



Institutionalization Measures: Key to Improved Process Monitoring

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Agenda



- “ Lockheed Martin Space Systems Company (SSC)
Overview and Background
- “ The Institutionalization Challenge
- “ Institutionalization in CMMI
- “ Institutionalization Scorecard Development Approach
and Overview
- “ Sample Institutionalization Scorecards
- “ Scorecard Initial Version Development and Use
- “ Next Steps

Lockheed Martin Space Systems Company Overview



- “ Space Systems is engaged in the design, research, development, engineering and production of
 - Satellites
 - Strategic and Defensive Missile Systems
 - Space Transportation Systems
- “ 2006 net sales of \$7.9 billion
- “ Integrated Engineering across all Space Systems sites
- “ Achieved CMMI[®] Maturity Level 3 December 2005
 - SCAMPISM V1.1 and CMMI-SE/SW/IPPD/SS V1.
 - Systems, Software, and Hardware Engineering
 - Validated LM-IEP to achieve CMMI compliance
- “ Journey of continual improvement aligned with Space Systems business objectives



SCAMPISM. Standard CMMI Appraisal Method for Process Improvement. SCAMPI is a service mark of Carnegie Mellon University.

CMMI[®]. Capability Maturity Model Integration. CMMI is registered in the U. S. Patent and Trademark Office by Carnegie Mellon University.

LM-IEP. Lockheed Martin Integrated Enterprise Process

Institutionalization Challenge



- “ The Lockheed Martin Space Systems Company (SSC) process improvement objectives are aligned with two major business objectives:
 - . Operational Excellence - quality products/service throughout the process
 - . 100% Mission Success - quality of product delivered
- “ Several major process improvement initiatives are underway
 - . Integration of Command Media across several major business sites
 - . Improving processes for usability and scalability
 - . Integrating tools and processes and enterprise measurement repositories
- “ Process institutionalization needs to be maintained during deployment of these initiatives
 - . The needs for measures to monitor institutionalization and measures of progress toward achieving initiative goals were identified
 - . Monitoring institutionalization measures reduces the probability of %process lapses+while major improvements are deployed
- “ A set of %scorecards+to track process institutionalization has been developed
 - . Deployment is underway

Institutionalization In CMMI®



CMMI for Development, Version 1.2

Institutionalization . the ingrained way of doing business that an organization follows routinely as part of its corporate culture

Institutionalization means “the level of adoption of a particular set of practices ... is deep enough, and broad enough, that their use would continue even through organizational and leadership changes.”
Reference: Suzanne Garcia and Richard Turner, CMMI Survival Guide, Addison Wesley 2006.

Institutionalization . SSC processes are used and are part of the culture.

1. Plan, deploy and monitor the processes across the Enterprise
2. Ensure the proper infrastructure is in place to support these processes

Selecting Scorecard Measures

- “ Identified candidate measures
 - . Noted measures already required by Common Integrated Process System (CIPS) and used to gauge institutionalization
 - . Noted measures related to CMMI Generic Practices
- “ Selected measures of highest importance to SSC
- “ Developed a scorecard that provides an overall measure of institutionalization that is a weighted sum of values computed for each measure

Mapping of Scorecard Measures to CMMI Generic Practices



Name	Generic Practice
Process Trained Personnel	GP 2.5 Train People
Establishing & Maintaining PDP	GP 3.1 Establish a Defined Process
Approved PDP & Program Deployment Summary	GP 2.3 Provide Resources GP 2.4 Assign Responsibility GP 2.5 Train People
Approved Measurement Plan	GP 2.2 Plan the Process

Name	Generic Practice
Total Measurement Collection Compliance	GP 2.8 Monitor and Control the Process
Measurement Usage	
Enterprise Standard Measurement (ESM) Collection Compliance	
CIPS Process Compliance	GP 2.9 Objectively Evaluate Adherence
Objective Evidence: Available vs. Required	GP 2.8 Monitor and Control the Process
CMMI-Based Appraisal Readiness Index	

Selected generic practices focus on institutionalization of highest importance to SSC

1. Training
2. Measurement
3. Compliance

Institutionalization Scorecards Overview



Major Functional Organizations (MFOs)	Program/Line of Business (LOB)
Measures for MFOs	Measures for Programs and LOB
Covers MFOs with responsibility for enterprise processes (e.g., systems engineering)	Covers Individual Program Measures
MFO measures include level of MFO proactive engagement in process performance assessment	Institutionalization measures for different programs in an LOB tier up to that LOB's measures



Scorecard Structure-1

Level	Current (in Month) View	Progress (Trend) View
Program	The component and overall score for a program in a particular month.	The actual and planned overall scores for a program versus month.
LOB (Set of Programs)	The overall scores for the programs in a LOB in a particular month and the averages of those scores.	The actual and planned average scores for a LOB versus month.
Enterprise (All of the LOBs in SSC)	The average of all of the LOB average scores, across all of the LOBs in the Enterprise (SSC).	The actual and planned average of all of the LOB average scores versus month.

