Process Alignment

From Aligned to Aligner

Ilene Pinsker
Sr. Systems Engineer
Rockwell Collins, Inc.
Simulation and Training Solutions
November, 2010
Agenda

- Background Information
- Simulation and Training Systems (STS) Alignment to Rockwell Collins (RC)
- Visual Systems (VS) Alignment to STS
- Observations and Lessons Learned
- Ongoing Activities
Rockwell Collins, Inc. (RCI)

- International provider of communication and aviation electronics solutions
- Mature processes
- CMMI Level 3
- Developing plans for CMMI future
NLX

- Small, privately owned company
- Built military and commercial full flight simulators
- Engineering facilities in Sterling VA, Binghamton NY and Huntsville AL
- Immature processes
- ISO certified
- Developing plans for CMMI Level 3
- Acquired by Rockwell Collins in December, 2003
  - NLX became Rockwell Collins Simulation and Training Solutions (STS)
Evans and Sutherland (E&S)

- Small company which created visual image generators
- Provided many of the image generators used in the simulators built by STS
- Engineering facilities in Salt Lake City UT, Orlando FL and Horsham, England
- Immature processes
- ISO certified
- No plans for CMMI
- Acquired by Rockwell Collins Simulation and Training Solutions in May, 2006
  - Evans and Sutherland became STS Visual Systems (VS)
Alignment Objectives

- Integrate STS into the RC Quality Management System
- Transition to RC Enterprise Tools
- Retain STS Best Practices
- Maintain ISO 9001:2000 Certification during transition and after alignment
- Achieve CMMI Level 3
Timeline

Dec-03
RC Acquires NLX

Jan-03
NLX Initiates CMMI Pursuit

Jan-04

Jan-05

Jan-06

Jan-07

Jan-08

May-05
First STS Project Uses RC Process

May-06
STS Acquires E&S

Mar-08
STS Achieves CMMI Level 3 (Excluded VS)
RC Contrast To STS

- Rockwell Collins product
  - Transitions to factory production
  - Requires FAA or equivalent certifications, such as DO178B

- STS product
  - Each simulator contract is for a custom-built device which doesn’t require large scale production
  - Simulators are not flight worthy systems, so they don’t require FAA certifications
STS and CMMI

• Although ISO certified, the CMMI requirements brought many new challenges for STS
  – No one at STS knew the CMMI
    • 2 people were sent to the SEI for the Introduction to the CMMI training
  – STS processes merely provided a starting point for CMMI
    • Too high level
    • Some process areas not included
  – Where do we begin?
Process Alignment

- Rockwell Collins processes were CMMI compliant!
- Can the same organizational standard process be used for simulators?
- What about the legacy STS processes?
- The vetting process began with much push-back from the practitioners that did not welcome change
  - “The process is oriented to a production environment”
  - “We don’t build flight worthy systems and don’t have the same safety requirements”
  - “The people in Cedar Rapids don’t understand our unique product needs”
  - “Our process is working, why do we need to change it?”
  - “Our customers are happy, why change?”
Process Alignment

- Representatives from Rockwell Collins provided mentoring on the RC Design and Development processes
- STS representative added to the RC Government Systems Organizational Process Group (OPG)
- STS Team
  - Lead by Engineering Processes and Tools and Software Quality
  - Functional area representatives
    - Quality Engineering
    - Engineering – Systems, Hardware and Software
    - Operations
    - Manufacturing
    - Project Management
- Each STS process was compared to the RC processes
  - Is there an existing RC process?
    - Can RC/STS use it as is?
    - If not, can it be modified to include unique product requirements?
    - If not, convert the legacy STS process to RC format
      - Due to tailorability of RC process, few processes were converted
    - New programs were required to follow the resulting process
  - RC provided training as well as mentoring
  - Institutionalization was gradually achieved
## Initial Findings

<table>
<thead>
<tr>
<th></th>
<th>RC Process</th>
<th>STS Legacy Process</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management</td>
<td>Entire life cycle (Business opportunity identification through program completion)</td>
<td>Starts at contract award</td>
<td>Replace legacy process with RC process</td>
</tr>
</tbody>
</table>
| Engineering  | •RC technical process includes areas that are not applicable to STS (i.e. ASIC, manufacturing transition)  
•Well defined tailoring tool | Hardware and software process can be directly mapped to RC process | New programs to use RC process and tailor out areas that are not applicable |
| Quality      | •Software Quality Engineering (SQE)  
•Design Quality Engineering (DQE) | •Quality Inspectors  
•Newly Software Quality position | RC to mentor development of SQE and DQE positions at STS               |
| CM           | Process includes configuration management and control                      | •CM process can be mapped to RC  
•Toolset is different                            | New programs to use RC CM process and tools                    |
Tool Alignment

