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## **Integrating CMMI® and Six Sigma in Software and Systems Engineering**

**M. Lynn Penn**  
**Lockheed Martin Integrated Systems and Solutions**

**SEPG 2005**  
**March 2005**

# Agenda

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**Introduction**

**IS&S Overview**

**Integrated Process Improvement**

**Lean Thinking**

**Technology/ Process Change Management Evolution –  
a Case Study**

# M. Lynn Penn

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## **Director Quality Systems & Process Management**

**Chair Executive Process Steering Committee**  
**Maintain the IS&S Standard Operating Process**  
**Maintain IS&S compliance to industry standards**  
**Maintain Organizational Performance Database**  
**Maintain Program Database**  
**Maintain Corrective Action Database**  
**Manage ISO and CMMI Maintenance Programs**  
    **ISO - Internal Audits & Surveillance**  
    **CMMI – SCAMPI B&C**

## **Credentials**

**CMMI Candidate SCAMPI Lead Appraiser**  
**CMMI Instructor**  
**ISO Lead Auditor**  
**Six Sigma Certified Black Belt**  
**SEI Affiliate**

# Lockheed Martin Integrated Systems & Solutions

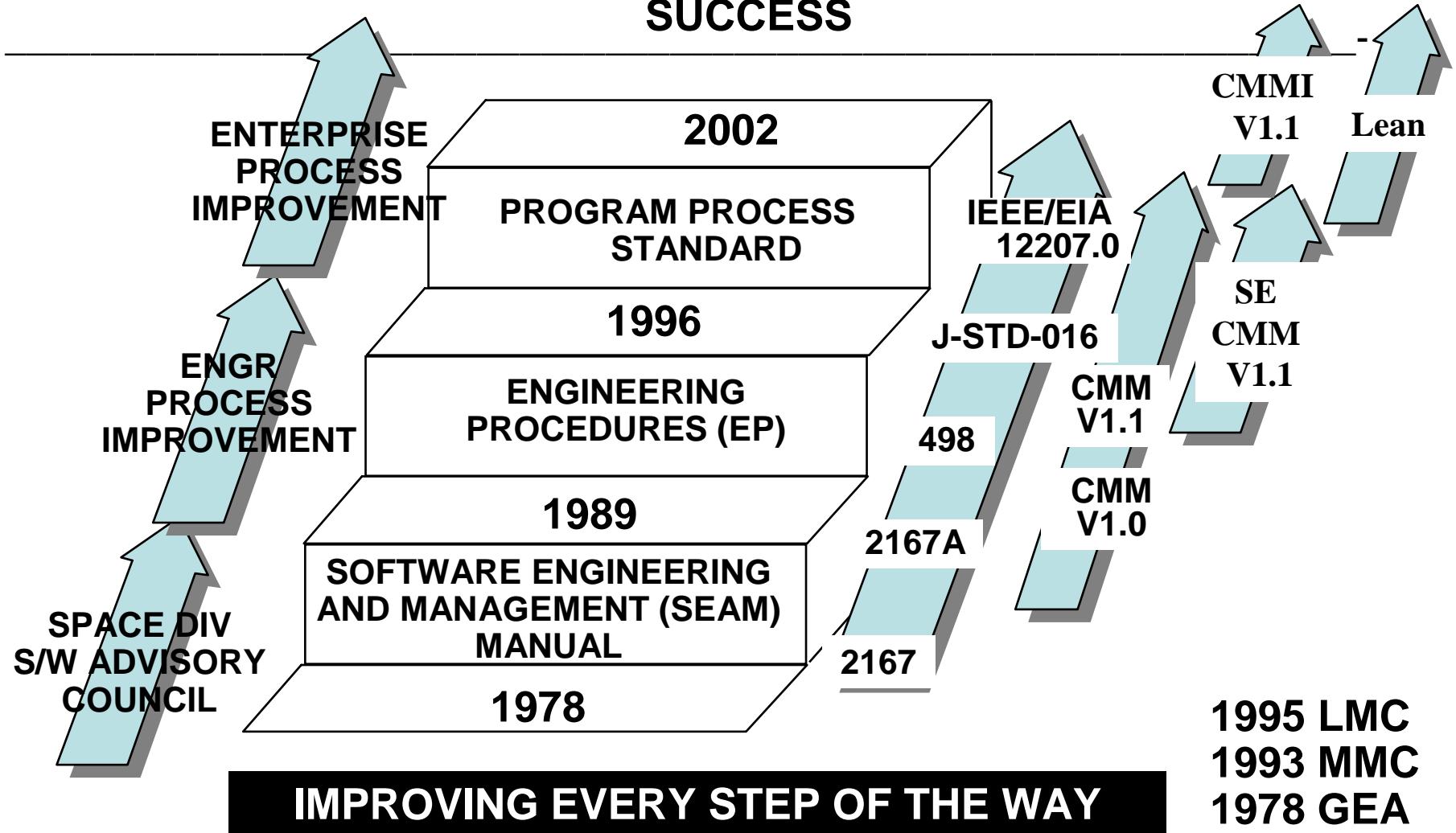
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## Integrated Systems & Solutions (IS&S)

