

# FAA Verification & Validation Summit 2009

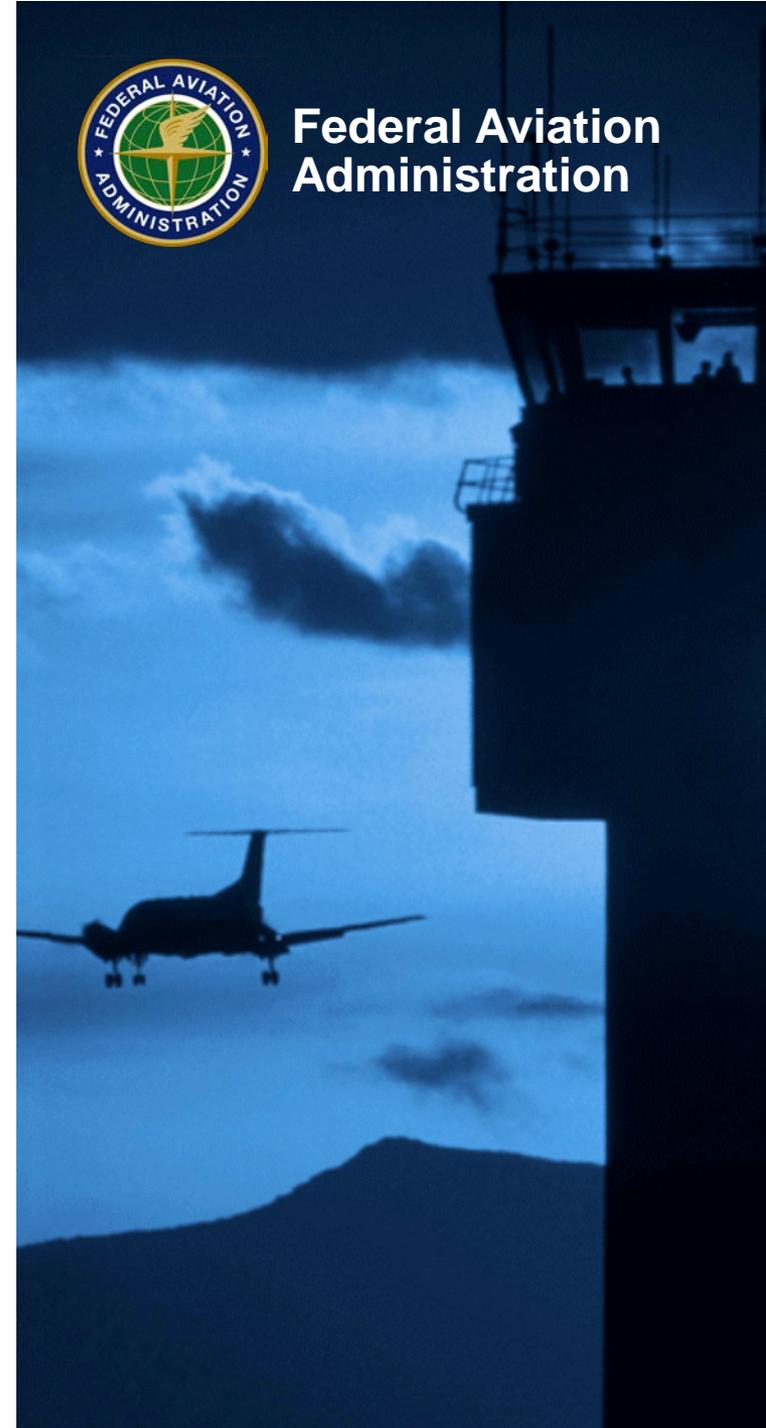
## Requirements & Interface Management (R&IM) Working Group

By: Kimberly Gill, ATO-P, Requirements & Interface Management

Date: November 5<sup>th</sup>, 2009



Federal Aviation  
Administration



# Reason for the R&IM Working Group

- The systems engineering environment is growing more complex
  - NAS development/transformation goals require engineering management that crosses domains, systems, and organizations
  - Decisions are becoming more difficult due to the interrelationships of the development efforts
- The need for improvement is urgent
  - The density of system investment decisions is increasing \*
  - F&E and R,E&D budgets are increasing
  - Risk of mistakes will increase
  - The cost, schedule, and performance impact of these mistakes will increase due to system interdependencies
- Requirements & Interface Management
  - The most recent Best Practices effort ended five years ago
  - Improvement must be driven by a holistic (cross-organizational) approach
  - Must be aligned with other process improvement initiatives (e.g., V&V)

\* JRC decision meetings will increase three fold between 2007 and 2010 according to an estimate performed by the JRC Secretariat.



