



**NORTHROP GRUMMAN**

DEFINING THE FUTURE

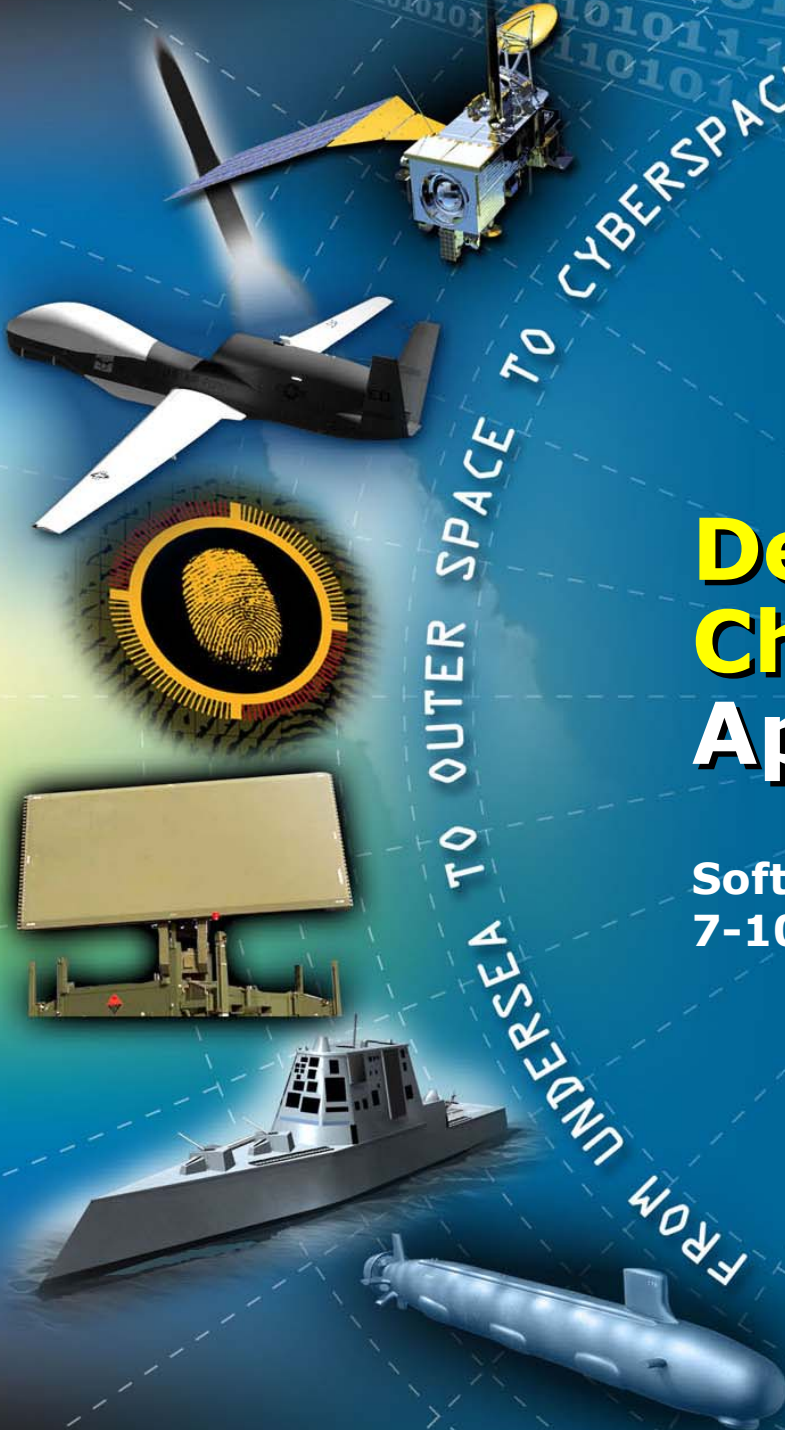
# Debating the Tough Change Requests: Appraisal Perspectives

Software Engineering Process Group Conference  
7-10 March 2005

**Rick Hefner**

Director, Process Initiatives  
Northrop Grumman

FROM UNDERSEA TO OUTER SPACE TO CYBERSPACE



# Agenda

---

- **Organizational Background**
- **Challenges Solved**
  - Reducing SCAMPI A Costs
  - Dealing with Ambiguity in the CMMI Model
- **Remaining Challenges**

