NORTHROP GRUMMAN

DEFINING THE FUTURE

Integrated Risk and Earned Value Management

2007 NDIA Systems Engineering Conference
San Diego, CA

October 24, 2007

Paul Davis
Northrop Grumman Corporation

Contents

- Uncertainty management premises
- State of industry
- “As-Is” risk management
- Baseline planning
- Risk identification
- Monitoring and control
- Integration approaches
- Summary

Uncertainty Management Premises

- **A failure to meet project objectives is a failure in uncertainty management**
- **Uncertainty management**
  - Risk management (RM) – minimizing negative consequences
  - Opportunity management – maximizing positive consequences
- **Risk management = Uncertainty management**
- **Uncertainty management**
  - Affects project execution
  - Changes the project future by
    - Identifying uncertainty
    - Measuring uncertainty
      - Risk exposure (likelihood X impact)
    - Improving effective of uncertainty handling
    - Improving decision making to successfully achieve objectives
- **Improved decision making a key focus**

NORTHROP GRUMMAN

State of Industry

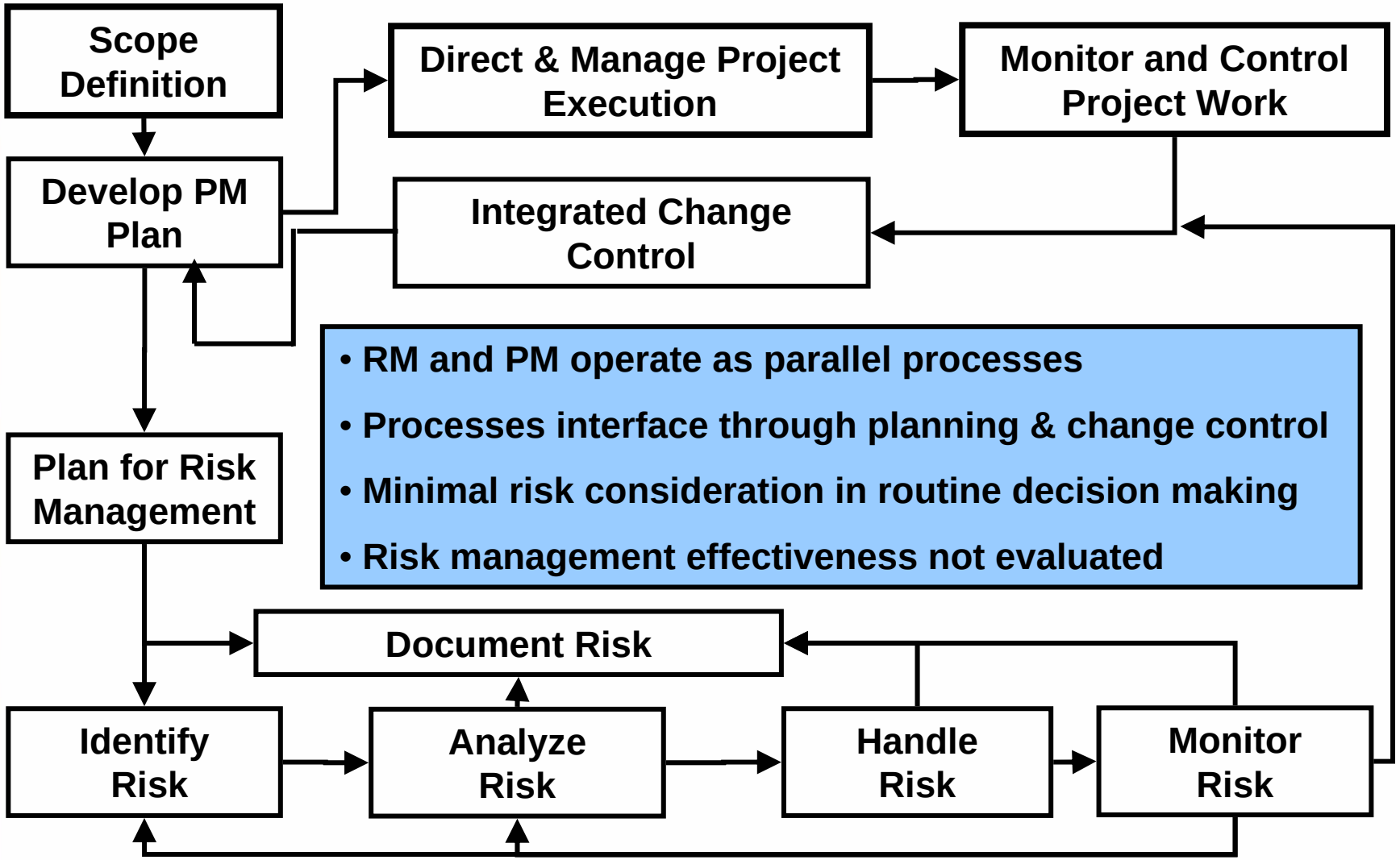
- **NDIA - Program Management Systems Committee Survey***
  - RM and EVM integration
  - Oct 2003 to Jun 2004
  - 121 respondents
- **Study findings:**
  - RM and EVM have separate process owners 76% of the time
    - System engineering
    - Program management
    - Project control
    - Business/financial management
  - Risk management seldom predicts near-term issues
  - Majority (70%) strongly believes in the value of integrated RM and EVM even though only 34% said they were successfully integrating them

