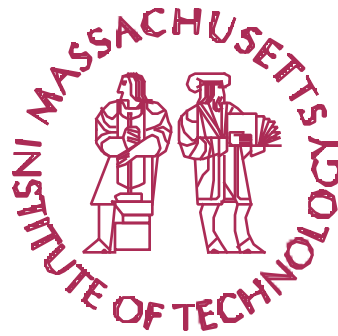


Integration of Space into LAI



January 13, 1998

**Joyce M. Warmkessel
MIT**



- Quick Look Study Results
- Integration of Space into LAI



Origins of Lean Space

- **Changing defense acquisition environment impacting space as well as aircraft**
- **AF/SMC interest in potential benefit of “lean” to space systems**
- **MIT requested to perform “Quick Look” study to evaluate benefits and issues. Contract initialed Dec. 1996.**



Quick Look Study Questions

- **Is a Lean Space Initiative of value?**
- **What is the basis for buy-in by the stakeholders?**
- **What is an appropriate Concept of Operations for a Lean Space Initiative?**
- **What should be the linkages with LAI?**
- **Should scope be limited to spacecraft and launchers or include operations?**



Quick Look Study Process

- **Form IPT**
 - **SMC/Mantech/Aerospace/Industry/MIT participation**
- **Survey stakeholders (written & visits)**
 - **Research Issues**
 - **Willingness to participate**
- **Map LEM into space enterprise**
- **Develop Concept of Operations**



Stakeholder Survey & Visits

Questions asked in Survey and Visits

- Would a Lean Space Initiative similar to the Lean Aircraft Initiative be of benefit to you?
- Will you be willing to participate?
- If so, how should it be structured?
- Have you initiated “lean” activities?
- What areas of research should be undertaken?
- What are key issues in achieving “lean-ness”?



Industry Stakeholders Queried

- ◆ Boeing Defense & Space Group (V)
- ◆ Hughes Space & Communications Co. (V)
- ◆ Lockheed Martin Astronautics (V)
- ◆ McDonnell-Douglas (V)
- ◆ Pratt & Whitney
- ◆ Textron Systems Division
- ◆ Space Applications Corp.
- ◆ Thiokol
- ◆ Lockheed-Martin Sunnyvale (V)
- ◆ Motorola
- ◆ Space Systems/Loral (V)
- ◆ TRW
- ◆ Computer Sciences (V)
- ◆ DynCorp
- ◆ GTE
- ◆ Globalstar
- ◆ Honeywell
- ◆ Litton Industries Inc.
- ◆ Raytheon Company
- ◆ Texas Instruments

(V) denotes visit



Government Stakeholders Queried

–Air Force

AFRL

Space Command (V)

ESC

ASC

AFMC

–NASA

–NRO (V)

–BMDO (V)

–Space Architect

–DUSD(Space)

(V) denotes visit

Survey Results:

- **Strong belief that the end-to-end process, from acquisition of space and launch assets to operation of those assets, can be streamlined**
- **Many believed a “lean space” activity would offer a modest-to-great benefit to their organization**
- **Most were interested in participating in a “lean space” activity**
- **Majority believed a lean space activity would benefit by being part of LAI**



Survey Results (Cont.)

- All have initiated major improvements in their productivity
- Current factors that discourage leanness:
 - Culture
 - “inconsistent and changing requirements from customers, government and prime contractors”
- Biggest factors that encourage leanness:
 - “customer-induced”- budget limitations
 - competitiveness



Stakeholder Research Interests

- **Current LAI research topics**

- Risk assessment and management in a lean environment
- Impact of acquisition policy on leanness
- Impact of constantly changing requirements & funding
- Lean Supply Chain management
- Lean development practices
- New technology insertion in a lean environment

- **Space Unique Research Topics**

- Translation and impact of the commercialization of space
- Leveraging of commercial space practices
- Lean space & launch operations
- How to create open architectures for multiple space systems



Stakeholder Issues

Sharing of competitive data

- **Data will be disguised**
- **Proprietary data completely protected**
- **Proprietary data review by applicable stakeholders prior to publication**

Classified information

- **Work through Lincoln Lab**

Foreign Interaction

- **LAI Executive Board looking at a possible model for foreign interaction**



Quick Look Study LEM Results

LEM Architecture Element	% Application
● Principles	100
● Over-arching practices (12)	100
● Enabling Practices (61)	80
● Data Sheets (94)	65

High Applicability



Concept of Operations Options

- **Stand-alone Lean Space Initiative**
- **Separate initiative under LAI**
- **Space Sector integrated into LAI**

- **There is strong support for a lean space activity**
- **There are significant unique research opportunities as well as opportunities to expand current LAI research**
- **LAI-created LEM maps well to space**
- **Recommended Space Sector integrated into LAI**
 - **Relevance of current LAI research and products**
 - **Applicable infrastructure**



