Collaborative Government / Contractor SCAMPI Appraisal

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Agenda

• Background
  – Nature of Program
  – Roles & Responsibilities
  – Contractual Requirements

• Appraisal Approach
  – Considerations for a Joint Appraisal
  – Tailoring of Method
  – Team Selection & Training
  – On-Site Activities

• Lessons Learned
  – Government
  – Boeing
  – Northrop Grumman
Background

Nature of Program
Roles & Responsibilities
Contractual Requirements
Nature of Program

Missile Defense Agency (MDA)

Ground-Based Midcourse Defense (GMD)
Fire Control & Communications (GFC/C)
Nature of Ballistic Missile Defense

- Within the Department of Defense, the MDA is responsible for developing, testing, and deploying the Ballistic Missile Defense System (BMDS).

- BMDS is a collection of systems (ABL, AEGIS, GMD, THADD, Patriot) and is designed to intercept threat missiles during all phases of their flight: boost, midcourse, and terminal.

- The Ground-Based Midcourse Defense (GMD) system is a component of the midcourse defense, during which the Ground-Based Interceptors (GBIs) intercept and destroy long-range missiles during the ballistic (midcourse) phase of their flight, before their reentry into the Earth’s atmosphere.

Note: Material on this page taken from public website – http://www.acq.osd.mil/bmdo/
Ground-Based Midcourse Defense

- On December 17, 2002, the President directed the Department of Defense to field initial BMDS missile defense capabilities beginning Fall, 2004.

- The plan calls for fielding up to 10 GMD interceptors by 2004 and an additional 10 by 2005 (for a total of up to 20), in addition to other assets.

- **GMD** is the most mature missile defense element; therefore, it will form the basis for this initial defensive capability.

- In addition, MDA / GMD will continue to develop, test and improve GMD capabilities.

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Roles & Responsibilities for GFC/C

GMD Fire Control & Communications (GFC/C) is essential for a GMD Initial Defensive Operations (IDO) Capability, scheduled for Fall, 2004. GFC/C is the central nervous system for GMD and interfaces with all GMD components and related external MDA systems.

- Government – GMD Joint Program Office (JPO) Management
- Boeing – Prime Contractor, GMD Systems Integrator
- Northrop Grumman – Primary Software Development Organization (SDO) for GFC/C Software Development
GMD Contractual Requirements

- GMD Contract requires all Software Development Organizations (SDOs) developing mission critical software to achieve and maintain a Software Engineering Institute (SEI) Capability Maturity Model (CMM) Level 3.

- GMD contract requirement for all SDOs to attain at least an SEI CMM Level 3 is specified by:
  - GMD Software Development Plan (SDP)
  - GMD Software Capability Evaluation (SCE) Assessment Plan

- Government and Boeing Contract requires conduct of a SCE on the Northrop Grumman GFC / C program every 18-24 months to monitor the software development progress.
GMD Fire Control & Communications

- Hardware, software and communications systems necessary for planning, tasking and controlling GMD.
- Enables personnel to understand the situation, make informed decisions, and control defense against a limited ballistic missile attack.
- Mission and engagement planning, situation assessment, system responses and centralized command and control.
Appraisal Approach

Considerations for a Joint Appraisal
Tailoring of Method
Team Selection & Training
On-Site Activities
Considerations for a Joint Appraisal

• Northrop Grumman requested substitution of CMMI SCAMPI instead of the SW-CMM SCE

• CMMI could provide greater value to the program
  – Bigger scope, more depth than SW-CMM
  – Northrop Grumman had transitioned to CMMI as the basis for process improvements

• Contract Letter Submitted to Government (GMD JPO) by Boeing, accepted by the Government

• CMMI SCAMPI conducted at Northrop Grumman facilities in Huntsville on 29 September – 3 October 2003
  – Joint Government-Boeing-Northrop Grumman appraisal team
  – CMMI Level 5 reached instead of SW-CMM Level 3
## SW-CMM to CMMI Comparison

<table>
<thead>
<tr>
<th>SW-CMM Level 3</th>
<th>CMMI Level 5</th>
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<tbody>
<tr>
<td>Organization process focus</td>
<td>Causal analysis and resolution</td>
</tr>
<tr>
<td>Organization process definition</td>
<td>Organizational innovation &amp; deployment</td>
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<tr>
<td>Training program</td>
<td>Organizational process performance</td>
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<td>Integrated software mgmt</td>
<td>Quantitative project management</td>
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<td>Software product engineering</td>
<td>Risk management</td>
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<td>Intergroup coordination</td>
<td>Requirements development</td>
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<td>Peer reviews</td>
<td>Technical solution</td>
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<td>Requirements management</td>
<td>Product integration</td>
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<td>Software project planning</td>
<td>Verification</td>
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<td>Software project tracking &amp; oversight</td>
<td>Validation</td>
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<td>Software subcontract mgmt</td>
<td>Decision analysis and resolution</td>
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<td>Software quality assurance</td>
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<td>Software configuration mgmt</td>
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Collaborative Government/Contractor SCAMPI Appraisal
Acquisition of Software-Intensive Systems