> "Failure to integrate RM, cost-risk analysis, and EVM contributes to overruns. The program manager is denied clear visibility of quantitative RM that could increase the probability of mission success."
>
> **Peter Teets, former Under Secretary of the Air Force**

*** "Integrating Risk Management with Earned Value Management", at www.ndia.org/Content/ContentGroups/Divisions1/Procurement/**

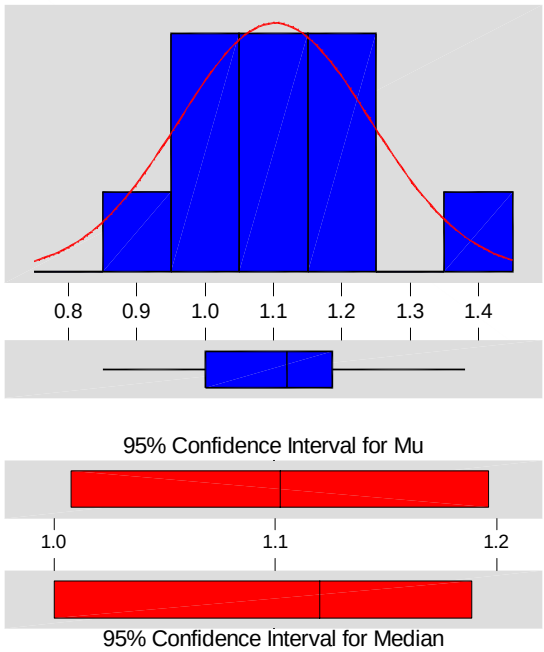
NORTHROP GRUMMAN

Typical "As-Is" Risk Management



“As-Is” Risk Management Process Capability – Cost Control

Past Performance Contract References



Variable: CPI Inverse

Anderson-Darling Normality Test

A-Squared:	0.252
P-Value:	0.664
Mean	1.10210
StDev	0.14044
Variance	1.97E-02
Skewness	0.206006
Kurtosis	0.821268
N	11
Minimum	0.85000
1st Quartile	1.00000
Median	1.12000
3rd Quartile	1.18600
Maximum	1.38000