- Engineering Tools
  - Process does not require use of specific tools, but many are highly recommended
  - Each RC standard tool was evaluated individually, this often included pilots
  - STS representative on the RC Tool Disposition Board

<table>
<thead>
<tr>
<th></th>
<th>RC Standard</th>
<th>STS</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design and Development Process</td>
<td>RC developed tailoring tool</td>
<td>No formal tool</td>
<td>Use RC tool</td>
</tr>
<tr>
<td>Requirements Management</td>
<td>DOORS</td>
<td>Excel Spreadsheet</td>
<td>DOORS is recommended, but decision is program dependent</td>
</tr>
<tr>
<td>Configuration Management</td>
<td>Subversion</td>
<td>Razor</td>
<td>New programs use Subversion Legacy programs continue with existing tool</td>
</tr>
<tr>
<td>Data Repository</td>
<td>TeamSpace – RC application of Microsoft Windows SharePoint Services Shared Drives</td>
<td>Electronic Database Management System (EDMS)</td>
<td>STS programs continue to use EDMS</td>
</tr>
<tr>
<td>Peer Reviews</td>
<td>RC developed tool</td>
<td>EDMS</td>
<td>Continue to use EDMS</td>
</tr>
</tbody>
</table>
Roll Out

- **Communication**
  - Briefings to senior management and program management
  - Quality oversight during program planning
  - Informative e-mails

- **Training**

- **Pilot project**
  - New full flight simulator
  - Required to achieve CMMI Level 3 within 36 months of contract
    - Highly motivated to use the RC CMMI compliant processes
  - Transition team mentoring
    - Trained project team on new process and tools
    - Guided project leaders through the tailoring process
    - Worked with team to assure all process required artifacts were developed

- **Quality audit checklists developed to assure compliance to the project’s tailored process**
CMMI Level 3 Achievement

- Shortly after roll out, CMMI activities began
- The need for CMMI provided impetus for institutionalization
- Cedar Rapids team performed CMMI Internal Evaluations
  - July, 2006 and October, 2007
- Class C Appraisal December, 2007
- CMMI Level 3 achieved March, 2008
Visual Systems

- The transition from STS to RC processes was well underway when STS Visual Systems (VS) entered the picture
- They needed to align with the RC Design and Development processes to eventually achieve CMMI Level 3
- The VS product transitions to the factory
- VS programs customize the basic product for specific purposes with no factory production
- The role of the transition team was now reversed
- Where do we begin?
Been There, Done That

- Recent alignment activities gave transition team good perspective
  - Desire to retain existing process
  - Need for buy-in from practitioners
    - “The STS process is not oriented to a production environment”
    - “You don’t understand our unique product needs”
    - “Our process is working, why do we need to change it?”
    - “Our customers are happy, why change?”
    - “We have many very short duration programs”
  - Analyze current processes and tools
    - Identify process gaps
    - Identify and retain best practices
Process Alignment

• Quality audits to identify process gaps
  – Used the checklists which were developed to audit STS projects
  – Assigned actions to close gaps
    • Start following process
    • Tailor process for unique VS needs

• Representatives from STS provided mentoring on the RC Design and Development processes with support from RC

• RC processes were evaluated for applicability to VS
  – Can the process be used as is?
  – If not, can it be modified to include unique VS requirements?
  – If not, create a new process

• VS Team
  – Lead by VS Quality and STS Engineering Process and Tools
  – Functional area representatives
    • Quality Engineering
    • Engineering – Systems, Hardware and Software
    • Project Management
    • Product Management
  – New programs were required to follow the resulting process
  – STS and RC provided training as well as mentoring
  – Institutionalization is progressing
# Initial Findings

<table>
<thead>
<tr>
<th></th>
<th>RC/STS Process</th>
<th>VS Legacy Process</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Management</strong></td>
<td>Entire life cycle (Business opportunity identification through program completion)</td>
<td>Starts at contract award</td>
<td>VS needs to replace legacy process with RC process</td>
</tr>
</tbody>
</table>
| **Engineering**      | • RC technical process  
                        • Well defined tailoring tool                                                  | Hardware, software and database processes can be directly mapped to RC process         | New programs can use RC process and tailor out areas that are not applicable                |
| **Quality**          | • Software Quality Engineering (SQE)  
                        • Design Quality Engineering (DQE)                                           | Quality Inspectors and Engineers – not same as the SQE and DQE role                   | STS to mentor development of SQE and DQE positions at VS                                  |
| **CM**               | Process includes configuration management and control                         | • CM process can be mapped to RC  
                        • Toolset is different                                                          | New programs will use RC CM tools                                                        |
**Tool Alignment**

- **Engineering Tools**
  - Each RC and STS standard tool was evaluated individually, this often included pilots