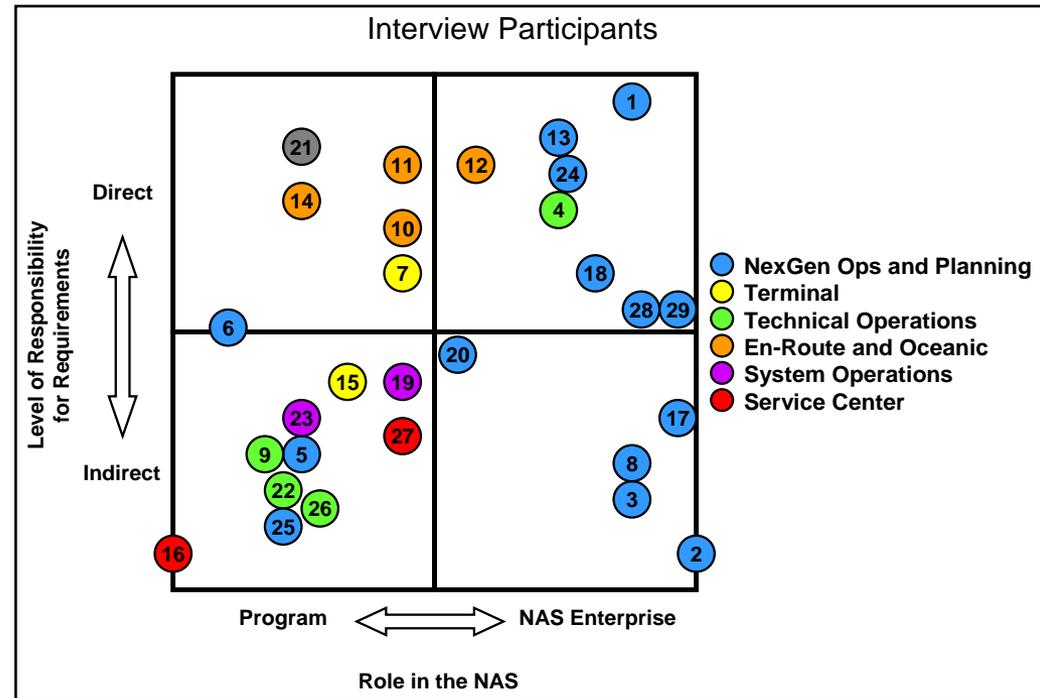
# FAA R&IM Stakeholder Data Collection

- FAA Internal Interviews

- Across the ATO and at different management levels (NAS enterprise, portfolios, domains, programs)
- ~40 invited, 29 conducted, ~2 additional scheduled

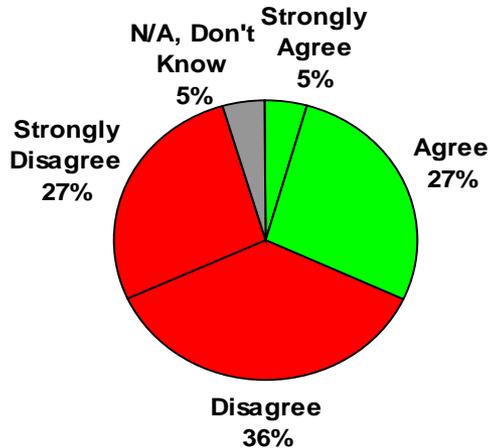
- FAA On-line Questionnaire

- 15-minute set of questions with a rating scale
- Participants selected by requirements experience
- ~35 responses so far