95% Confidence Interval for Mu

1.00776	1.19645

95% Confidence Interval for Sigma

0.09813	0.24646

95% Confidence Interval for Median

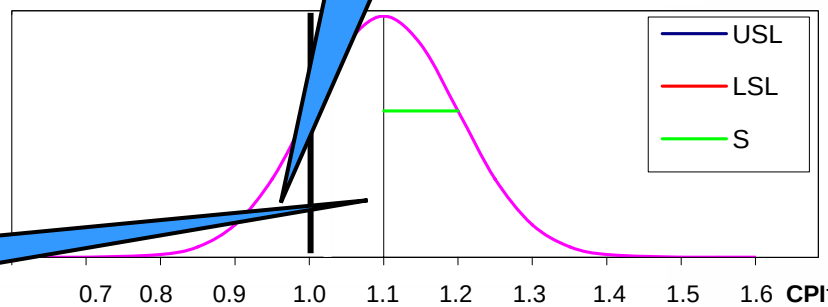
1.00000	1.18880

Less than 25% of projects meet budgeted costs

Xbar	1.102
S	0.14
USL	1
LSL	
	0.77 sigma

2. Label a Normal curve

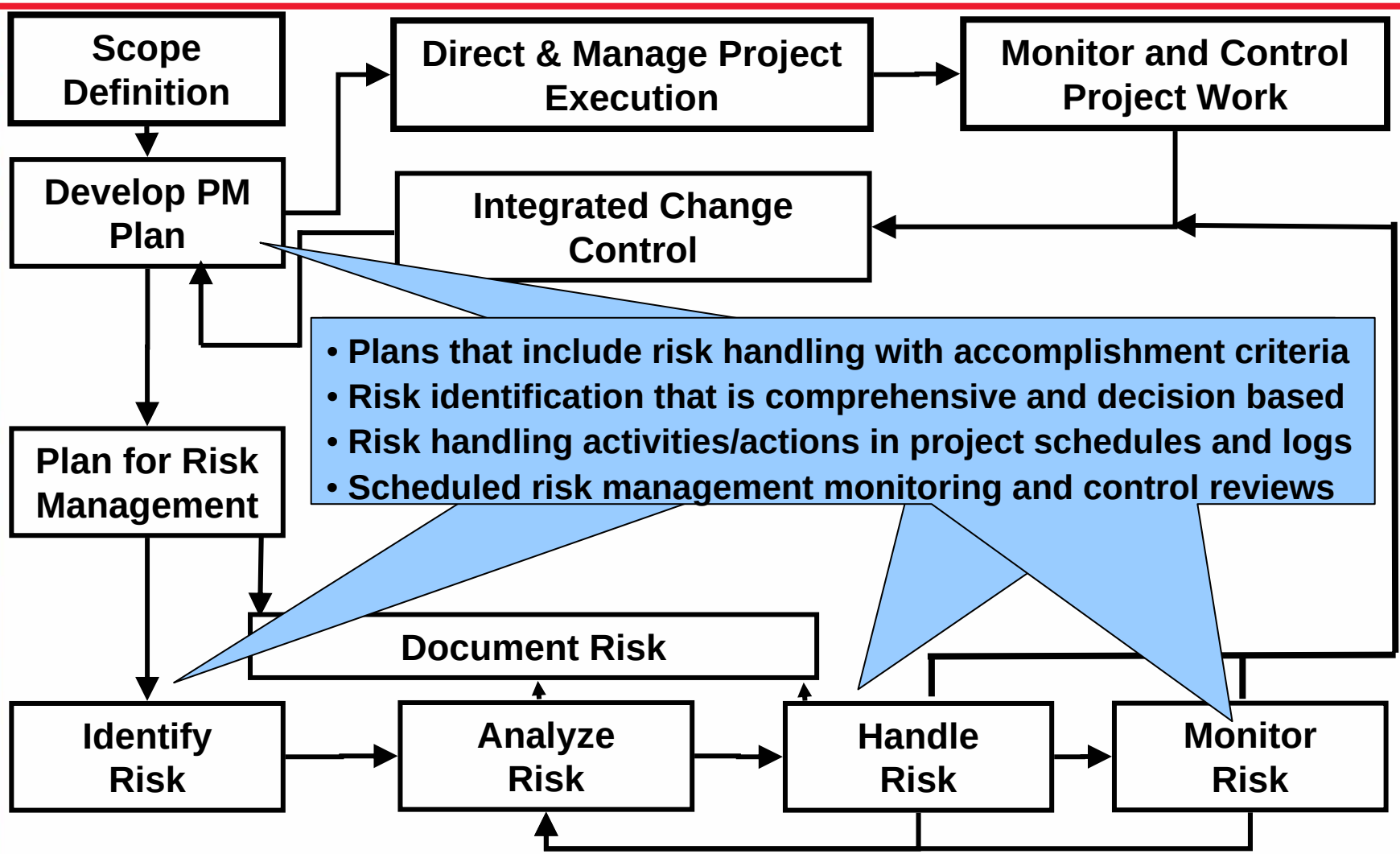
- Average
- Standard deviation
- USL (and shade to LEFT for Area 1)
- LSL (and shade to LEFT for Area 2)