<table>
<thead>
<tr>
<th></th>
<th>STS</th>
<th>VS</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design and Development</td>
<td>RC developed tailoring tool</td>
<td>No formal tool</td>
<td>Use RC tool</td>
</tr>
<tr>
<td>Development Process</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Requirements Management</td>
<td>DOORS or Excel Spreadsheet</td>
<td>No formal tool</td>
<td>Transition to DOORS</td>
</tr>
<tr>
<td>Configuration Management</td>
<td>Subversion</td>
<td>ClearCase</td>
<td>•New programs use Subversion</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>•Legacy programs continue with existing tool</td>
</tr>
</tbody>
</table>
| Data Repository             | Electronic Database Management System          | •TeamSpace – RC application of Microsoft Windows SharePoint Services  
                             | (EDMS)                                        | •Shared Drives                                       |
|                             |                                               |                                              | New programs use EDMS                                 |
| Peer Reviews                | EDMS                                          | No formal tool                               | EDMS                                                 |
Roll Out

- Communication
  - Briefings to senior management and program management
  - Quality oversight during program planning
  - Informative e-mails
- Training
- Programs that supplied the image generator for STS programs
  - Already following parts of the process as part of the STS team
- New product development
- Include in next CMMI appraisal
- Transition team mentoring
  - Process and tool training
  - Guide project leaders through the tailoring process
  - Work with team to assure all process required artifacts were developed
- Quality audits to project’s tailored process
Observations After Being On Both Sides

- Practitioner buy-in is critical to success
  - Listen to them
  - Acknowledge their concerns
  - Include them in the process
  - Assure they understand the reason for change
- Leverage prior integration experience
- Audit to the acquirer’s process to identify gaps
  - Alignment may be closer than you think
- Don’t mandate process change
  - Communicate the business case for the change
  - “Because I said so” will lead to a process that no one follows
- The basic design and development process is the same in spite of varied end products
Lessons Learned

- Learn and incorporate the best practices of the legacy process
  - Don’t assume the “acquirer” does it better. The basic Design and Development process is the same for all products
- Tailoring allows for unique business needs
- Mentoring is critical to achieve understanding
  - Include a process advocate at each facility
- Distance is a challenge
  - Involve all business locations to assure buy-in
  - Acquirer alignment team members should be at acquirer facility during the transition
- Assign specific actions, set deadlines and cadence
  - Run the transition as a program
- Transition as soon after acquisition as possible
- Select a pilot program
- Audit to the new process early in the project
- The practitioners will resist change
- Communication is critical to avoid duplication of efforts
Ongoing Activities to Maintain Alignment

• Mentoring
  – Enterprise level project start-up teams
    • Process tailoring
    • Project planning

• Design and Development Governance Council
  – Approves new and updated processes
  – Representation from multiple RC Business Units and locations
    • Assures unique product needs are considered

• Internal Audits
  – Quality audits use the same checklists and criteria to assure all locations are adhering to the process
Questions?
Backup
Backup

- **NLX QMS**
  - 125 Documents
    - 108 Procedures
    - 17 Work Instructions
  - 83 Obsolete
  - 24 RC

- **E&S QMS**
  - Approximately 125 Documents
  - 3 converted to RC
# VS Quality Audit Result

<table>
<thead>
<tr>
<th>Process</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set Direction</td>
<td>0.75</td>
</tr>
<tr>
<td>Risks and Opportunities</td>
<td>0.65</td>
</tr>
<tr>
<td>Plan Project</td>
<td>0.28</td>
</tr>
<tr>
<td>Execute Project</td>
<td>0.73</td>
</tr>
<tr>
<td>Evaluate Project</td>
<td>0.55</td>
</tr>
<tr>
<td>Complete Project</td>
<td>0.75</td>
</tr>
<tr>
<td>Capture Originating Requirements</td>
<td>0.83</td>
</tr>
<tr>
<td>Define Operational Concepts</td>
<td>0.25</td>
</tr>
<tr>
<td>Define Requirements</td>
<td>0.85</td>
</tr>
<tr>
<td>Design Solution</td>
<td>0.90</td>
</tr>
<tr>
<td>Implement Solution</td>
<td>0.94</td>
</tr>
<tr>
<td>Integrate Solution</td>
<td>0.83</td>
</tr>
<tr>
<td>Develop Acceptance Procedures</td>
<td>1.00</td>
</tr>
<tr>
<td>Develop Validation Cases and Procedures</td>
<td>1.00</td>
</tr>
<tr>
<td>Verify Solution</td>
<td>0.75</td>
</tr>
<tr>
<td>Support Solution</td>
<td>0.94</td>
</tr>
</tbody>
</table>

**Legend**
- 0.9 – 1.00
- 0.5 – 0.89
- 0.0 – 0.49