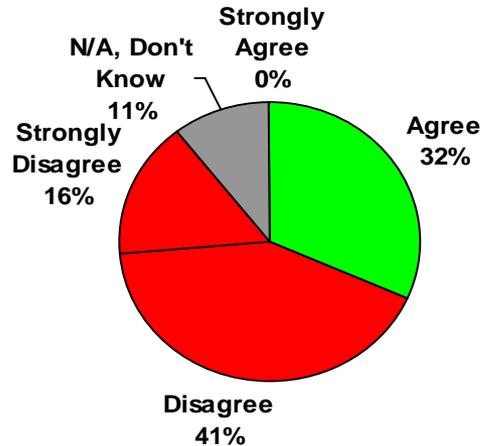


# Web-based Questionnaire Results

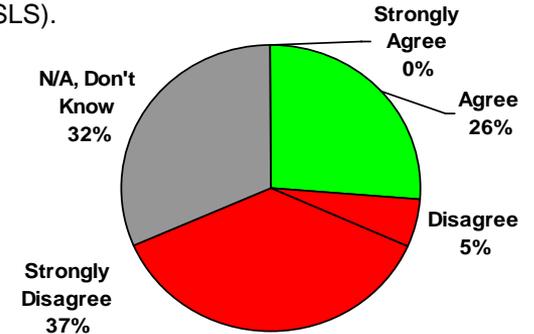
**1. People:** Adequate training is provided on how to conduct requirements and interface management activities.



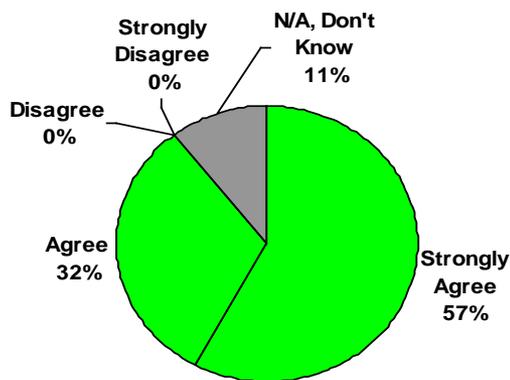
**2. Process:** It is well understood how system level requirements trace/link to the customer/stakeholder needs.



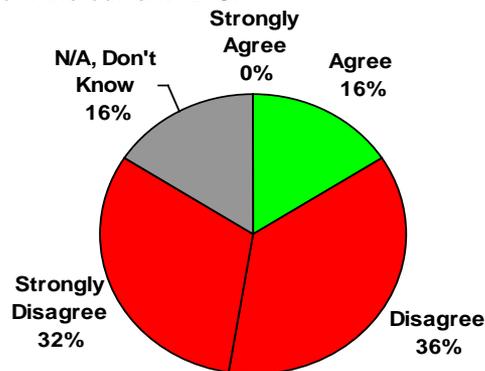
**3. Process:** NAS-level, enterprise requirements are effectively traced down to the Program level. For example, the NAS CONOPS and Operational Improvements (OI) have full requirements traceability to the System Level Specifications (SLS).



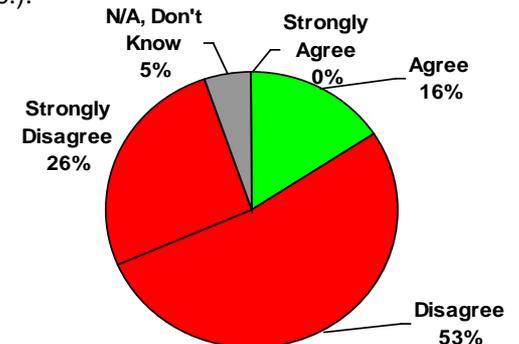
**4. Tools:** There is a need for a more consistent application of requirements management tools across the ATO programs.



**5. Communication:** There is a shared vision throughout the ATO on the 2025 NextGen goals and how to achieve those goals by transitioning from the current NAS.



