



***NORTHROP GRUMMAN***

DEFINING THE FUTURE



**Commitment to Performance Excellence  
Our Journey to CMMI Level 5**

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**Diane G. Miller, CDP**  
Group Director, Programs and Process  
Northrop Grumman

# Topics



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- Northrop Grumman Overview
  - Our Journey in Performance Excellence
  - Why Strive for Higher Levels of Maturity?
  - Characteristics of CMMI Levels 4 and 5
  - Lessons Learned in Achieving Level 5
  - Summary

# Northrop Grumman Overview

- One of top three defense contractors
- One of two top IT providers to the U.S. government
- Leading IT systems integrator & information security provider
- Largest military shipbuilder
- Largest provider of airborne radar & electronic warfare systems
- One of three major contractors in military & civil space, missile defense






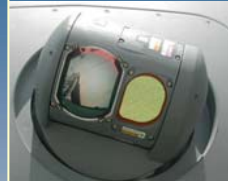

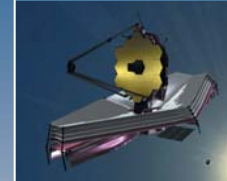

**\$32 Billion**

**50 States**

**25 Countries**

**120,000 Employees**

# Northrop Grumman Overview (continued)

INFORMATION & SERVICES			ELECTRONICS	AEROSPACE		SHIPBUILDING
<b>Mission Systems</b>	<b>Information Technology</b>	<b>Technical Services</b>	<b>Electronic Systems</b>	<b>Integrated Systems</b>	<b>Space Technology</b>	<b>Shipbuilding</b>
						
<p><b>Command, Control &amp; Communications</b></p> <p><b>Intelligence, Surveillance &amp; Reconnaissance</b></p> <p><b>Missile Systems</b></p>	<p><b>Enterprise Systems and Security</b></p> <p><b>IT/Network Outsourcing</b></p> <p><b>Defense &amp; Intelligence</b></p> <p><b>Federal, State/Local &amp; Commercial</b></p> <p><b>ISR, Homeland Security &amp; Health</b></p>	<p><b>Systems Support</b></p> <p>Base and Infrastructure Support</p> <p>Range Operations</p> <p><b>Training and Simulations</b></p> <p>Technical and Operational Support</p> <p>Live, Virtual and Constructive Domains</p> <p><b>Life Cycle Optimization</b></p> <p>Performance Based Logistics</p> <p>Lead Support Integrator (LSI)</p>	<p><b>Radar Systems</b></p> <p><b>C4ISR</b></p> <p><b>Electronic Warfare</b></p> <p><b>Naval &amp; Marine Systems</b></p> <p><b>Navigation &amp; Guidance</b></p> <p><b>Military Space</b></p> <p><b>Government Systems</b></p>	<p><b>Large Scale Systems Integration</b></p> <p><b>C4ISR</b></p> <p><b>Unmanned Systems</b></p> <p><b>Airborne Ground Surveillance / C2</b></p> <p><b>Naval BMC2</b></p> <p><b>Global / Theater Strike Systems</b></p> <p><b>Electronic Combat Operations</b></p>	<p><b>ISR Satellite Systems</b></p> <p><b>Missile Defense Satellite Systems</b></p> <p><b>MILSATCOM Systems</b></p> <p><b>Environmental &amp; Space Science Satellite Systems</b></p> <p><b>Software Defined Radios</b></p> <p><b>Directed Energy Systems</b></p> <p><b>Strategic Space Systems</b></p>	<p><b>Naval Systems Integrator</b></p> <p><b>Surface Combatants</b></p> <p><b>Expeditionary Warfare Ships</b></p> <p><b>Auxiliary Ships</b></p> <p><b>Marine Composite Technology</b></p> <p><b>Coast Guard Cutters</b></p> <p><b>Commercial Ships</b></p> <p><b>Nuclear Aircraft Carriers</b></p> <p><b>Nuclear Submarines</b></p> <p><b>Fleet Maintenance</b></p> <p>Aircraft Carrier Overhaul &amp; Refueling</p>

***A Portfolio Positioned for the Future***

# Our Journey in Performance Excellence

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- Overarching corporate Performance Excellence (PE) initiative to establish corporate-wide goals and expectations
- Sector implementation of PE based on type of business portfolio, customer priorities and value to customer
  - Mission Systems: CMMI, AS9100 and Lean Six Sigma
  - Information Technology: ISO 20000:2005, ITIL Best Practices and CMMI
  - Technical Services: Best Industry Practices
  - Electronic Systems: ISO 9001:2000 and Lean Six Sigma
  - Integrated Systems: Lean Manufacturing
  - Space Technology: CMMI, AS9100 and Lean Six Sigma
  - Shipbuilding: Lean Manufacturing and Lean Six Sigma
- Nature of the business and value to customer must drive selection of quality and process improvement framework(s)