Average costs exceed budgeted costs by 10.7%

NORTHROP GRUMMAN

Project Baseline Planning Integrating Risk Management

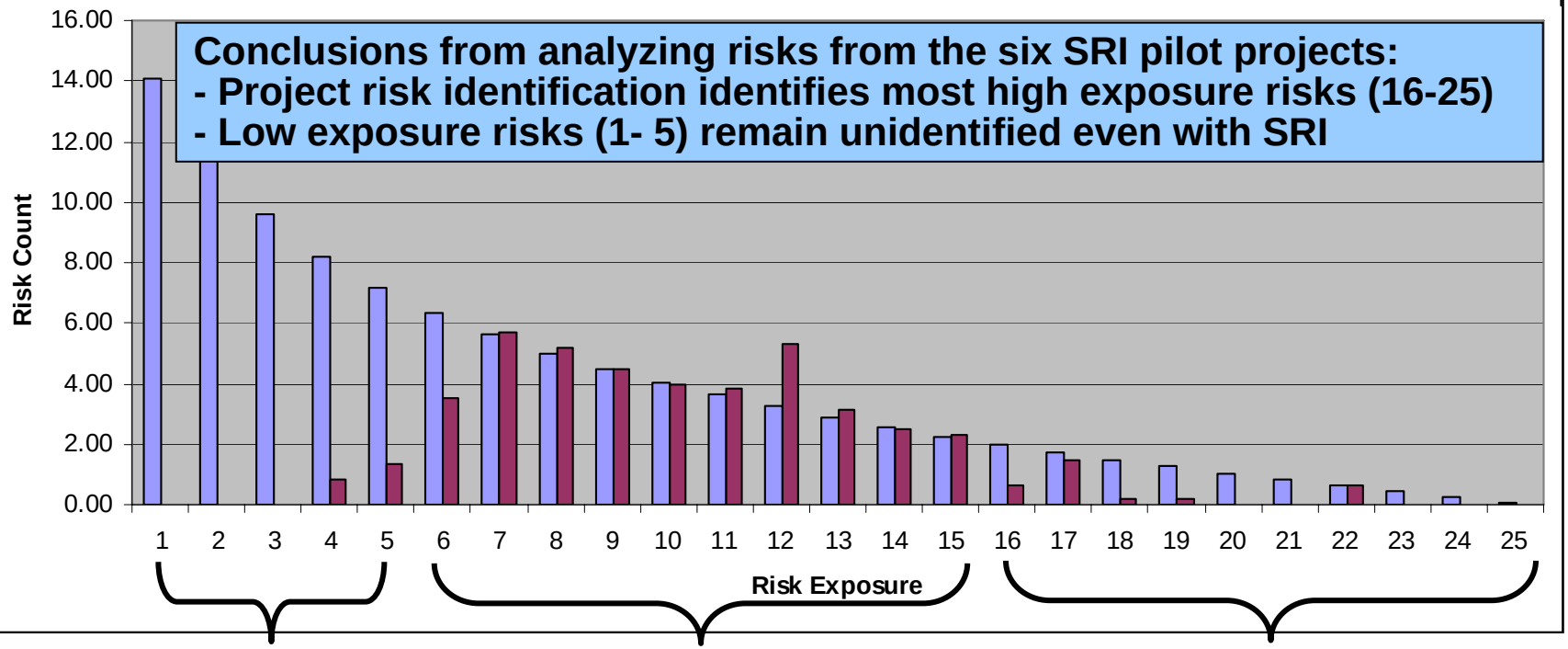


Effective Risk Management Actions are Comprehensive

NORTHROP GRUMMAN

A Structured Risk and Opportunity Identification (SROI) Approach Is Effective in Identifying More Uncertainties