# Northrop Grumman Mission Systems

- A leading integrator of complex, mission-enabling systems
- 2003 Sales - ~\$4.1B
- 18,000 employees in 50 states and in 23 countries
- 1500 active contracts
- Deep, legacy domain expertise in priority, high-growth segments
- Premier provider of mission critical end-to-end solutions



Joint National  
Integration Center



Satellite Command & Control

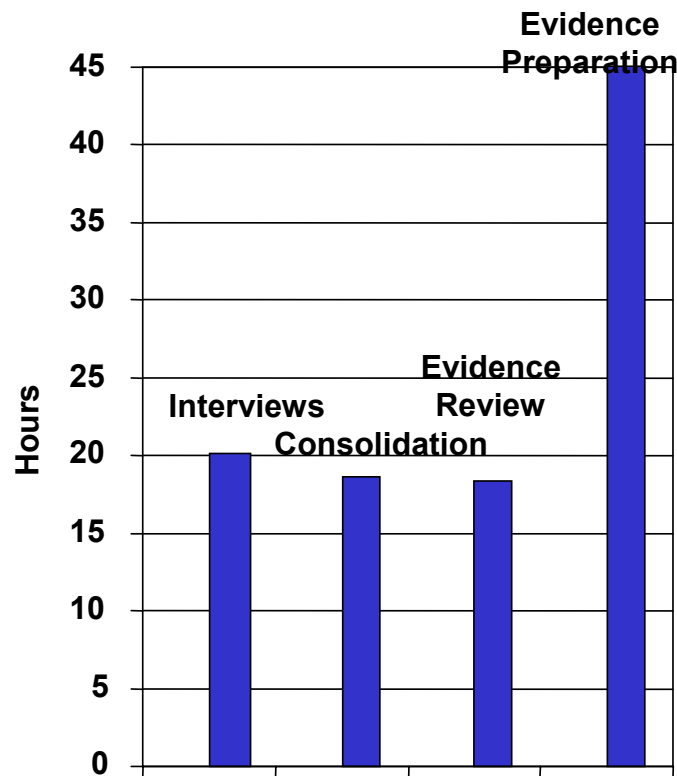
Intercontinental  
Ballistic Missile  
Program



*Focused on program performance*

# Applying Six Sigma To Appraisals

- **Several Six Sigma projects were conducted to optimize the SCAMPI appraisal process**



“Minimizing SCAMPI Costs via Quantitative Methods,”  
R. Hefner and Ron Ulrich, CMMI Technology  
Conference & User Group, 17-20 November 2003

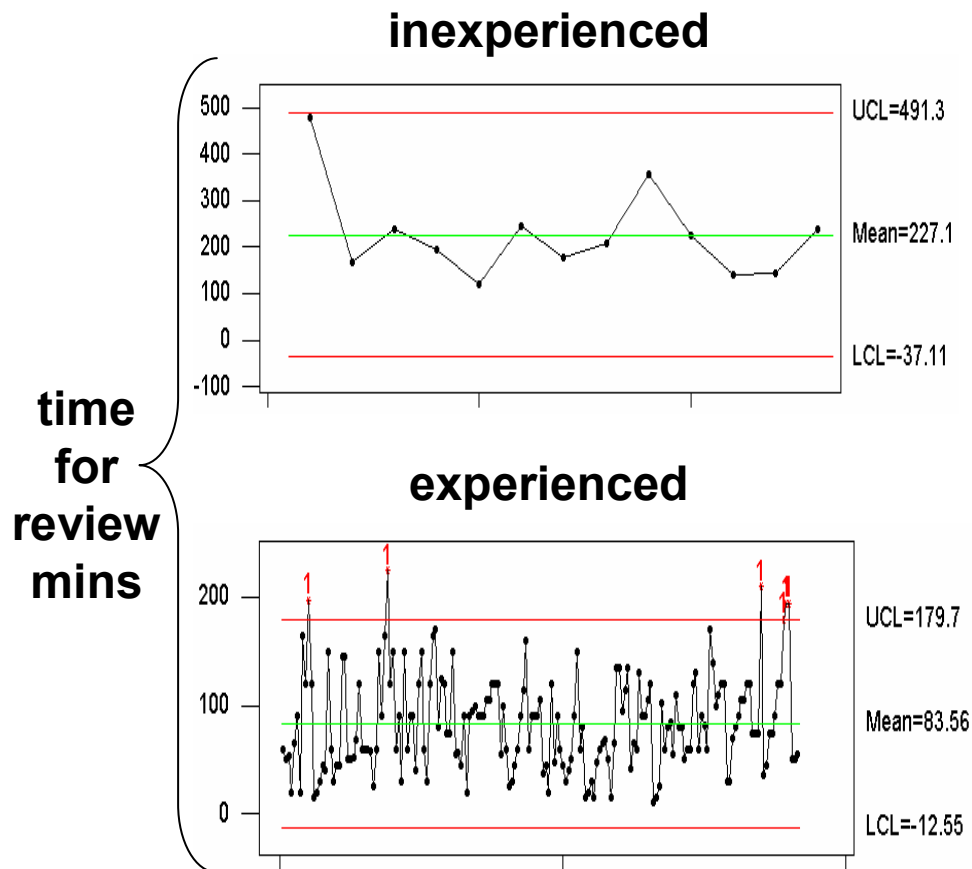
- **Collected metrics on time spent on various appraisal activities, defects**
- **Used Pareto chart to identify bottlenecks, opportunities for improvement**
- **Used individuals charts to study variation in the appraisal process**
- **Used fishbone charts and other causal analysis methods to identify potential improvements**