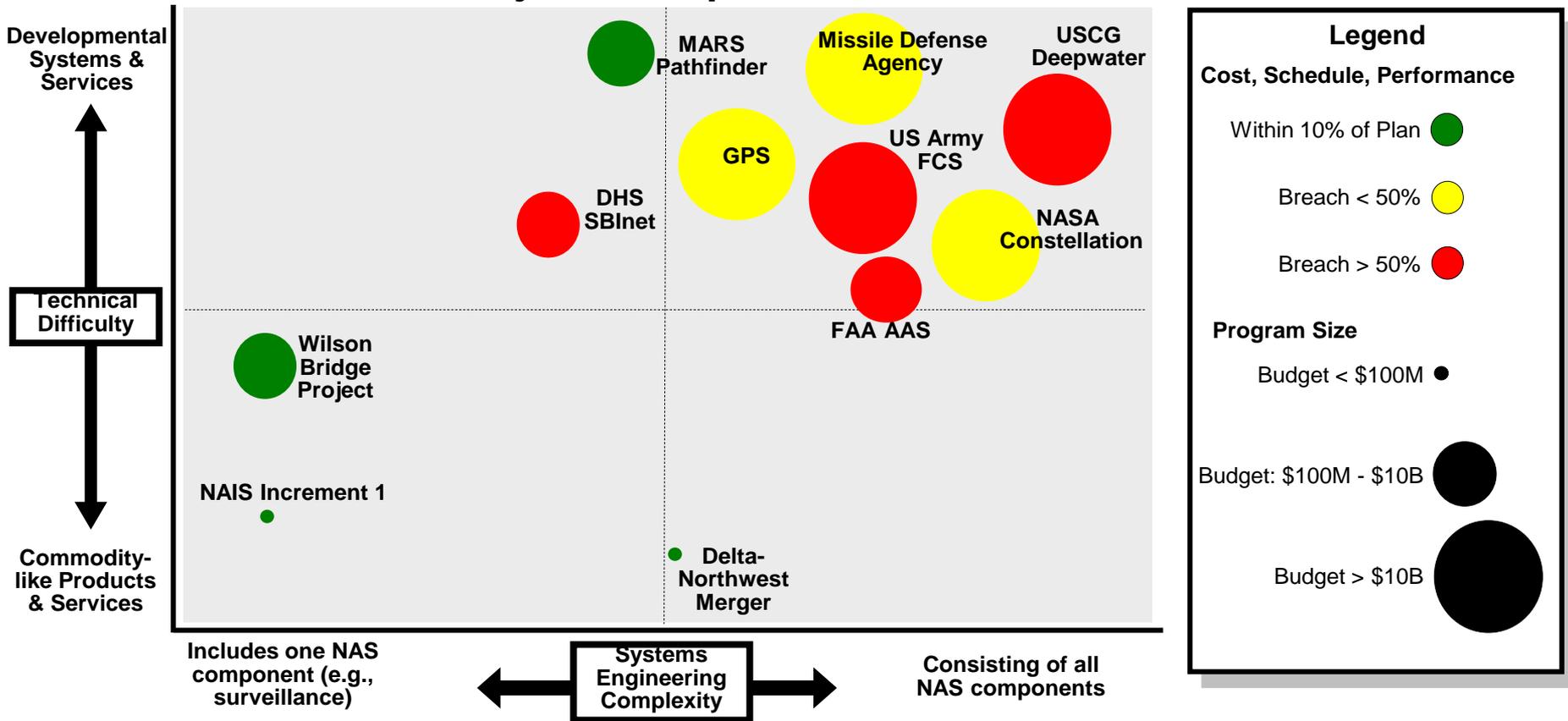
**6. Communication:** Methods for communication across programs and domains are clearly understood and practiced (e.g., to support requirements negotiations, prioritization, analysis, etc.).



# SoS Best Practices & Lessons Learned

## Surveying Large Systems of Systems Projects / Acquisitions

*Also met with the Software Engineering Institute.*



# SoS Best Practices Interviews

- **Willingness to support**
  - Practitioners are eager to share their experiences/knowledge in general
  - Interested in following up with the FAA and supporting further efforts
- **Common messages**
  - Involve the right people throughout the process
  - Big is not better, all aspects become more complex
  - Every program had issues and none offered cookie-cutter, textbook best practices
  - Must have comprehensive requirements tracing, more detail is better
  - Tailor processes based on size and complexity of the effort
  - Establish an organization with well understood SoS functions
  - Problems with requirements management will cause big problems for contractor performance