Comparison of risk counts from uniformly distributed risks over a (5 X 5) likelihood-by-impact linear risk space with average counts from 6 SRI pilot projects



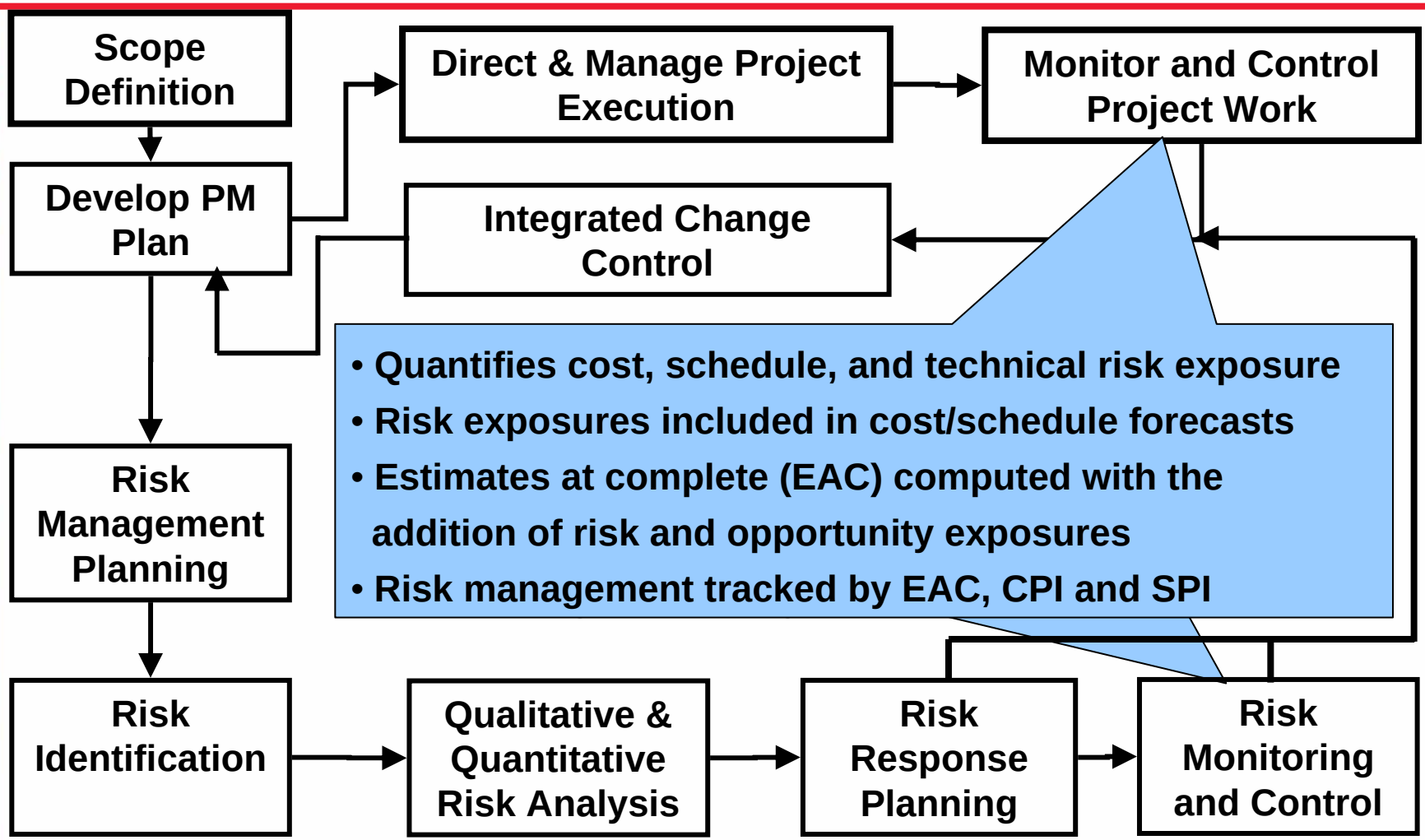
Unidentified risks
- 50% of risks
- 20% of risk exposure