# Reducing Appraisal Time by Better Preparation

|                                   |   |  |   |  |                 |                     |              |            |
|-----------------------------------|---|--|---|--|-----------------|---------------------|--------------|------------|
| Date: <b>1-Oct-03</b>             |   | © 2003 Northrop Grumman Space and Mission Systems                      |   | Software POCs  | Last Name       | First               | Phone Number | Systems PC |
| Project:                          |   | SAT Version 4.3e   |   | Project Manager:   |                 |                     |              | Project M  |
| Division: <b>Selecta Division</b> |   | CMMI_SAT_2K_V4_3e.xls  |   | Project SAT POC:   |                 |                     |              | Project SA |
| Tool                              | Levels <input type="radio"/> Level2 <input type="radio"/> Level3 <input type="radio"/> Level4 <input type="radio"/> Level5              | LOE <input checked="" type="radio"/> Hide <input type="radio"/> Show   | Software Engineering  |  |                 |                     |              |            |
| Controls                          | Scope <input checked="" type="radio"/> All <input type="radio"/> Plan <input type="radio"/> No Plan <input type="radio"/> My Ans's Area | ORG <input checked="" type="radio"/> Lock <input type="radio"/> Unlock |   |  |                 |                     |              |            |
| CMMI & ISO Ref                    | Export <b>Maturity Level</b> Import   | Typical Evidence   | Baseline Status   | Current Status   | Actual Evidence | Implementation Plan | Actual       | Remarks    |
| Level 2 – Managed                 |   |  |   | Level 2 – Managed  |                 |                     |              |            |
| Requirements Management           |   |  |   | Requirements Management  |                 |                     |              |            |
|                                   | SG 1  | G  | Requirements are managed and inconsistencies with project plans and work products are identified.                                     |  |                 |                     |              |            |
| Req M                             | SP11  | P  | Does the project develop an understanding with the requirements providers on the meaning of the requirements?                         | meeting records, review records, an agreed to set of written requirements                | No              |                     |              |            |
| Req M                             | SP12  | P  | Does the project obtain commitment to the requirements from the project participants?   | sign off   | No              |                     |              |            |
| Req M                             | SP13  | P  | Does the project manage changes to the requirements as they evolve during the project?  | CM records, change requests, CCB records, sign off                                       | No              |                     |              |            |
| Req M                             | SP14  | P  | Does the project establish and maintain bi-directional traceability between the requirements and the project plans and work products? | requirements traceability matrix, requirements tracking system, test verification matrix | No              |                     |              |            |
| Req M                             | SP15  | P  | Does the project identify inconsistencies between the project plans and work products and the requirements?                           | revision histories, change requests  | No              |                     |              |            |
|                                   | GG 2  | G  | The process is institutionalized as a managed process.  |  |                 |                     |              |            |
| Req M                             | GP 2.1a (CO 1)  | S  | Does the organization establish and maintain a policy for planning and performing the requirements management process?                | organizational policy (e.g., Systems PFM 931 Requirements Development and Management)    | No              |                     |              |            |
| Req M                             | GP 2.2 (AB 1)   | P  | Does the project establish and maintain the plan for performing the requirements management process?                                  | project plans  | No              |                     |              |            |

