



Process Alignment

From Aligned to Aligner

Ilene Pinsker
Sr. Systems Engineer
Rockwell Collins, Inc.
Simulation and Training Solutions
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***Rockwell
Collins***

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)

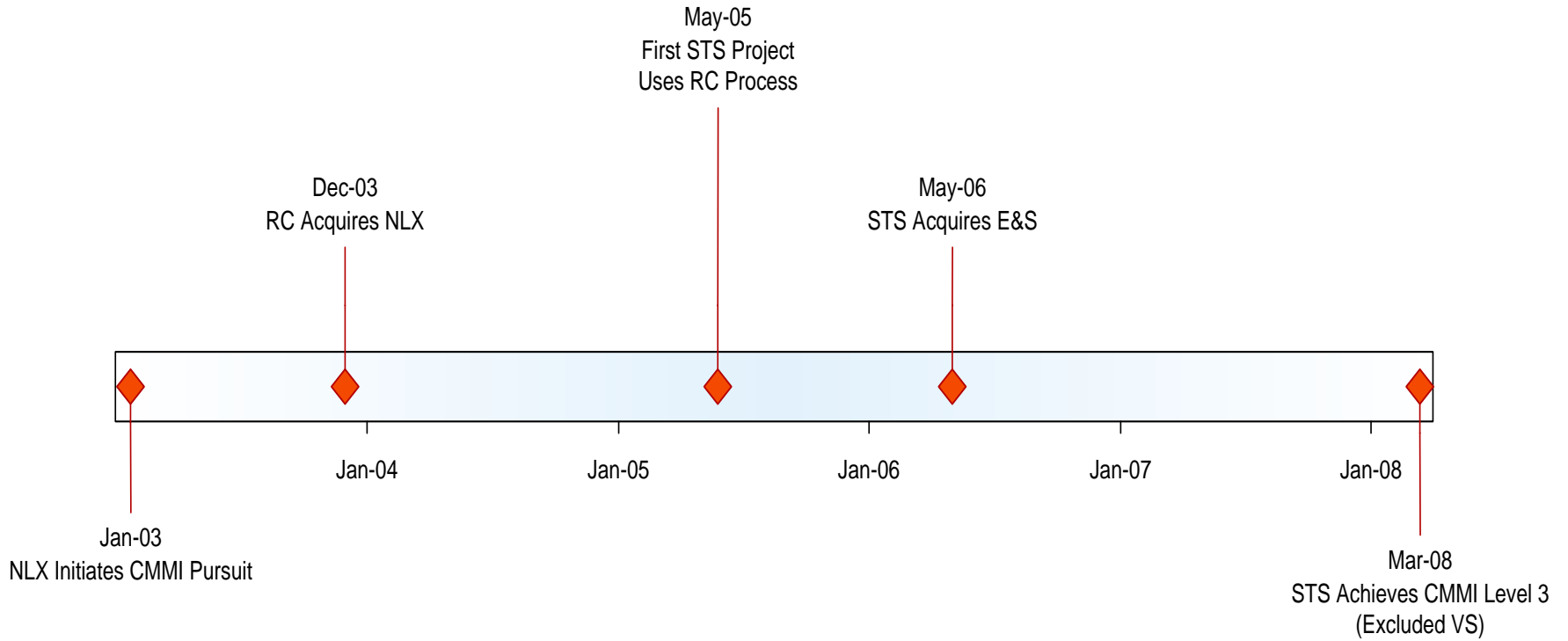
Evans and Sutherland (E&S)

- 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



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

	RC Process	STS Legacy Process	Result
Management	Entire life cycle (Business opportunity identification through program completion)	Starts at contract award	Replace legacy process with RC process
Engineering	<ul style="list-style-type: none"> •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	<ul style="list-style-type: none"> •Software Quality Engineering (SQE) •Design Quality Engineering (DQE) 	<ul style="list-style-type: none"> •Quality Inspectors •Newly Software Quality position 	RC to mentor development of SQE and DQE positions at STS
CM	Process includes configuration management and control	<ul style="list-style-type: none"> •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