# Our Journey in Performance Excellence (continued)

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- Each sector determines their Performance Excellence approach and establishes appropriate goals
- Goals, measures and evaluations are then flowed to all subsequent levels in the organization as applicable to the area of responsibility
- Communities of Practice (CoP) created across sectors as needed to leverage experiences
- Best practices and lessons learned are shared through working groups, Process Asset Libraries (PAL), training, tiger teams, and informal means

# Mission Assurance Example of Performance Excellence Implementation



A single, integrated framework to leverage all aspects of Performance Excellence

# Why Strive for Higher Levels of Maturity?

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- In today's highly-competitive business market, every organization must perform at its best
- Oftentimes a customer seeks "value" rather than "lowest cost" in a competitive procurement
- Improved ability to attract and retain high-performing employees as individuals seek a well-managed, high-performing employer
- Increased accuracy in bids and estimates
- CMMI is an industry-recognized framework against which one can implement improvements and stay competitive
- Achieving CMMI Level 5 is still a discriminator – a value that distinguishes one organization from any other

# Why Strive for CMMI Maturity Level 5?

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- Performance at Level 3 demonstrates a commitment to disciplined implementation of basic program management and engineering practices and a desire to stay “ahead of the pack”.
- Level 3 forms a good foundation for higher levels of maturity.
- However, Level 3 metrics, measurement processes, and goal setting are generally inadequate for Performance Excellence at Levels 4 and 5
- Level 4 permits understanding of the process; Level 5 permits improvement of the process
- Until Level 5, it is difficult to quantitatively manage continuous improvement
- But there are detractors about the value of pursuing CMMI Level 5 . . .

# Common Detractors to Pursuing CMMI ML5

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- My customer won't pay for it
- My customer will pay for Level 3, but nothing past that
- It's too expensive
- My customer doesn't care about process – they only care about the product
- Technical excellence will always overcome the need for process
- It's too much work – and not worth the effort
- Level 3 is good enough
- My customer is Level 1 - - they don't know how to manage a Level 5 contractor
- Don't bother me - I have REAL work to do

# Our Experiences with Pursuing CMMI Level 5

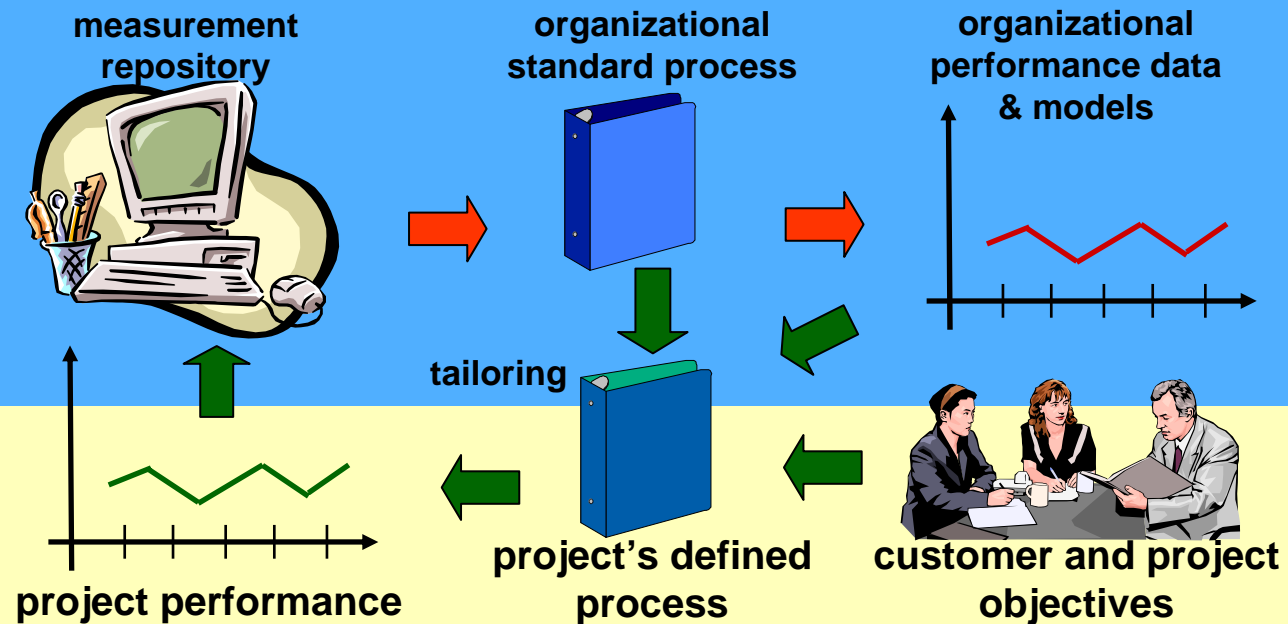


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- It's hard
  - It's expensive
  - It takes years
  - It requires expertise in leading change
  - Depending upon your organization, pursuing CMMI Level 5 could be very disruptive!

