
- School of Engineering:
  - Aerospace
  - Mechanical
- Sloan School of Management

US Air Force
- SAF/AQ
- Aeronautical Systems Center
- Air Force Research Laboratory
  (Materials and Manufacturing Directorate)
- Space and Missile Center
- SPOs: JSF, F-22, C-17, Training (JPATS)

Other Participants
- IAM
- AIA
- DAU
- IDA
- International Collaborations:
  - Linköping University
  - Warwick, Bath, Cranfield
  - Nottingham Universities

Other Government
- DCMA
- NASA
- NAVAIR
- AMCOM
- OUSD(AT&L)
- NRO

Propulsion/Systems
- Rolls Royce (North America)
- Pratt & Whitney
- Hamilton Sundstrand
- Curtiss-Wright Flight Systems
- Harris Government Comm.

US Air Force
- SAF/AQ
- Aeronautical Systems Center
- Air Force Research Laboratory
  (Materials and Manufacturing Directorate)
- Space and Missile Center
- SPOs: JSF, F-22, C-17, Training (JPATS)
LAI Accelerates Transformation to Lean

"In effect, the LAI is responsible for taking years off our change-over from traditional to lean practices…"
Enterprise Value Phase Vision & Mission

**Vision:** U.S. aerospace enterprises reliably and efficiently creating value and rapidly adapting to change

**Mission:** Research, develop and promulgate practices, tools and knowledge to enable and accelerate the envisioned transformation of the greater US aerospace enterprise through people and processes
Key Stakeholder Value Expectations

Gen Lester Lyles, Commander, AFMC and LAI Co-Chair

• Get the word out; create and teach lean curriculum across the country
• “Kick it up a notch!”

Mrs. Darleen Druyun, Principal Deputy Assistant Secretary, SAF/AQ and LAI Co-Chair

• Lean promises and can deliver big improvements in productivity and efficiency
• Expand beyond the factory floor and into the rest of the organization, where the big costs are
• Lean must be driven into the supplier base
• Support Acquisition Center of Excellence
Enterprise Value Phase Goals

**Overarching Goal:** Accelerate the lean enterprise transformation of the U.S. aerospace enterprise

**Overarching Metric:** Meeting LAI stakeholders’ expectations

**Goal 1:** Support the ongoing lean transformation of industry

**Goal 2:** Enable lean, value-creating supplier base

**Goal 3:** Support lean transformation of the government

**Goal 4:** Educate and train stakeholders in value-creating lean principles and practices

**Goal 5:** Enhance the effectiveness of the national workforce

**Goal 6:** Support member implementation efforts by sustaining tools and knowledge base and by organizing outreach events
Lean Aerospace Journey And LAI Products

Lean Enterprise

Lean Factory

Lean Auto Factory

1993 Phase I
1996 Phase II
1999 Phase III
2002 EV Phase

Lean Enterprise Model
Transition to Lean Roadmaps (TTL)
Lean Enterprise Self Assessment Tool (LESAT)
LAI Book

Toyota Production System

LAI Book

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Lean Enterprise Toolset

How do I transform my enterprise to lean?

LEM Principles & Practices

What are lean principles and practices?

TTL Roadmap

Lessons Learned

Best Practices

Assessment

LESAT

How do I assess my progress?
Transition-To-Lean Roadmap

**Entry/Re-entry Cycle**
- Adopt Lean Paradigm
  - Build Vision
  - Convey Urgency
  - Foster Lean Learning
  - Make the Commitment
  - Obtain Senior Mgmt. Buy-in

**Long Term Cycle**
- Focus on the Value Stream
  - Map Value Stream
  - Internalize Vision
  - Set Goals & Metrics
  - Identify & Involve Key Stakeholders
- Develop Lean Structure & Behavior
  - Organize for Lean Implementation
  - Identify & Empower Change Agents
  - Align Incentives
  - Adapt Structure & Systems