- Most appraisal time is spent mapping evidence to CMMI practices
- A Self-Assessment Tool was created to organize the mapping
  - Serves as the PIID
- Can generate compliance statistics across any level of the organization
- Used to generate evidence review and interview worksheets for the appraisal team

# Reducing Variation in Evidence Review



- **The time it takes to review evidence is predictable**
  - Some variation by process area
- **The mean review time and variation is much higher among inexperienced appraisers**
  - At least half of the appraisers on the team should be experienced
- **Review time is driven by the clarity with which evidence is assembled and mapped to the CMMI practices**
  - Ensure thorough evidence scrub prior to on-site period
  - Bad evidence (“defects”) causes unexpected schedule overruns

# Optimizing Interviews by Using SCAMPI Philosophy



- **To reduce cost:**
  - Used pre-scripted interview questions
  - Conducted interviews simultaneously in mini-teams
  - Scheduled one interview per practice & instantiation (no SCAMPI requirement for multiple interview sources like in CBA IPI)
- **Maintain appraisal accuracy by emphasis on direct evidence**
  - Interviews simply confirm that the evidence is “real”
  - Interviews are not a test of how well someone remembers the practice

# Reducing Consolidation Time

## *Crafting observations*

- **Voice of Customer data indicates organizations and projects simply want to know which practices they do not comply with**
  - Consistent with Verification mode
  - No need to wordsmith charts
- ✓ **Created an Appraisal Findings tool to capture the ratings at the instantiation level (every project, every practice)**
  - Simplifies data consolidation, team discussion

## *Reviewing as a team*

- **Most of the time is spent arguing about how to interpret a few CMMI practices**
  - Especially Generic Practices
- ✓ **Created “CMMI Interpretation” training which clarifies how ambiguous practices will be evaluated**
  - Driven by areas where disagreement occurred
  - Useful in reaching team (and organizational) consensus



# Ten Most Misinterpreted CMMI Practices

- **Requirements Management**  
SP 1.4 Maintain Bidirectional Traceability of Requirements
- **Project Planning**  
SP 1.2 Establish Estimates of Work Product and Task Attributes
- **Project Monitoring and Control**  
SP 1.1 Monitor Project Planning Parameters
- **Measurement and Analysis**  
SP 1.1 Establish Measurement Objectives
- **Configuration Management**  
SP 3.2 Perform Configuration Audits
- **Verification**  
SP 2.2 Conduct Peer Reviews  
SP 2.3 Analyze Peer Review Data
- **Risk Management**  
SP 1.1 Determine Risk Sources and Categories  
SP 1.3 Establish a Risk Management Strategy
- **Generic Practices**

“The 10 Most Commonly Misunderstood CMMI Practices, “ R. Hefner, CMMI Technology Conference & User Group, 17-20 November 2003

“Applying CMMI® Generic Practices with Good Judgment, “ R. Hefner and G. Draper, CMMI Technology Conference and User Group, 15-18 November 2004

## Measured Success

---

- **We are typically conducting Level 5 SCAMPI appraisals in 5-6 days**
  - Based on over 30 SCAMPI A appraisals
  - 3-4 projects, 6-9 appraisers, 3 mini-teams, 10 hour days
  - Significant cost savings
- **Post-appraisal follow-up indicates >95% accuracy rate**
- **We are continuing to look at ways to decrease the preparation time**
  - Evidence notebook organization
  - On-line evidence

## Remaining Challenges

---

- **Overcoming the industry perception that SCAMPI A's require 2-3 weeks of 16 hour days**
  - We've proven that 1 week of 10 hour days are possible, given training, tools, and experience
- **Establishing ethical industry standards for sampling projects**
  - We do not sample – we assess ALL projects
- **Educating the customer on how to evaluate appraisal results**
  - Customers should request and know how to read an Appraisal Disclosure Statement
  - B and C methods are not as accurate as SCAMPI A's