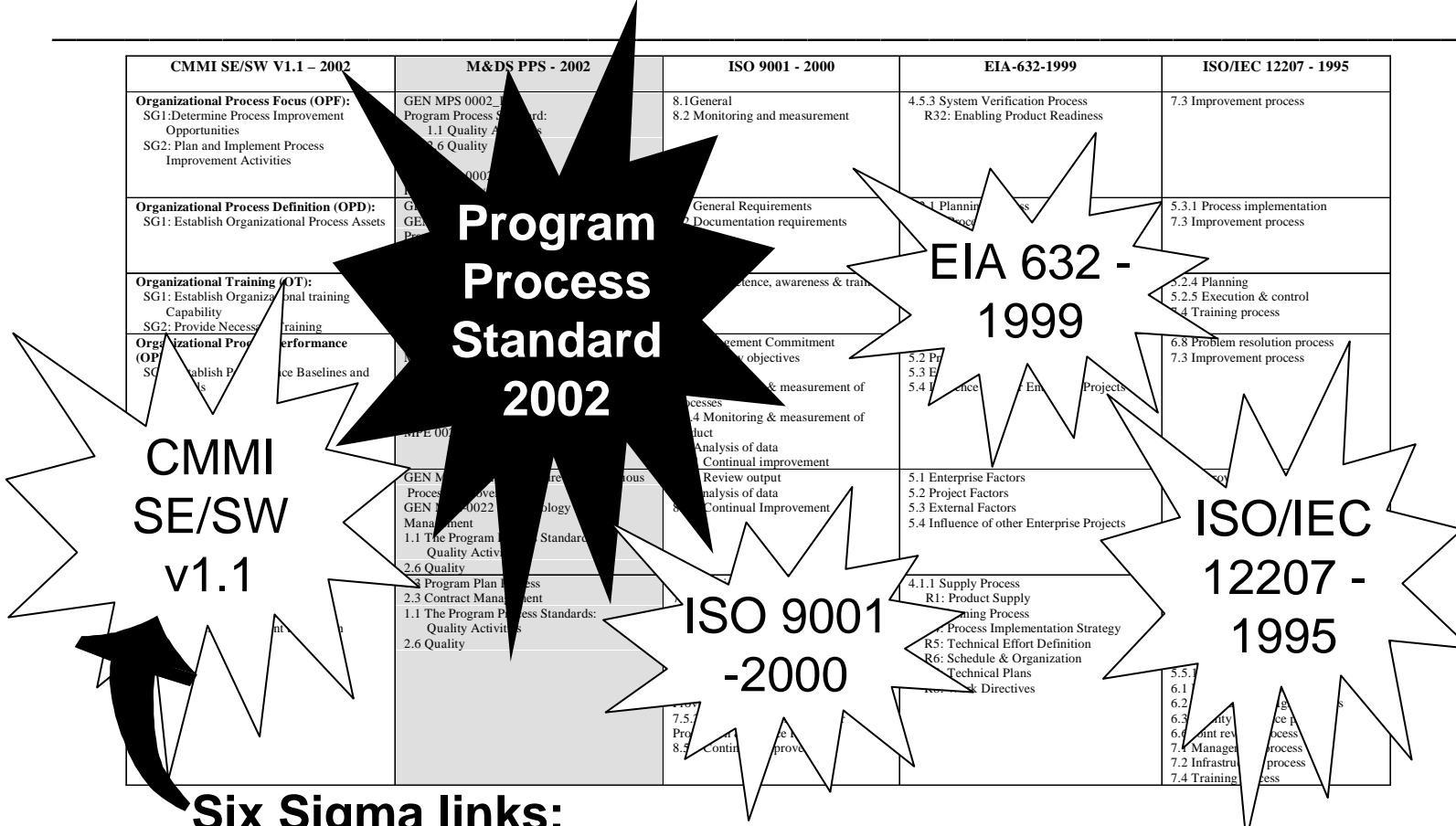
- 15,000 employees
- Four primary geographic regions (40+ sites)
- Seven Lines of Business
- Process Foundation
  - Management & Data Systems Recognized Standard Operating Process (Program Process Standard) across all programs
  - Mandated by senior management
  - Maintain the CMMI Maturity Level 5 through mergers and acquisitions