# R&IM Working Group Charter

- **Working group subordinate to the AEB Best Practices Group**
- **Purpose of working group**
  - Cross-organizational body focused on defining and implementing methods for R&IM
  - Gather information on R&IM best practices and needs within the FAA and stakeholder community
  - Develop approaches to effectively conduct the R&IM activities at the enterprise, portfolio, and program levels throughout each phase of the AMS life cycle
  - Review, recommend for approval, and support the implementation of process improvement recommendations
  - Update AMS policy, FAA guidance documents (such as the System Engineering Manual), on-line FAST guidance, and AEB Acquisition Practices Toolkits



# Working Group Membership

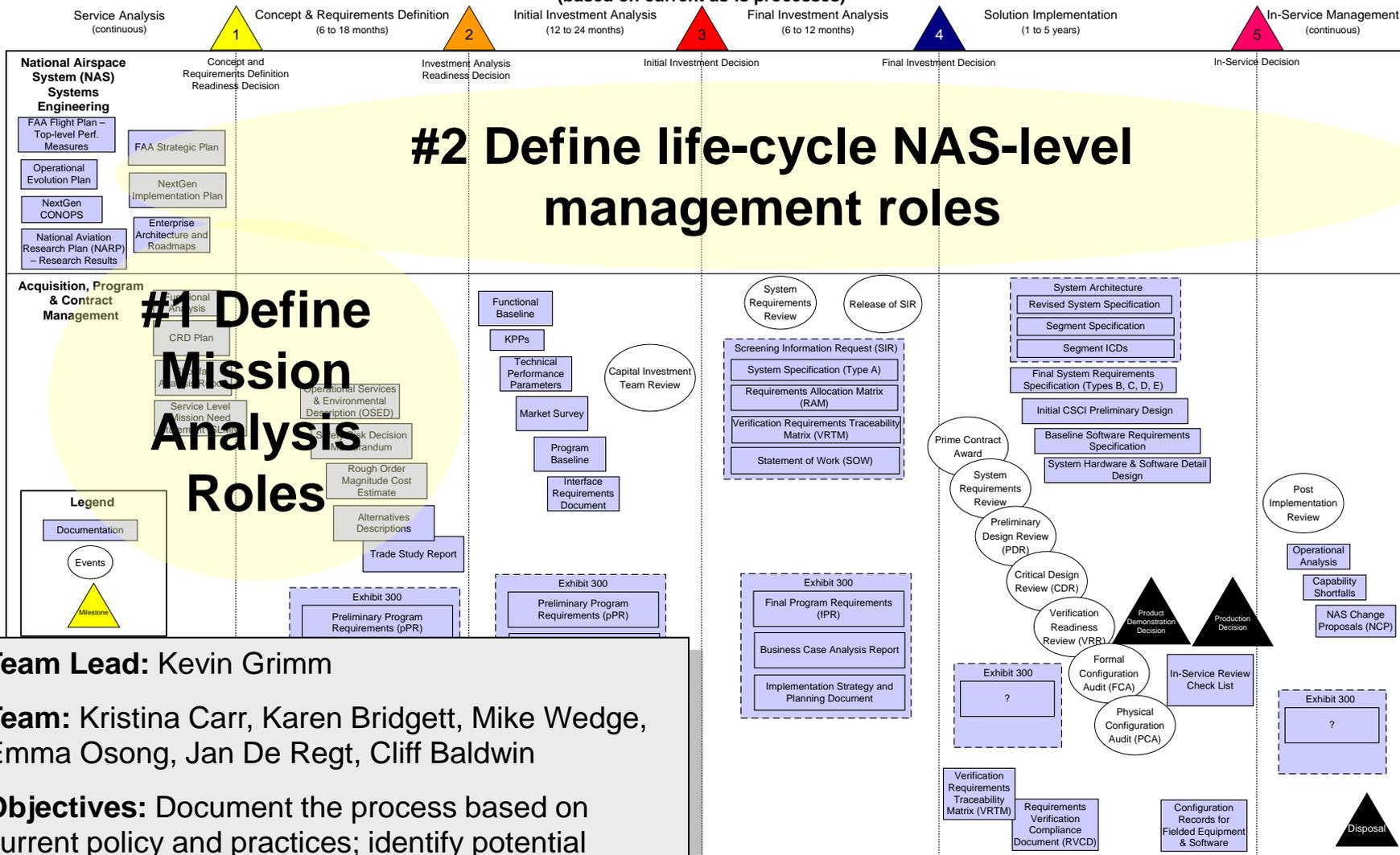
R&IM Working Group Voting Members					Tiger Teams		
Name	Code	Organization	Title	Process	Hierarchy	Tools	
R&IM Working Group Voting Members	Antonio Borrego	AJV-C3	Service Center	SUPV Aviation Tech Sys Spec - Planning & Req't Group			
	Diana Shelton	AJW-13	Tech Ops	NAS Support Group			X
	Eric Hoover	AJP-7A6	Ops Planning	Flight Service Systems Team			X
	Glen Hewitt	AJP-61	Ops Planning	Human Factors Research and Engineering		X	
	Ian Levitt	AJP-653	Ops Planning	Surveillance Team			
	James Winbush	AJW-281	Tech Ops	Operational Services Team		X	
	Jan deRegt	AJT-16	Terminal Program Ops	Terminal Program Management & Integration	X	X	
	Jim Linney	AJE-63	En-route	Program Management - Surveillance and Broadcast Services			
	John Chung	AJP-173	Ops Planning	Requirements Development Team			
	John Frederick	AJP-7C2	Ops Planning	Test Standards & Prog Assessment Team (V&V toolkit focal)			X
	Kevin Grimm	AJR-42	Sys Ops	Domain System Engineering	X		
	Kimberly Gill	AJP-14	Ops Planning	NAS Requirements and Interface Management		Chair	
	Kristina Carr	AJP-661	Ops Planning	Sim and Analysis Team - ATS Concept Development & Validation Group	X		
