

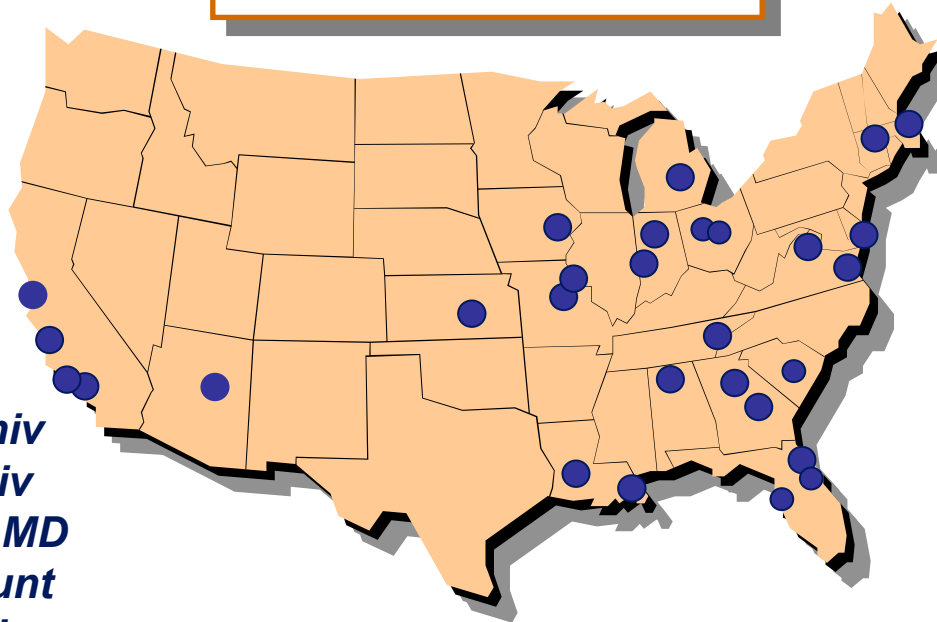


LAI EdNet and Lean Systems Engineering

April 17, 2007

● 32 Member Schools

*AFIT
AZ State U
Cal Poly SLO
Cranfield (UK)
DAU
Embry-Riddle
Georgia Tech
Indiana State Univ
Jacksonville Univ
Loyola College, MD
Loyola Marymount
Macon State Col
MIT
Old Dominion Univ
North Carolina State
Purdue Univ
St. Louis Univ, MO*



*San Jose State Univ
U of AL, Huntsville
U of Iowa
U of Michigan
U MO Rolla
USC
U of Bath (UK)
U of South Florida
U of Tenn, Knoxville
U of New Orleans
U of Louisiana,
Lafayette
U of Warwick (UK)
Wichita State Univ
Wright State Univ
WPI*

3 UK schools ● ● ●

Plus a 3-person (~1.5 FTE) EdNet Staff to coordinate, develop, and deliver curriculum

EdNet Vision & Mission

Vision: EdNet is a **learning community** dedicated to creating, deploying, and continuously improving **curriculum for enterprise excellence**; noticeably impacting workforce capability; and recognized as a **model of collaborative innovation**.

Mission: EdNet will **leverage member's expertise and resources** through collaboration and networking to accelerate the **development and deployment of curriculum** for achieving enterprise excellence.