Hefner/King/Garcia - 12
26-28 January 2004
### Appraisal Objectives & Approach

<table>
<thead>
<tr>
<th>Objective</th>
<th>Approach</th>
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<tbody>
<tr>
<td>Reduce cost and effort</td>
<td>• Use mature Northrop Grumman appraisal process, tools, and experienced appraisers</td>
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<td></td>
<td>• Scheduled a six day appraisal, based on Northrop Grumman history (20+ SCAMPI appraisals)</td>
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<td>Ensure sufficient CMMI expertise on appraisal team</td>
<td>• Train a pool of Govt., Boeing and Northrop Grumman appraisal team members on CMMI and SCAMPI</td>
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<td>• Provide on-site team training</td>
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<td>Maintain objectivity and ensure accuracy of results</td>
<td>• Mix Government, Boeing, and Northrop Grumman personnel on team, sub-teams</td>
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<td></td>
<td>• Project prepared all evidence in advance, mapped to the CMMI</td>
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Team Selection & Training

• An SEI-authorized external Lead Appraiser, independent of Northrop Grumman, Boeing, and the Government, was hired to lead the appraisal team

• The Government and Boeing nominated appraisal team members and alternates

• Northrop Grumman provided training to the appraiser pool
  – Official 3-day CMMI training - provided by Northrop Grumman SEI-authorized instructors
  – 2-day SCAMPI training, based on SEI material - provided by experienced Northrop Grumman Lead Appraisers
  – Northrop Grumman provided an overview of the process and tools
  – The external Lead provided an overview of difficult model interpretations
On-Site Activities

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
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<tbody>
<tr>
<td>Arrival</td>
<td>Evidence Review</td>
<td>Interviews</td>
<td>Review Findings</td>
<td>Review New Evidence</td>
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<td></td>
<td>(in mini-teams)</td>
<td>(in mini-teams)</td>
<td>(whole team)</td>
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<tr>
<td>Opening Briefing by Site</td>
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<td>Team Training</td>
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<tr>
<td>Evidence Review</td>
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<tr>
<td>Whole Team Interview (training)</td>
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<tr>
<td>Findings Consolidation (training)</td>
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</tr>
<tr>
<td>Evidence Review</td>
<td>Interviews</td>
<td>Interviews</td>
<td>Present Draft Findings</td>
<td>Executive Briefing</td>
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<td></td>
<td>(in mini-teams)</td>
<td>(in mini-teams)</td>
<td></td>
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</tr>
<tr>
<td>Whole Team Interview (training)</td>
<td>Consolidation</td>
<td>Consolidation</td>
<td>Review New Evidence &amp;</td>
<td>Final Findings</td>
</tr>
<tr>
<td>Findings Consolidation (training)</td>
<td>Evidence Review</td>
<td>Draft Findings</td>
<td>Conduct New Interviews</td>
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<tr>
<td></td>
<td></td>
<td>(in mini-teams)</td>
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Finished a day early, due to well-trained team and well-prepared evidence.
Evidence Prepared in Advance

• 13 team members
  – 1 Lead
  – 4 Government
  – 3 Boeing
  – 5 Northrop Grumman

• Organized in mini-teams, with joint membership on each
  – Project Management
  – Engineering
  – Support + Process Management
  – Level 4/5 Process Areas

• Northrop Grumman pre-assembled the evidence
  – At least one notebook for each Process Area
  – Each notebook had separate tabs for each practice
Lessons Learned

Government
Boeing
Northrop Grumman
### Lessons Learned - Government

<table>
<thead>
<tr>
<th>Initial Concerns</th>
<th>Experience</th>
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| • Collaborative efforts among Government / Boeing / Northrop Grumman was an area of concern, as past CMM SCE activities were viewed as adversarial in nature | • CMMI SCAMPI Team members worked very well together from the start  
  – Mini-team composition was Boeing, Northrop Grumman, and Government on each  
  – Teamwork was evident |
| • Ensuring sufficient CMMI knowledge and SCAMPI experience on the team         | • Government is now trained & experienced on SCAMPI  
  • Northrop Grumman provided SEI-approved CMMI & SCAMPI training to Government |
  – CMMI experience  
  – No SCAMPI trained Government personnel  