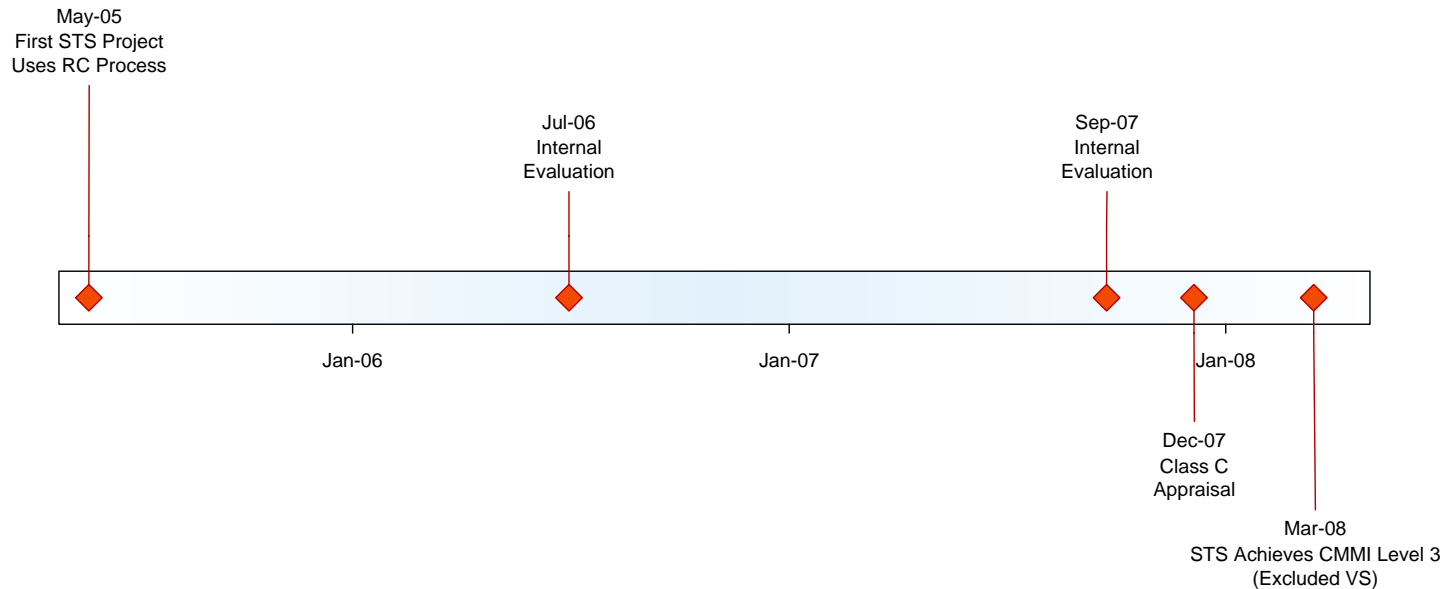
	RC Standard	STS	Result
Design and Development Process	RC developed tailoring tool	No formal tool	Use RC tool
Requirements Management	DOORS	Excel Spreadsheet	DOORS is recommended, but decision is program dependent
Configuration Management	Subversion	Razor	New programs use Subversion Legacy programs continue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

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

	RC/STS Process	VS Legacy Process	Result
Management	Entire life cycle (Business opportunity identification through program completion)	Starts at contract award	VS needs to replace legacy process with RC process
Engineering	<ul style="list-style-type: none"> •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	<ul style="list-style-type: none"> •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	<ul style="list-style-type: none"> •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

	STS	VS	Result
Design and Development Process	RC developed tailoring tool	No formal tool	Use RC tool
Requirements Management	DOORS or Excel Spreadsheet	No formal tool	Transition to DOORS
Configuration Management	Subversion	ClearCase	<ul style="list-style-type: none"> •New programs use Subversion •Legacy programs continue with existing tool
Data Repository	Electronic Database Management System (EDMS)	<ul style="list-style-type: none"> •TeamSpace – RC application of Microsoft Windows SharePoint Services •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

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

Legend	0.9 – 1.00	0.5 – 0.89	0.0 – 0.49
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