SRI identified risks
- 42% of risks
- 55% of risk exposure

Project-identified risks
- 8% of risks
- 25% of risk exposure

NORTHROP GRUMMAN

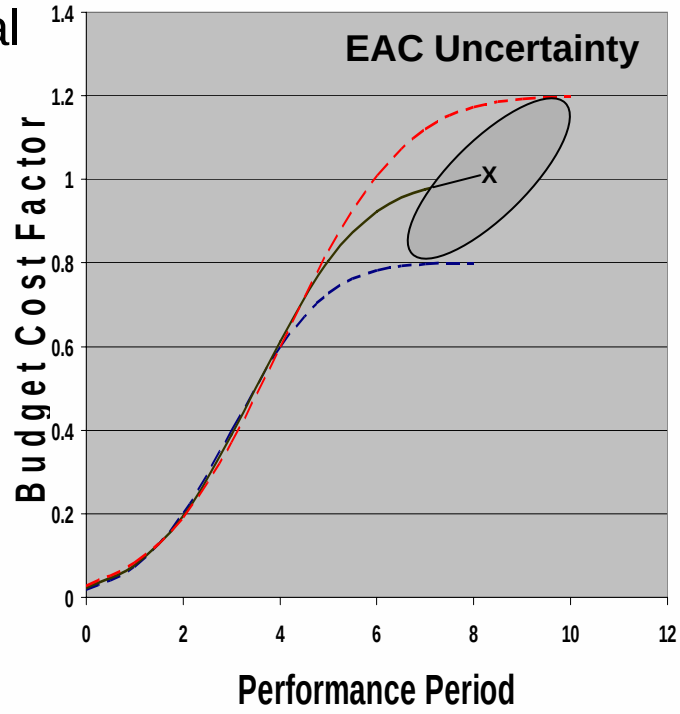
Integrating Risk Monitoring and Control with Project Monitoring and Control



Integrated RM & EVM assists decision making

RM and EVM Integration Approaches

- **Barriers to risk management integration***
  - Contractual incentives
  - Technology - tools
  - RM or EVM process maturity
  - Internal/external management cultures
  - Organizational
  - Baseline instability
  - Emotional
- **RM-EVM integration approaches**
  - EAC with and without risk exposure
  - Residual uncertainties in forecasts with statistical profiles and EAC ellipses
  - Risk handling earned value monitoring – residual risks monitored against plans
  - Cost and schedule performance indices (CPI and SPI) monitoring and control
- **Focus on risk handling, not mechanics**