For SDOs that have transitioned to SEI CMMI, conducting an SEI CMMI SCAMPI is an appropriate activity.
## Lessons Learned - Government

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<th>Experience</th>
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<tbody>
<tr>
<td>• Contract requires SEI CMM SCE, and Government and Boeing had not participated in a CMMI SCAMPI</td>
<td>• Previous Northrop Grumman CMMI SCAMPI Efforts outside GFC/C contract reduced risk to Government</td>
</tr>
<tr>
<td>• Some risks with a deviation to performance of a SEI CMMI SCAMPI</td>
<td>– External SCAMPI, Assessed at CMMI Level 3, December 2002</td>
</tr>
<tr>
<td>• Would joint Government/ Boeing/ Northrop Grumman SCAMPI “Path Finder” efforts be successful?</td>
<td>– Internal CMMI SCAMPI, Summer, 2003</td>
</tr>
<tr>
<td>– Objectivity</td>
<td>• GFC/C SCAMPI Appraisal was very Successful – Thorough, Objective Agreements Reached</td>
</tr>
<tr>
<td>– Consensus</td>
<td>– Mini-Teams</td>
</tr>
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<td></td>
<td>– Entire SCAMPI Team</td>
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Path Finding, Ground-Breaking, 1st Ever Joint Government / Contractor Team for a CMMI SCAMPI – Very Positive
# Lessons Learned - Boeing

<table>
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| **Objectivity in the performance of the SCAMPI**  
  – Contract calls for 50% Government and 50% Boeing                                                                                                          | **Well picked team members Northrop Grumman members knowledgeable in the CMMI**  
  – Knowledgeable in CMMI  
  – Good work ethic by all  
  – Well trained                                                                                                                                 |
| **Having an outside team Lead that has worked with Northrop Grumman, and Northrop Grumman as a co-lead**  
  – Contract calls for Boeing lead and Government co-lead                                                                                                    | **Trust gained in the team members after a day of assessing**                                                                                                                                               |
| **Concerns during the SCAMPI**  
  – Not being able to see/hear all of the evidence/assessment  
  – Not knowing the background or experience of all team members                                                                                   | **Good discussions among the team members during and after group meetings**  
  – Overall hard and time-consuming work put in by all                                                                                                                                                 |

Team worked professionally and maintained objectivity. Good for trust building and team building of the involved entities.
### Lessons Learned - Northrop Grumman

<table>
<thead>
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<th>Experience</th>
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<tr>
<td>• Ensuring the appraisal was value-added to the program</td>
<td>• Joint appraisal team fosters joint ownership of the results</td>
</tr>
<tr>
<td>– SW-CMM results are of little value to Northrop Grumman, since we have</td>
<td>– More opportunities to explore the process in depth</td>
</tr>
<tr>
<td>moved on to CMMI</td>
<td>– Joint assessment of process-related program risks</td>
</tr>
<tr>
<td>• Ensuring sufficient CMMI knowledge and SCAMPI experience on the team</td>
<td>• Training the Government and Boeing team members was straightforward</td>
</tr>
<tr>
<td>– Some past SCEs have used untrained/inexperienced assessors</td>
<td>– Integrated into an existing Northrop Grumman class</td>
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<tr>
<td>– Results are inaccurate and of little use to the programs</td>
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</table>

The joint SCAMPI fit well with the internal process improvement program, and provided accurate and useful results.
Summary Lessons Learned

• Early planning is essential
  – Communicate early with all parties involved
  – Involve all stakeholders in the plan, training and scheduling

• Selection of the team members is critical
  – Team must have a balance representation from all stakeholders
  – Team must have knowledge in CMMI SCAMPI methodology and the assessment process to be used.

• Must build trust of all stakeholders into the process
  – Keep all parties informed from start to finish of the assessment
  – Process must be conveyed and understood by all stakeholders
  – Clear line of responsibilities and roles need to be established early

• Training is essential
  – All team members must be trained in the method and appraisal process
  – Group training builds understanding and camaraderie
Conclusions

• The Government, Boeing, and Northrop Grumman agree that the joint SCAMPI approach was successful

• We recommend that a similar approach be used on other contracts to promote a joint understanding of process maturity program risk and trust

• Having a mix of Government, Boeing, and Northrop Grumman on the Mini-Teams was a major factor contributing to the success of the Collaborative Government / Contractor CMMI Appraisal