Note: Enterprise (All of the LOBs in SSC) Level is not shown.

Scorecard Structure-2



Name	Description	Component Data Entry	
Process Trained Personnel	Compare Number of Program Target Audience to Target Audience Baseline	Number of People Trained	Number of People in Target Audience Baseline
Establishing & Maintaining PDP	Timely Disposition of the OSP Documents in the PDP	Number of Documents Dispositioned as of Latest Command Media Release	Number of Undispositioned Documents Spanning 2 Command Media Releases
Approved PDP & Program Deployment Summary	Approved PDP & Program Deployment Summary	User enters "Yes" or "No"	
Approved Measurement Plan	Approved Measurement Plan	User enters "Yes" or "No" / In Progress	
Total Measurement Collection Compliance	Compare Measures Planned to be Collected to Measures Collected	Number of Measures Collected	Planned Number of Measures Collected

Scorecard Structure-3



Name	Description	Component Data Entry	
Measurement Usage	Compare Measurement Planned to be Used to Measures Analyzed and Reported "Usage"	Number of Measures Analyzed and Reported "Usage"	Planned Number of Measures Analyzed and Reported "Usage"
Enterprise Standard Measurement (ESM) Collection Compliance	Compare Enterprise Standard Measurement Committed to Collect to the ESM Collected	Number of ESM Collected	Committed Number of ESM to Collect
CIPS Process Compliance	Running Average of Audit Findings/Processes Audited	Number of CIPS Processes Compliant (monthly)	Number of Processes Audited (monthly)
Objective Evidence: Available vs. Required	Compare Objective Evidence Available to Objective Evidence Required	Objective Evidence Available	Objective Evidence Required (Number of Processes Performing that Require Objective Evidence)
CMMI-Based Appraisal Readiness Index	Program Readiness by Completion of Key Appraisal Milestones	Cumulative Number of Milestones Achieved to Date	Total Number of Milestones in Process

Institutionalization Score



- “ Map each component score, e.g., Percent of Process Trained Personnel, Approved Measurement Plan, to its corresponding utility.
 - . A utility is the value accorded to some data item; the value can be numeric (e.g., 10) or linguistic (e.g., yes).

- “ The institutionalization score for a given program for a particular month is the weighted sum of the utilities for the 10 component measures.
 - . Each weight represents the importance or value of that attribute relative to those for the other 9 attributes.

- “ Management selects the attribute weights according to their view of the importance or value of each attribute.
 - . In the example, the utilities for each of the attributes are accorded equal weight.

Institutionalization Score For Program A



Institutionalization Score for Program A			Date (Month)
PROGRAM SCORE (Utility)	82	Score range (0-100); weighted sum of available individual component measures	
COMPONENT MEASURES	COMPONENT SCORE	THRESHOLDS	UTILITY
1. Process Trained Personnel	45%	Red - < 30%; Yellow - = >30% to = < 50%; Green - >50%	45
2. Establishing & Maintaining PDP	92%	Red < 90% or undispositioned for more than 2 Releases; Yellow - 90% to < 100%; Green - =100%	92
3. Approved PDP & Program Deployment Summary	Yes	Red = PDP & Program Deployment Summary Not Approved; Green = PDP & Program Deployment Summary Approved	100
4. Approved Measurement Plan	Yes	Red = Plan Not Approved, Yellow = Plan in Progress, Green = Plan Approved	100
5. Total Measurement Collection Compliance	90%	Red < 90%, Yellow =>90% to < 95%, Green = >95%	90

The component measure weights are selected by management. Each weight is 10% in this example. This data is notional.