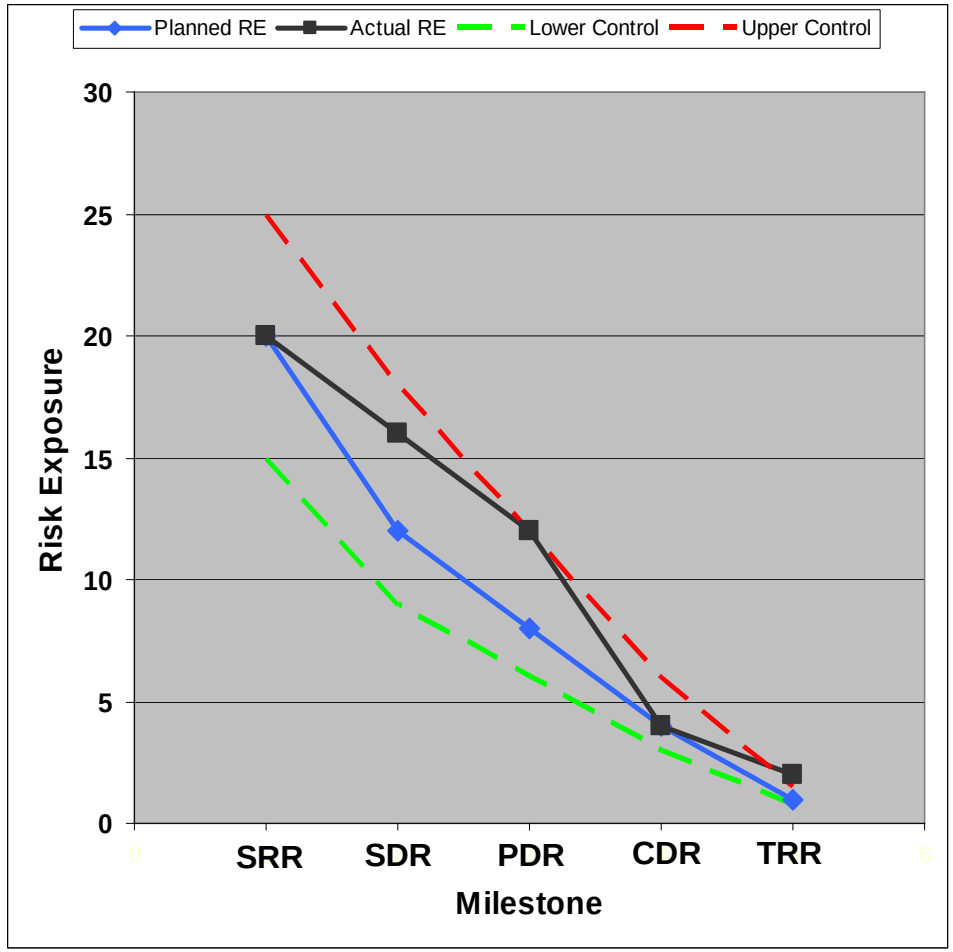


* "Integrating Risk Management with Earned Value Management", NDIA Study Report 2005