Educate, Motivate, Innovate

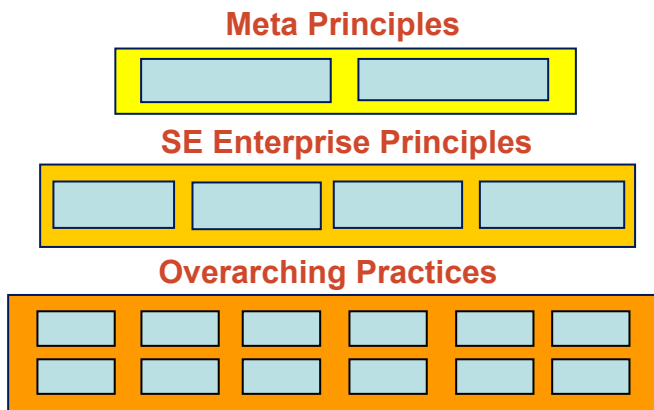
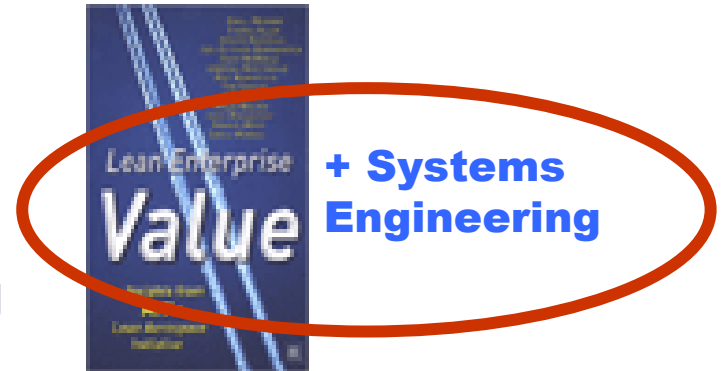
Curriculum Development Underway

- **Tailored LAI Lean Academy[®] courses:**
 - 5 day traditional course
 - 3 day short course
 - 1 day seminars
 - 3+1+1 combo courses
- **Develop Lean Engineering/Product Development course**
- **Develop Lean Supply Chain Management course**

Meeting needs with expanded curriculum offerings

LAI EdNet Lean SE Working Group

- SE processes recognized as sound, but not always applied effectively
- “Lean” provides an approach to maximize value while minimizing wasted effort
- Synergies of lean practices and SE practices are being explored



Possible WG outputs

- Lean SE Learning community
- Lean Systems Engineering Framework
- Course materials
- Research

- **Lean and Systems Engineering: processes that evolved through experience and practice**
 - Shaped by different contexts with different areas of emphasis
 - Bodies of Knowledge (BoKs) based upon observed best practices
- **Both emphasize process as a key enabler**
- **Both have the objective of better delivering best lifecycle value to the customer (end user)**
 - **Lean:** right product at the right time and cost
 - **SE:** right system that meets customer requirements and works on first use

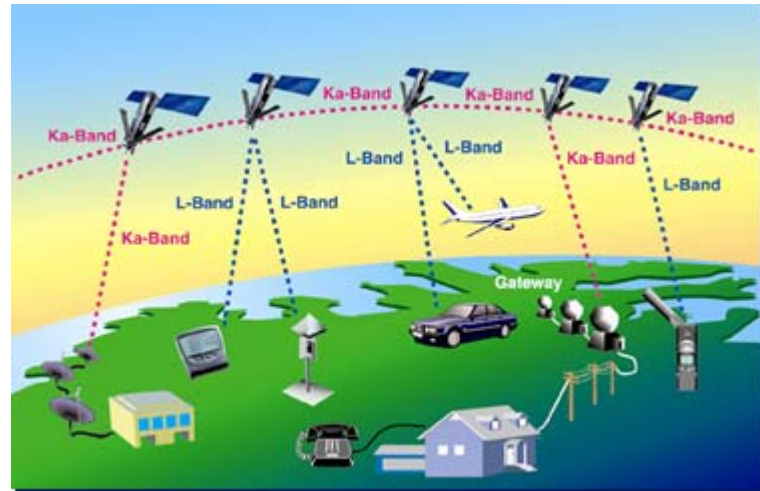
Can the combination of Lean and SE BoKs lead to a more effective and efficient SE approach?

Lean Systems Engineering ??