Institutionalization Score For Program A

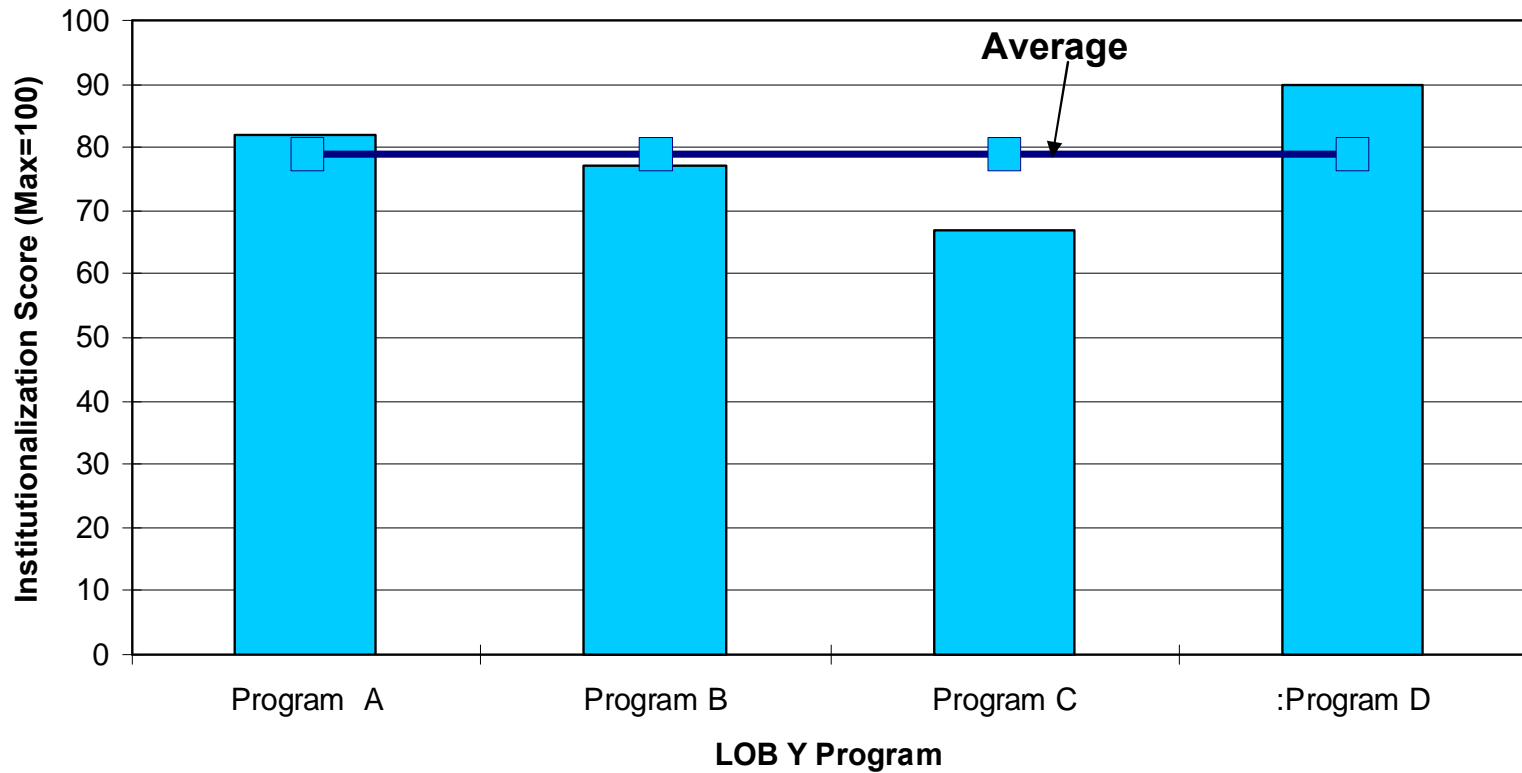
Institutionalization Score for Program A			Date (Month)
PROGRAM SCORE (Utility)	82	Score range (0-100); weighted sum of available individual component measures	
COMPONENT MEASURES	COMPONENT SCORE	THRESHOLDS	UTILITY
6. Measurement Usage	90%	Red < 90%, Yellow = > 90% to < 95%, Green = >95%	90
7. Enterprise Standard Measurement (ESM) Collection Compliance	92%	Red < 90%, Yellow = >90% to < 95%, Green = >95%	92
8. CIPS Process Compliance	90%	Red - < 80%; Yellow - = > 80% to = < 90%; Green - >90%	90
9. % Objective Evidence Available vs Objective Evidence Required	80%	Red - < 80%; Yellow - = > 80% to =< 90%; Green - >90%	80
10. CMMI-Based Appraisal Readiness Index	2	User enters a digit 0,1,2,3,4, or 5 corresponding to the number of milestones that have been achieved.	40

The component measure weights are selected by management. Each weight is 10% in this example. This data is notional.