Steps to an LAI Space Sector

- **General DeKok of SMC approved concept July 1997**
- **LAI Executive Board voted to include Space in LAI and change name to Lean Aerospace Initiative.**
- **Revised Phase II ConOps incorporating Space signed Nov 13, 1997.**
- **Space Sector kickoff meeting 13-14 Jan 98 in Los Angeles**



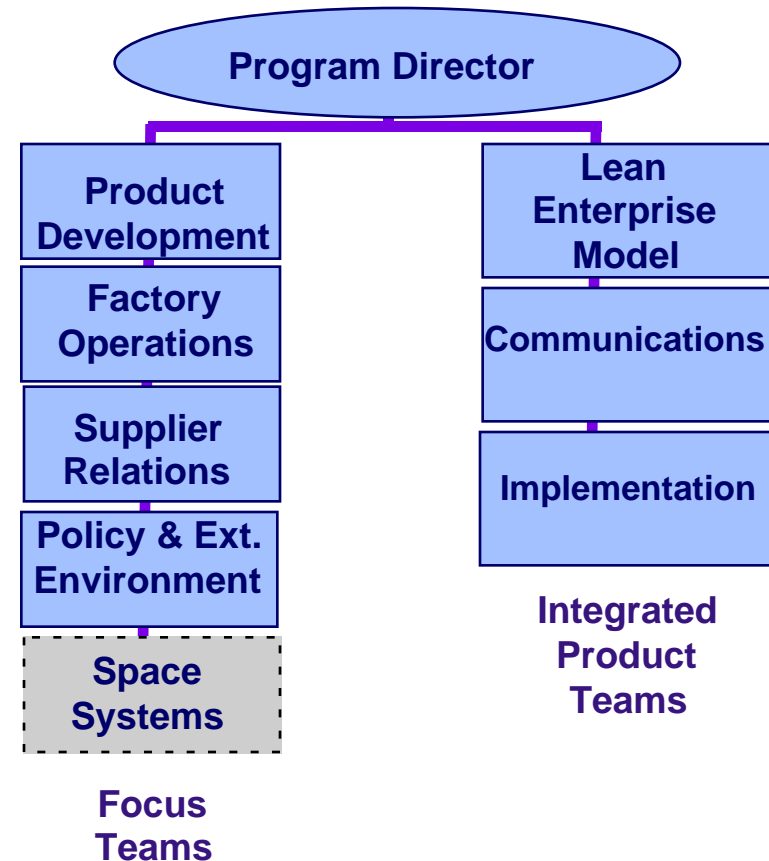
Revised LAI Con Ops

- Name changed to Lean Aerospace Initiative
- Executive Board expanded to include Space Representatives
- Space Sector member added to LAI Integration Team
- Space Systems Focus Team created
- Industry memberships
 - \$25K per division for current LAI members to join space sector
 - \$75K for new members to join space sector
 - Includes EB and WG membership
- Matching funds from government



Research Structure

- **Space Systems Focus Team** to form space related agenda and perform space unique research (MIT Lead Joyce Warmkessel)
- **Existing LAI Focus Teams and IPTs** expanded to include space related issues as appropriate





Initial Mapping of Space Stakeholder Interests

- Risk assessment and management in a lean environment
- Impact of acquisition policy on leanness
- Impact of constantly changing requirements & funding
- Lean Supply Chain management
- Lean development practices
- New technology insertion in a lean environment
- Translation and impact of the commercialization of space
- Leveraging of commercial space practices
- Lean space & launch operations
- How to create open architectures for multiple space systems

SPACE	PD	FO	SR	PE
O				
O				
O				
	O			

O = "new topics" = "ongoing research"



Creating Research Agenda

14 January Working Group Agenda

LAI Research Process

Fred Stahl, Boeing

**LAI Working Group & Role of Points
of Contact**

Tom Spires, Hughes

Stakeholder Priorities

Stakeholders

**LAI Focus Team Research Mapping
of Stakeholder Priorities**

LAI Team Leads

**Identification of Space unique
research topics**

All

Next Steps

Joyce Warmkessel



Space Sector Integration into LAI

- **Membership commitment**
- **Identify Points of Contact (POC)**
- **Integration of new members into LAI**
 - **Identify Focus Team & IPT members**
 - **Establish access to LAI products and information**
- **Participate in upcoming LAI meetings**
 - **30 March Space Sector**
 - **31 March - 1 April Plenary**
 - **2 April Working Group**
 - **5 May Executive Board**



Summary

- **Quick Look Study recommended Space Sector to be added to LAI**
- **LAI Executive Board supported recommendation**
- **Synergistic research opportunities exist**
- **New research opportunities to be defined**
- **Space Sector integration into LAI is strong benefit to both Space Stakeholders and to current LAI.**