Measurement Planning and Data Collection
Topics

• Background
• Deploy measurement process across programs
• Collect measurement usage across the company
• Evaluate measures for commonality and standardization
• Summary
29,000 employees across the company and around the world

- Palmdale, CA: 3,834
- Fort Worth, TX: 14,529
- Marietta, GA: 6,864
- Meridian, MS: 134
- Pinellas Park, FL: 174
- Johnstown, PA: 103
- Clarksburg, WV: 78
- Greenville, SC: 3400
- International: 39

Lockheed Martin Aeronautics Overview
Background

• Lockheed Martin Aeronautics measurement process improvements
  – Multi site measurement programs – pre 2000
  – Programs specific measures and formats – pre 1993
  – SEI CMM Level 3 for software – 1993
    • SW Standard Metrics
  – SEI CMM Level 4 for software – 1999
    • SW Quantitative Management
    • Common Repository for all SW measurement data
  – SEI CMMI Level 3 at company level – 2007 & 2010
    • Company wide measurement process
Use of measures across the company

- How to collect data on measurements used across the company and provide value added to the programs
  - Institutionalize the Measurement & Analysis (M&A) process
  - Identify common measurement needs across the programs
  - Standardize M&A planning across the company
  - Streamline M&A planning for the programs
Approach

• Establish a method to collect data on measurement indicators while using it to pre-populate program M&A plans
  – Establish Measurement Model Database
    • Measurement Objectives, Information Needs, and Measurement Indicators
  – M&A planning workshops on site with the programs facilitated data collection and distribution of common measurement planning data
  – Pre-populate M&A planning templates using data in the database
  – Generate Measurement Matrix for each program
Approach (cont.)

• **Measurement Matrix (MS Excel Work Book)**
  – Measurement Objectives
  – Information Needs
  – Measurement Indicators
  – Base Measures
  – Program briefings where indicators are used
  – Program owners of the indicators

• **Matrix is a part of program M&A plans**
  – Replaces multiple traceability tables

• **Matrix is generated from Measurement Model database**
Approach (cont.)

• Resources:
  – Pre-populated M&A plan template
    • Common objectives, information needs and measures
    • Boiler plate information
    • Training
    • References to standard process
  – Measurement Model Database
    • Specification data for standard measures
    • Common objectives and information needs
    • Able to generate tables for M&A plan
    • Collect program specific measures
Measurement Model

Stores information about the program

Stores information about the objectives, information needs, indicators and base measures

Tabular reports can be generated consistent with those needed for M&A Planning

Can be used to generate a Measurement Matrix for any program or function
measurement model (cont.)

Collect information about the objectives
List the objectives

Collect information about the Information Needs
List the Information Needs

Collect information about the Measurement Indicators
List the Measurement Indicators

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Information Needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deliver High Quality Aircraft on Schedule</td>
<td>Is the program performing to schedule?</td>
</tr>
<tr>
<td>Aggressively Manage GFE and DMS Issues</td>
<td>Is the aircraft meeting quality expectations?</td>
</tr>
<tr>
<td>Proactively Manage Configuration Control of Each Aircraft and the RERP (C-5M) Baseline</td>
<td>Does the corrective action process work effectively to meet program/project expectations?</td>
</tr>
<tr>
<td>Manage timely Procurement of all supplier required products for C-5 programs</td>
<td>How much scrap &amp; rework is being generated?</td>
</tr>
<tr>
<td>Minimize Waste to support Affordable Products and Contribute to Environmentally Sustainable Program</td>
<td></td>
</tr>
</tbody>
</table>
Relates the Objective to appropriate Information Needs

Relates the Information Need to its category, Indicators used to answer it, and the Objectives it is related to
Collect detailed information about each measurement indicator
Can generate specification table for each or all indicators
### Measurement Matrix

<table>
<thead>
<tr>
<th>Measurement Matrix</th>
<th>Measurement Objectives and their associated Information Needs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Information Needs mapped to standard categories and the Indicators used for each Information Need</td>
</tr>
<tr>
<td></td>
<td>Specification details about each Indicator</td>
</tr>
<tr>
<td></td>
<td>Base Measures used for each Indicator</td>
</tr>
</tbody>
</table>

#### Generated from the Measurement Model database

Each tab replaces a table in the M&A Plan

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1. **Cost Performance**
   - **Category**: C
   - **Objective**: Cost
   - **Description**: Provide insight into the actual labor expenditure
   - **Indicators**:
     - B.S.001
     - B.S.002
     - B.S.003

2. **Cost Variance**
   - **Category**: C
   - **Objective**: Cost
   - **Description**: Represent actual cost expenditure to budget
   - **Indicators**:
     - B.S.001
     - B.S.002
     - B.S.003

3. **CPM Time**
   - **Category**: C
   - **Objective**: Schedule
   - **Description**: Schedule and progress
   - **Indicators**:
     - A.S.008
     - A.S.009

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**Measurement Model**

- **Objectives**
- **Needs**
- **Indicators**
- **Measures**

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Each Objective may map to multiple Information Needs. Each Information Need can map to multiple Indicators. Each Indicator may use multiple Base Measures. Indicator details includes an owner for each measure and what management briefings include the measure. Indicators can be sorted by owner, briefing, category, etc for program use.
Program Measurement and Analysis Plan

Measurement Matrix is combined with Measurement Plan template to create program Measurement Plan
Organizational Analysis of Measurement Planning Data

Load program measurement matrices into organizational Measurement Model
Organizational Analysis of Measurement Planning Data

- Evaluate which measures are common across programs
- Used M&A Working Group to down select those to add to the company standard set of measures

Final update approved by Enterprise Process Board

Programs are represented on M&A WG
Summary

• Deployed Measurement and Analysis (M&A) process to all programs
• Streamlined Measurement and Analysis planning for the programs
• Standardized M&A Planning across the programs
• Collected measurement usage across the company
• Updated the set of standard measures based on results
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