NORTHROP GRUMMAN

“Earned Value” Monitoring Measures Risk Handling Effectiveness

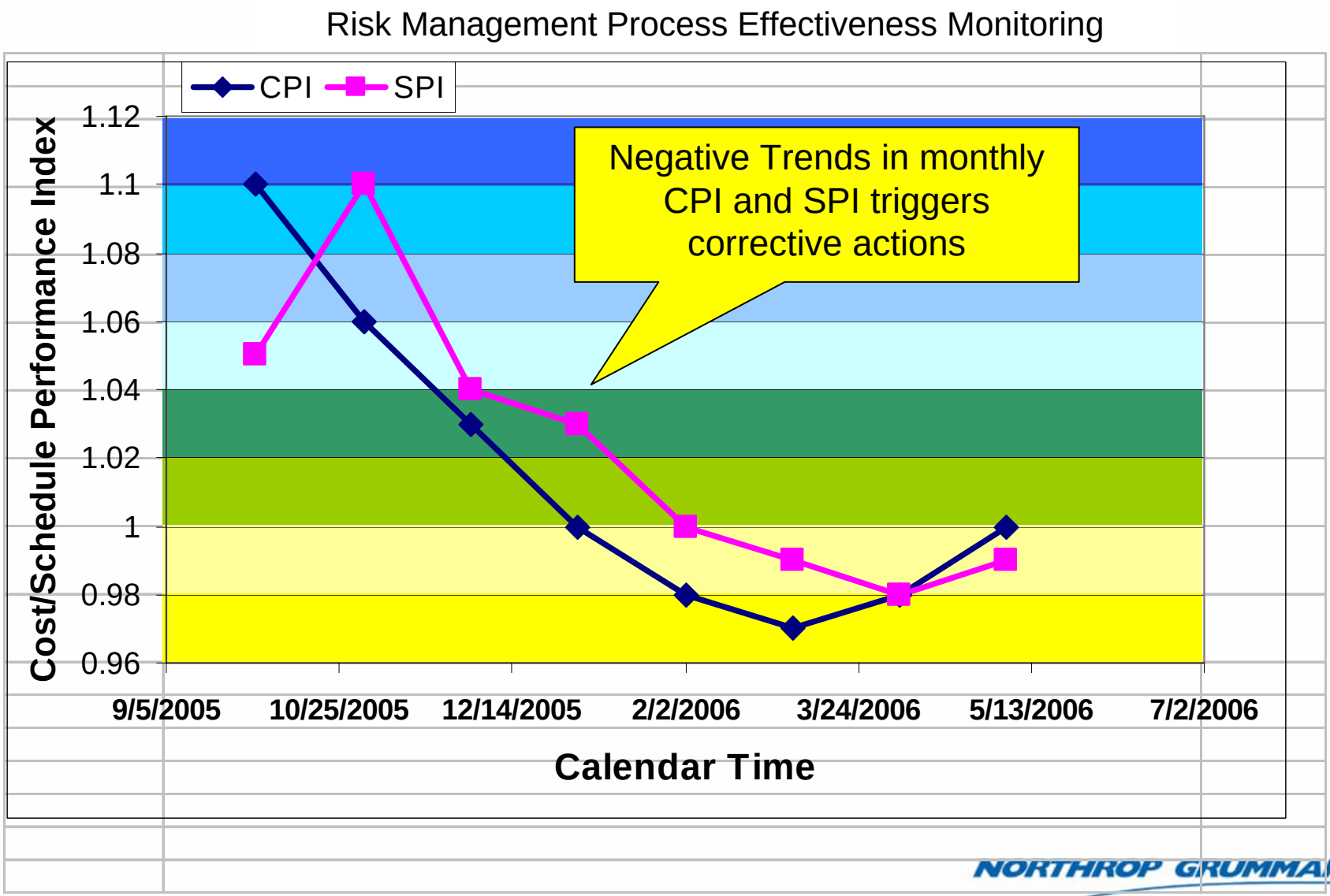
- **Monitors actual handling performance against plans**
- **Performance-based earned value® measures**
  - A means to measure uncertainty management effectiveness performance
- **Measures <u>effectiveness</u> of uncertainty management, not just task completion**
- **Triggers uncertainty management corrective actions**



® Performance-Based Earned Value is registered with the U.S. Patent and Trademark Office by Paul Solomon.

NORTHROP GRUMMAN

Cost/Schedule Performance Monitoring Provides Leading Indicators for Corrective Action



Summary

- RM-EVM integration provides leading indicators that increase response time and probability of success
- A structured risk identification approach increases risk assessment comprehension
- Quantified uncertainty metrics are a basis for effective management
- Alternative RM-EVM integration approaches can be selected to meet project needs
- Focus on uncertainty handling and project decision making -- not on uncertainty computation mechanics

NORTHROP GRUMMAN