*But it's still worth it!*

# Characteristics of CMMI Levels 4 and 5

- Organizational Process Performance
  - Establishes a quantitative understanding of the performance of the organization's set of standard processes
  - Provides process performance data, baselines, and models to quantitatively manage the organization's projects



- Quantitative Project Management
  - Quantitatively manage the project's defined process to achieve the project's established quality and process-performance objectives.

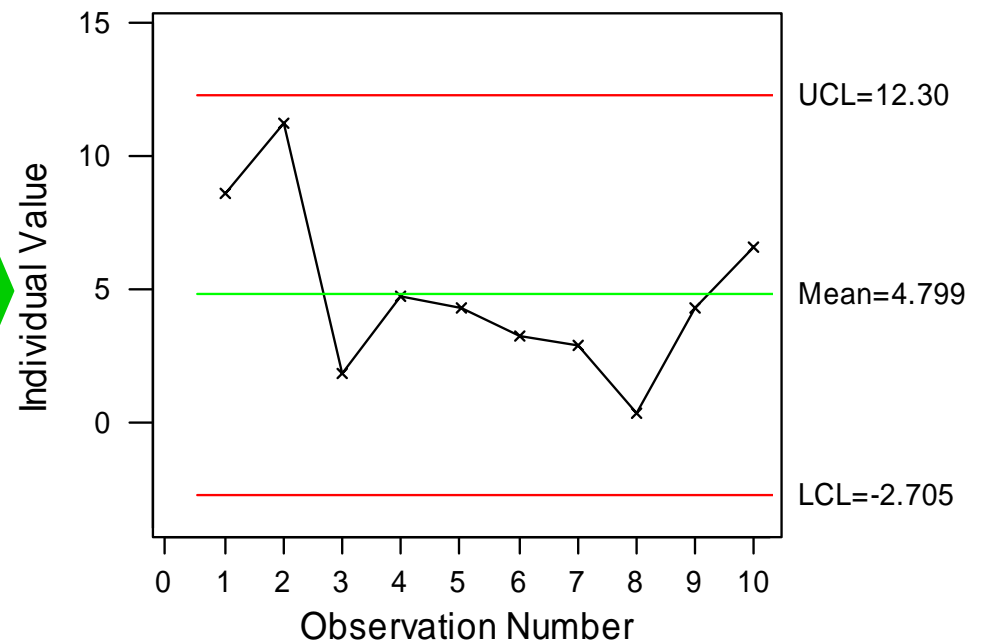
# Using Six Sigma to Understand the Process

## *Managing by Variation*

- How many errors are typically found in reviewing an interface specification?

Expected  
Variation

Average



- Useful in evaluating future reviews
  - Was the review effective?
  - Was the process different?
  - Is the product different?

 **Corrective and  
preventative actions**

# What Can a Level 4 Organization Do?



- Determine whether processes are behaving consistently or have stable trends (i.e., are predictable)
- Identify processes where the performance is within natural bounds that are consistent across process implementation teams
- Establish criteria for identifying whether a process or process element should be statistically managed, and determine pertinent measures and analytic techniques to be used in such management
- Identify processes that show unusual (e.g., sporadic or unpredictable) behavior
- Identify any aspects of the processes that can be improved in the organization's set of standard processes
- Identify the implementation of a process which performs best

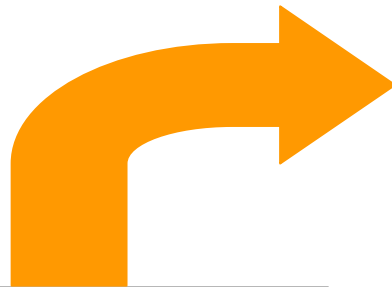
# What Does Level 5 Add to the Organization?