Institutionalization Score - LOB Level



LOB Y Institutionalization Scores as of Month 8

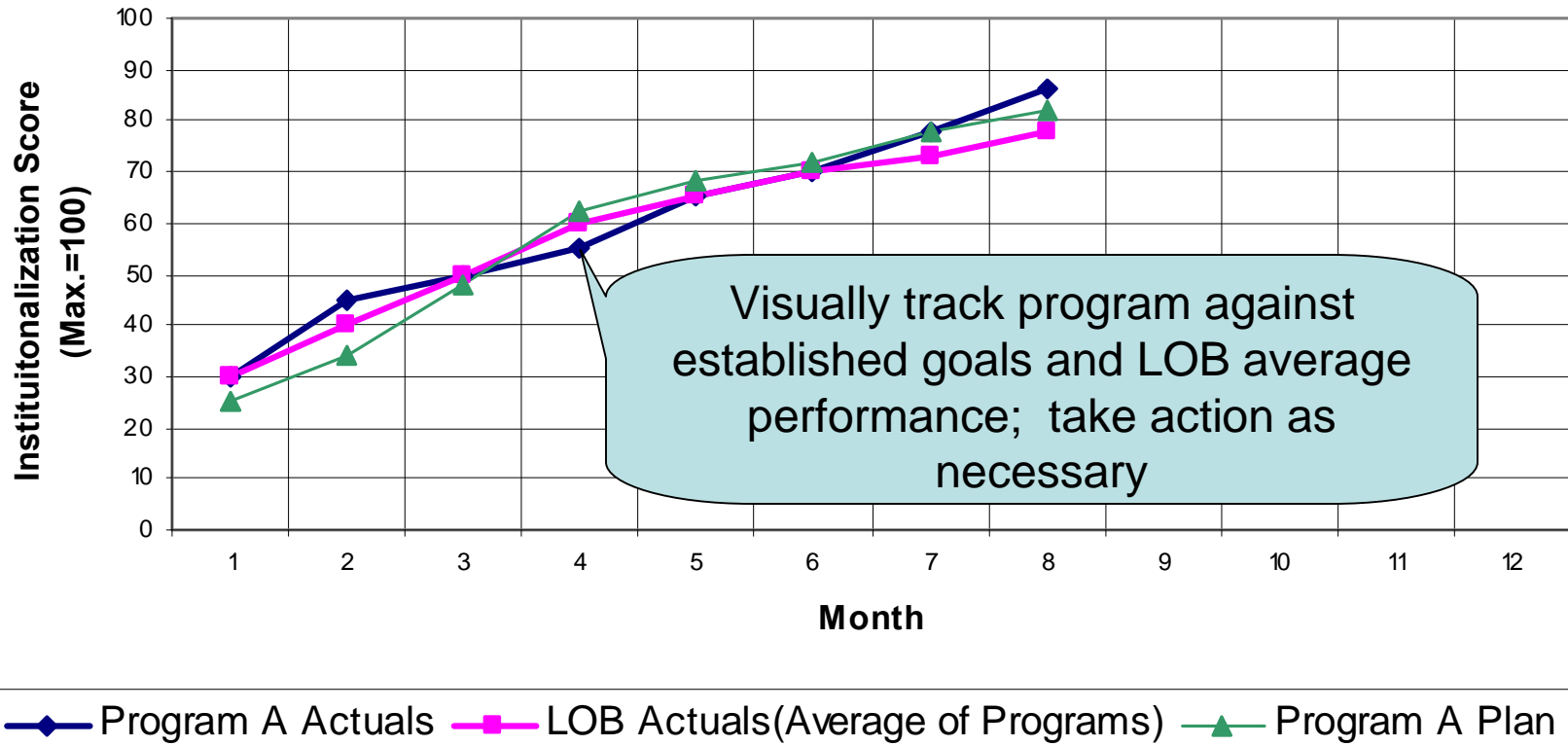


This profile or snapshot shows the institutionalization scores across a set of programs at one point in time as well as their average. This data is notional.