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## MISSION SUCCESS



# LMC IS&S Process Standard Roadmap



# LMC IS&S Implementation

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## IS&S Program Process Standard (PPS)

- minimum mandatory set of development processes
- updated using industry standards in which certifications were desired
- **ENABLER** for Process Standard Compliance
- Lean versus Six Sigma implementation

## Example: Quantitative Management

- Key elements
  - program process standards
  - metrics program
- Map to CMMI Organizational Process Performance (OPP)
  - SG1: Establish performance baselines and models
- Map to ISO 9001 – 2001
  - 5.1 Management Commitment
  - 5.4.1 Quality Objectives....
- and so on



# IS&S Lean Methodology

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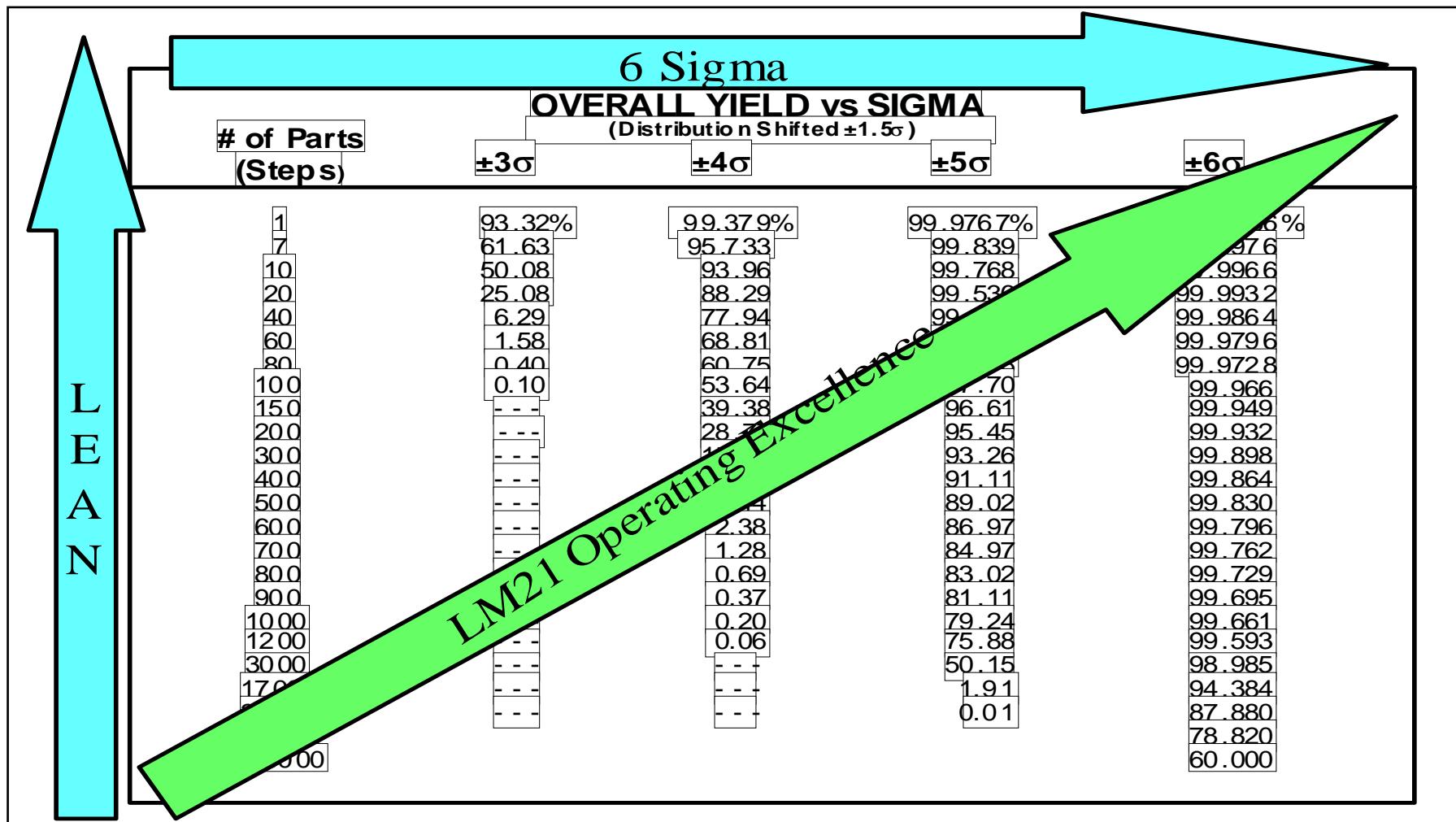
“An organization working together to make continuous improvements without large capital investment”

## Purpose

- brings the right people together to understand the process and make immediate improvements to the process.
- evaluates opportunities to reduce cycle time, cost, inventory and eliminate all waste.