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**Level 3**

*Organizational Process Focus*

- Goals are qualitative (e.g., get better)
- The effects of the improvements are not estimated or measured



**Level 5**

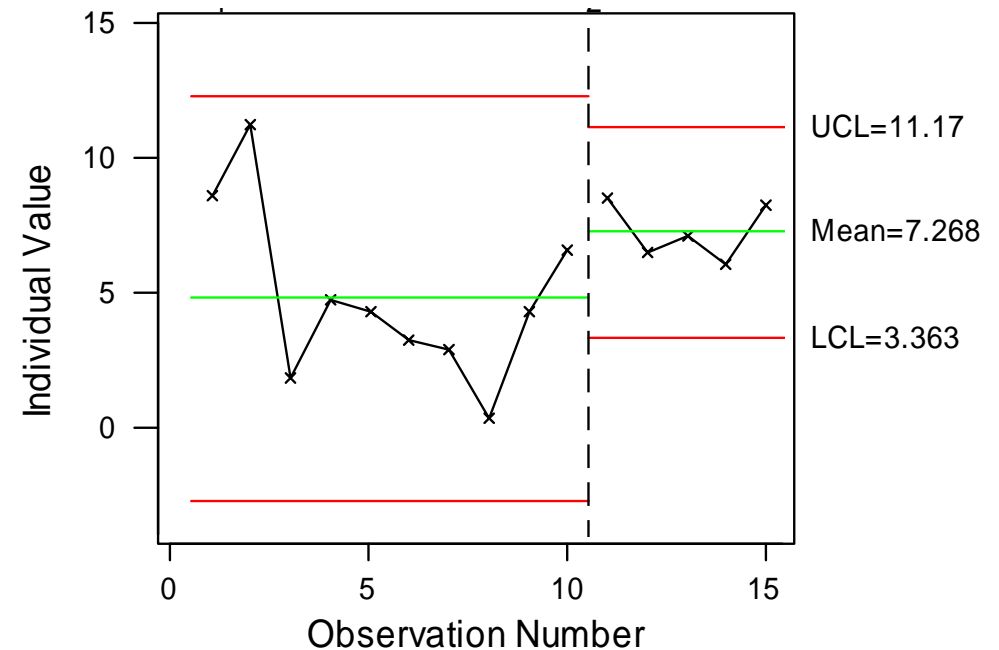
*Organizational Innovation & Deployment*

- Goals are quantitative (e.g., reduce variation by X%, reduce mean by Y%)
- Incremental improvements – eliminate special causes of variation
- Innovative improvements - cause a major shift in process capability
- Potential improvements are analyzed to estimate costs and impacts (benefits)
- Improvements are piloted to ensure success
- Improvements are measured in terms of variation and mean

# Example of Improving the Process Peer Reviews



- Reduce the variation
  - Train people on the process
  - Create procedures/checklists
  - Strengthen process audits
- Increase the effectiveness (increase the mean)
  - Train people
  - Create checklists
  - Reduce waste and re-work
  - Replicate best practices from other projects