**Decision to Pursue Enterprise Transformation**
- Transition-To-Lean Roadmap

**Initial Lean Vision**
- Environmental Corrective Action Indicators

**Short Term Cycle**
- Focus on Continuous Improvement
  - Monitor Lean Progress
  - Nurture the Process
  - Refine the Plan
  - Capture & Adopt New Knowledge
- Implement Lean Initiatives
  - Develop Detailed Plans
  - Implement Lean Activities

**Enterprise Strategic Planning**
- Leverage Enterprise Metrics

**Detailed Lean Vision**
- Lean Transformation Framework
- Create & Refine Transformation Plan
  - Identify & Prioritize Activities
  - Commit Resources
  - Provide Education & Training

**Outcomes on Enterprise Metrics**
- +

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Evidence of Lean Potential in An Enterprise

- F-16 maintained sales price and decreased order-to-delivery time by up to 42% while production rate decreased 75%
- C-17 unit priced decreased from $260M to $178 M for final 80 aircraft of 120 aircraft buy.
- Northrop Grumman ISS lean enterprise implementation reduced throughput times for major systems by 21 to 42%.
- F/A18-E/F EMD completed on time, within budget (without rebaseline) while meeting or exceeding performance requirements.
- Raytheon realized $300M FY 2000 bottom line benefits from its enterprise wide Six Sigma program
Leading Transformation
Continuous Improvement Process

- Achieve
- Improve
- Characterize
- Prioritize
- Commit
- Visualize
Managing Complex Change

VISION + SKILLS + INCENTIVE + RESOURCES + ACTION PLAN = EFFECTIVE CHANGE

SKILLS + INCENTIVE + RESOURCES + ACTION PLAN = CONFUSION

VISION + INCENTIVE + RESOURCES + ACTION PLAN = ANXIETY

VISION + SKILLS + RESOURCES + ACTION PLAN = GRADUAL CHANGE

VISION + SKILLS + INCENTIVE + ACTION PLAN = FRUSTRATION

VISION + SKILLS + INCENTIVE + RESOURCES = FALSE STARTS
Things We Hide Behind . . . .

Culture

BARRIERS:

- NIH
- Politics
- Resistance to Change
- Mixed Signals
- Lack of Trust
- Skepticism
- Lack of Commitment
- Inconsistent Direction
Barriers to Improvement

- Concepts
- Theories
- Philosophies

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<th>NIH</th>
<th>Politics</th>
<th>Resistance to Change</th>
<th>Mixed Signals</th>
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Breakthrough!

- Concepts
- Theories
- Philosophies

Leadership

Knowledge

Understanding

Skills

Empowerment

Barsriers

Roadblocks
What Makes People Want to Change?

- Pain (burning platform)
- Despair (over long period of time)
- Discovery that change is possible
Which Organization is Likely to Lead the Way to the 21st Century?

**Traditional**
- Multiple reviews
- “Institutionalizes” waste
- Hierarchical approval
- Multiple processes & systems
- Sub-optimization
- “Push”

**Lean**
- Minimal meetings
- Focuses on “eliminating waste”
- Accountability
- Common processes & systems
- Business optimization
- “Pull”

Lean Is a Journey NOT an Event
What is Meaningful Change?

- **Unfreezing**
  - Resistance to change
  - Education and awareness

- **Movement**
  - Change agents
  - Change in behavior
  - Empowerment

- **Refreezing**
  - Application of reinforcement
  - Feedback – Measurements
  - Rewards

When the desired state is better than the existing state.

Meaningful change is the disruption of the status quo for a better state.
Elements of Success

All the elements to succeed are in place…..

• High and visible commitment
• Advanced information and focus
• Total involvement
• Process owners are the change agents
• Honest evaluations
• A good diagnosis (VSMs)
• Linked to mission and goals
• Professionalism

….. you are ready to succeed!

Take action, Lean Now!