# Lean: Six Sigma Representation





# LMC IS&S Lessons Learned

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## **Six Sigma is more than statistical analysis**

- It is a tool box of methodologies that align with an organization's process improvement.
- The alignment is directly related to high maturity but is not restricted to that.
- Combining with Lean Methodology gives a more visible value stream.



# LMC IS&S Training & Implementation

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## Process Orientation Training

- All employees – overview of Process Asset Library
- Overview of Program Process Standard

## Executive Lean Training

- Top Executives – one week off site
- Must understand and promote
- Set goals associated with savings \$ & Time

## Green Belt Training

- One week course (corporate initiated/ unit led)
- Certification (completion of course, 1 event, Black Belt Mentor)
- Considering expanding Green Belt training to keep Black Belt training at three weeks

## Black Belt Training

- Three week DFSS/Lean course (corporate initiated)
- Certification (completion of course, 3 events, mentored one greenbelt to certification)

# LMC IS&S Training & Implementation

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## Lean Event Training

- 2-hour training session opens each lean event
- covers tools and methodologies
- geared for those without previous experience

## Organizational Training Goals

- green belts to be trained set annually
- black belts to be trained set annually
- \$\$\$ challenge based on process changes
  - Functional/ business/ project

# LMC IS&S – Strategy

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## Analyzed Principles

- Value from the customers' perspective
- Value Stream – measured
- Flow
- Pull
- Perfection – rapid feedback / mistake proofing

## World-wide Benchmarking Results

- A 4 Sigma company will spend > 10% of revenue on internal and external repair.
- A 6 Sigma company will spend < 1 % of revenue on internal and external repair.

## IS&S Analysis

- Associate Sigma values to the appropriate level of aggregation – enterprise versus product line versus program.



# LMC IS&S Project Selection

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1. Process Improvement Recommendation (PIR)
  - any one can submit
  - process suggestion passed to Process Owner to evaluate, determine feasibility, determine level of institutionalization (and determine if pilot is necessary)
2. E-Transformation
  - all business processes that affect overhead are applicable
  - selection based on ROI and relevance to business – firm understanding of the before state
    - Just do it Projects
    - Kaizen event with rollout plan
  - require use of Six Sigma methodologies/ tools to pursue optimization
3. Technology Change Management Working Group (TCMWG) – **Case Study**
  - once a year call for ideas – process oriented
  - can also be used to pilot ideas from PIRs
  - selection based on understanding the before state to measure the after state
  - modeling techniques implementing a six sigma target



# LMC IS&S Technology Change Management

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## Purpose (M&A, RSKM, TS, QPM, OPP, OID)

- identify and assess emerging process-related technologies (e.g., Tools, Commercial Practices)
- guide those having benefit into our development activities in an orderly manner

## Implementation (OID)

- Technology Change Management (TCM) Working Group (TCMWG) formed to identify process improvement needs and oversee the planning, progress, and application of solutions
- each functional organization represented on TCMWG
- annual call for TCM project proposals
  - parallel effort with call for Independent Research And Development (IRAD) projects
  - based on needs expressed in the strategic plan
- meets monthly to review ongoing projects, assess new business needs, and communicate new technology



# LMC IS&S Technology Change Management

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## Definition

- process-centric (as opposed to product-centric)
- separation of former and latter based on legal barriers
- Technology changes for product is accomplished by extensive IRAD effort
- enterprise wide

## Focus on TCM motivated by Acquisition Reform in 1995

- considerable maturing of TCM process in six years
- business results rather than just “ticket punching”
- utilizes value added methodology – 6 Sigma Tools

## Driven by LMC IS&S Strategic Plan

- TCM participants contribute to Strategic Plan

## Harmonious with company-wide process philosophy



# LMC IS&S TCM Summary

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**The TCM Program is driven by the strategic process needs of our product lines.**

**TCM projects have had a positive impact on new business pursuits.**

**TCM projects have resulted in cost savings as well as cost avoidance.**

**TCM projects can result in changes to the standard processes.**

**Our business leaders are encouraged to push process boundaries through TCM.**

**Lean and Six Sigma Activities have resulted in an increase in award fee, increased software productivity, and earlier detection of defects.**

# Implementation Lessons Learned

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**Process initiatives must be integrated into the business rhythm**

**Process Initiatives should be run like a program**

**Specific process initiatives can accelerate the adoption of other processes**

**Evidence of Six Sigma and CMMI adoption**

**Process Initiatives will mature each other**

**Difference in TCM as CMMI Maturity was realized**