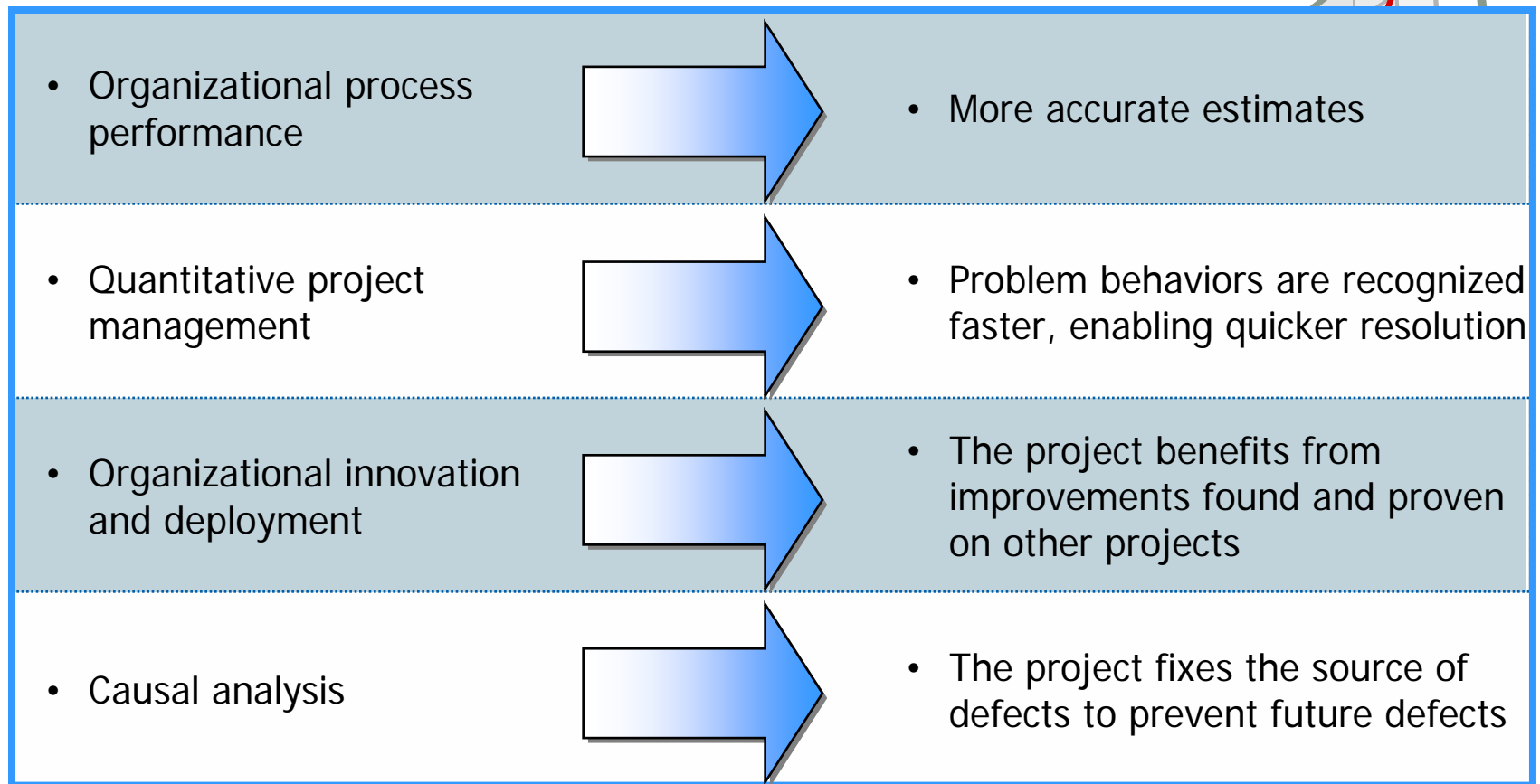
# What Does Level 5 Add to the Project?

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- Casual Analysis & Resolution
  - Identify and analyze causes of defects and other problems
  - Take specific actions to remove the causes
- The project can then take actions to prevent the occurrence of those types of defects and problems in the future
- Many projects implement Causal Analysis & Resolution at Level 4
  - Identify and eliminate special cause variations to stabilize the process

# How Do Level 4 & 5 Benefit the Customer?



***Better Products and Services Produced Faster And Cheaper***

# Lessons Learned in Achieving CMMI Level 5

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- It must align with and support achievement of organizational business goals
- It must be realistic in light of the organization's "rate of change" capacity
- It must be well-planned and provided adequate resources
- Create a strong organization-level infrastructure to pull some of the work off the focus programs
  - A strong Process Asset Library (PAL) easy to navigate and use
  - Common, modularized training materials accessible to all to ensure institutionalization
  - Active Engineering Process Group with the resources to be successful
  - Tools, templates and organization standard processes that add value to programs
  - Corrective and Preventive Action System (CPAS) that allows trending for decision-making

# Lessons Learned in Achieving CMMI Level 5

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- It should be run like a strategic organization-wide program – with a plan, budget, schedule, resources, milestones, commitment, progress reviews and reporting, and executive oversight
  - Recognize that surprises can happen and adjust as necessary
- It must become part of your business culture – just how you manage your organization and execute your programs
- External, independent, appraisals are key to objective assessment upon which customers can rely

# Lessons Learned in Achieving CMMI Level 5

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- The Leadership Team must be engaged
  - “Executive Sponsorship” is not enough
  - Leadership must demonstrate “walking the talk”
  - Leadership must measure progress against goal, plan and schedule and apply assistance when needed to return to plan
  - Leadership may be called upon to “referee” among competing priorities
  - Leadership must be visible to all stakeholders
    - Customers
    - Front line software and system engineers
  - The Engineering Process Group cannot succeed without strong, visible support from the Leadership Team

# Summary

- Performance Excellence, regardless of the framework selected to support implementation, is a significant commitment for any organization
- Integration of multiple frameworks, tools and techniques can provide greatest value
  - As long as the approach is planned and managed
  - Leverage the quantitative abilities of Six Sigma to support Levels 4 and 5
- Now that the investment has been made, define the means to sustain the gain
  - Expand implementation to other parts of the organization
  - Expand depth and breadth of implementation
  - Expand types of frameworks used
  - Make improvements based on what your data indicate
  - Predict performance and adjust processes accordingly
- It is an investment with valuable return in increased productivity, reduced performance risk and reduced defects

CMMI<sup>®</sup> is a registered trade mark of the Software Engineering Institute

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