Institutionalization Score . Program A by Month



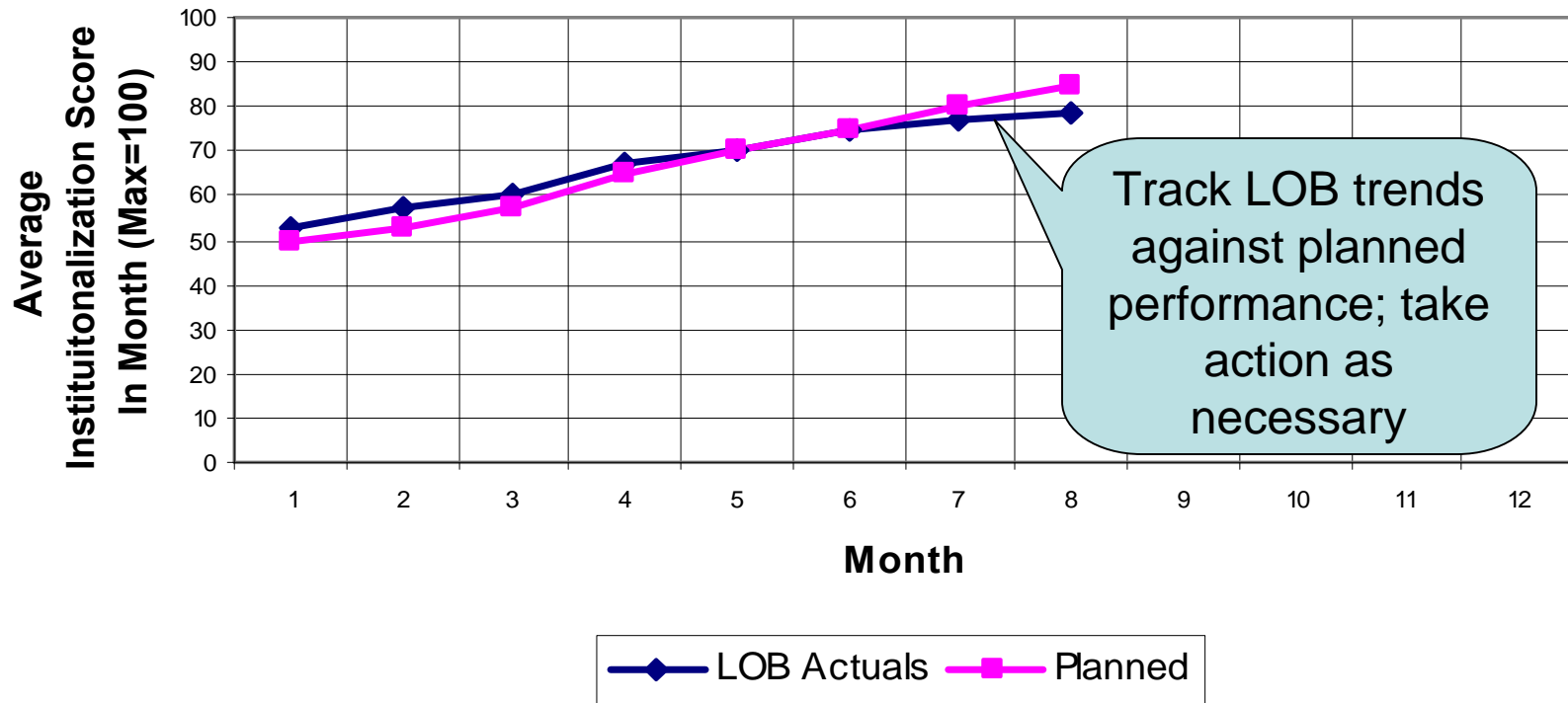
Institutionalization Progress For Program A



This graph shows the institutionalization progress trend for a program over a period of time, compared to LOB average results. This data is notional.

Institutionalization Score . LOB by Month

LOB Y Institutionalization Progress



This graph shows the institutionalization progress trend for the programs in LOB Y over a period of time compared to planned progress. The progress measure is the average of the scores for the programs LOB-wide. This data is notional.

Summary & Next Steps



” Summary

- . Systematic use of key institutionalization measures support SSC business goals and objectives

” Next Steps

- . The initial versions of the scorecards have been developed.
- . Some data has been collected for several measures.
- . We are moving toward deployment across major functional areas and lines of business/programs.

Additional Information



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