- Is there any evidence based upon actual practice that Lean Thinking and Systems Engineering are synergistic?
- Two examples help address this question



F/A-18 E/F



Iridium Satellite System



Systems Engineering

- Rigorous Requirements Flowdown
- Disciplined Technical Reviews
- Configuration / Data Mgt.
- Systems Cost-effectiveness/
- LCC Trade studies
- Producibility / DFMA
- Risk Management / TPM
- Program Independent Audits
- Reliability/ Maintainability/Safety
- Human factors engineering
- Integrated Logistics

Lean Practices

- Continuous Improvement
- Optimal First -Unit Delivered Quality
- Metrics Tracked Weekly Across the Extended Enterprise
- Seamless Information Flow (USN, NGC, GE Engines, Suppliers)
- Decisions Made at the Lowest Level of WBS Via “Delegated” RAA
- Joint Configuration Change Board
- Disciplined Weekly Earned Value Mgt. & Reporting

Achieved Cost, Schedule Performance Goals

Source: Al Haggerty, “The F/A-18E/F Super Hornet as a Case Study in Value Based Systems Engineering”, INCOSE Panel on Lean Systems Engineering, June 2004



Iridium Manufacturing

- Cycle time of 25 days vs. industry standard of 12-18 months
- Dock-to-Dock rate of 4.3 Days



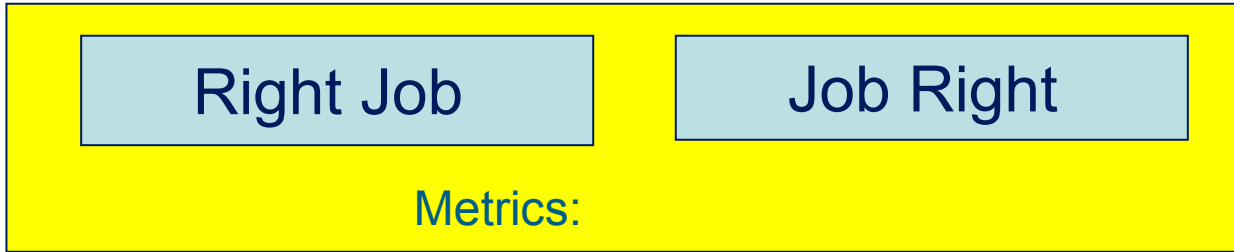
Iridium Deployment



- 72 Satellites in 12 Months, 12 Days
- 14 Satellites on 3 Launch Vehicles, from 3 Countries, in 13 Days
- 22 Consecutive Successful Launches !

Lean SE Tool: Draft Model

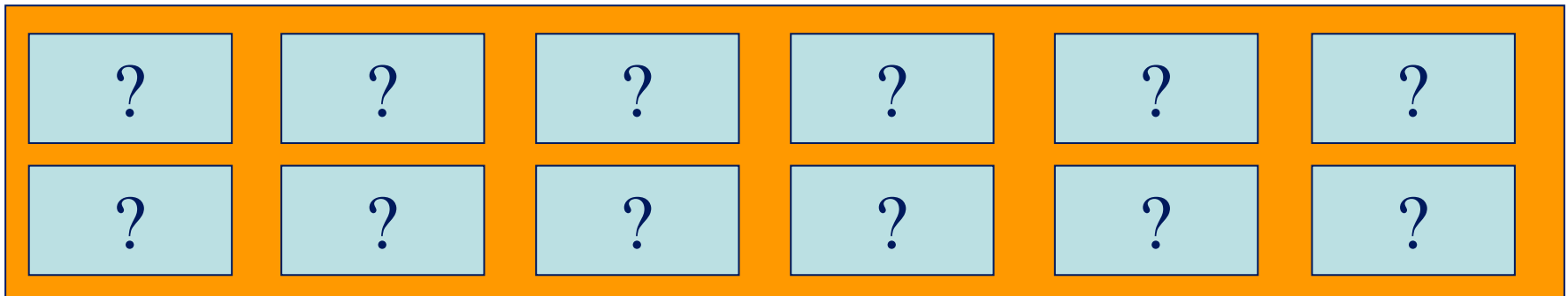
Meta Principles



SE Enterprise Principles



Overarching Practices



- **Lean and Systems Engineering have commonalities**
 - **Delivering value to customer and end user**
 - **Focus on process**
 - **BoKs based upon practice**
- **There is some evidence that program execution based upon both BoKs perform well**
- **Are there additional case studies we could learn from?**
- **Is there interest in codifying the LeanSE BoK?**