	Linda Suppan	ARD-200	FAA CIO	IT Enterprise Research and Development		X	
	Robert Pfoff	AJE-15	En-route	Domain Engineering Group - En Route and Oceanic Services			X
	Stephen Ryan	AJT-34	Terminal	Systems Engineering			
Stewart Stepney	AJW-17	Tech Ops	Communications, Flight Service & Weather Engrn Group				
Supporting Team Members	Christopher Gunther	AJP-14	Booz Allen Hamilton	NAS Requirements and Interface Management	X	X	X
	Clifton Baldwin	AJP-173	Ops Planning	Requirements Development Team	X		
	Emma Osong	AJE-6	System Enginuity, Inc.	SBS Best Practices		X	
	Fernando Anzola	AJP-14	Ops Planning	NAS Requirements and Interface Management		X	
	Karen Bridgett	AES-100	i-Cubed Partners	IT Program and Portfolio Services	X		
	Mike McVeigh	AJP-14	Ops Planning	NAS Requirements and Interface Management		X	X
	Mike Wedge	AJP-14	Ops Planning	NAS Requirements and Interface Management	X		
	Patrick McCusker	AJP-14	Booz Allen Hamilton	NAS Requirements and Interface Management	X	X	X
	Richard Kenney	AJE-6	Evans Incorporated	SBS Best Practices			
	Usmaan Javed	AJP-14	Ops Planning	NAS Requirements and Interface Management			X
	Vince Telfer	AJP-14	Ops Planning	NAS Requirements and Interface Management		X	X

**Succession:** members are responsible for identifying and integrating replacements to represent their organization.



# Process Modeling Tiger Team

FAA Integrated Systems Engineering, Acquisition and Life Cycle Management Framework  
(based on current as-is processes)



**#2 Define life-cycle NAS-level management roles**

**#1 Define Mission Analysis Roles**

**Team Lead:** Kevin Grimm

**Team:** Kristina Carr, Karen Bridgett, Mike Wedge, Emma Osong, Jan De Regt, Cliff Baldwin

**Objectives:** Document the process based on current policy and practices; identify potential improvements; focus on NAS R&IM with linkages to the programs.

To request copies or changes to this chart please send an email to kimberly.gill@faa.gov.

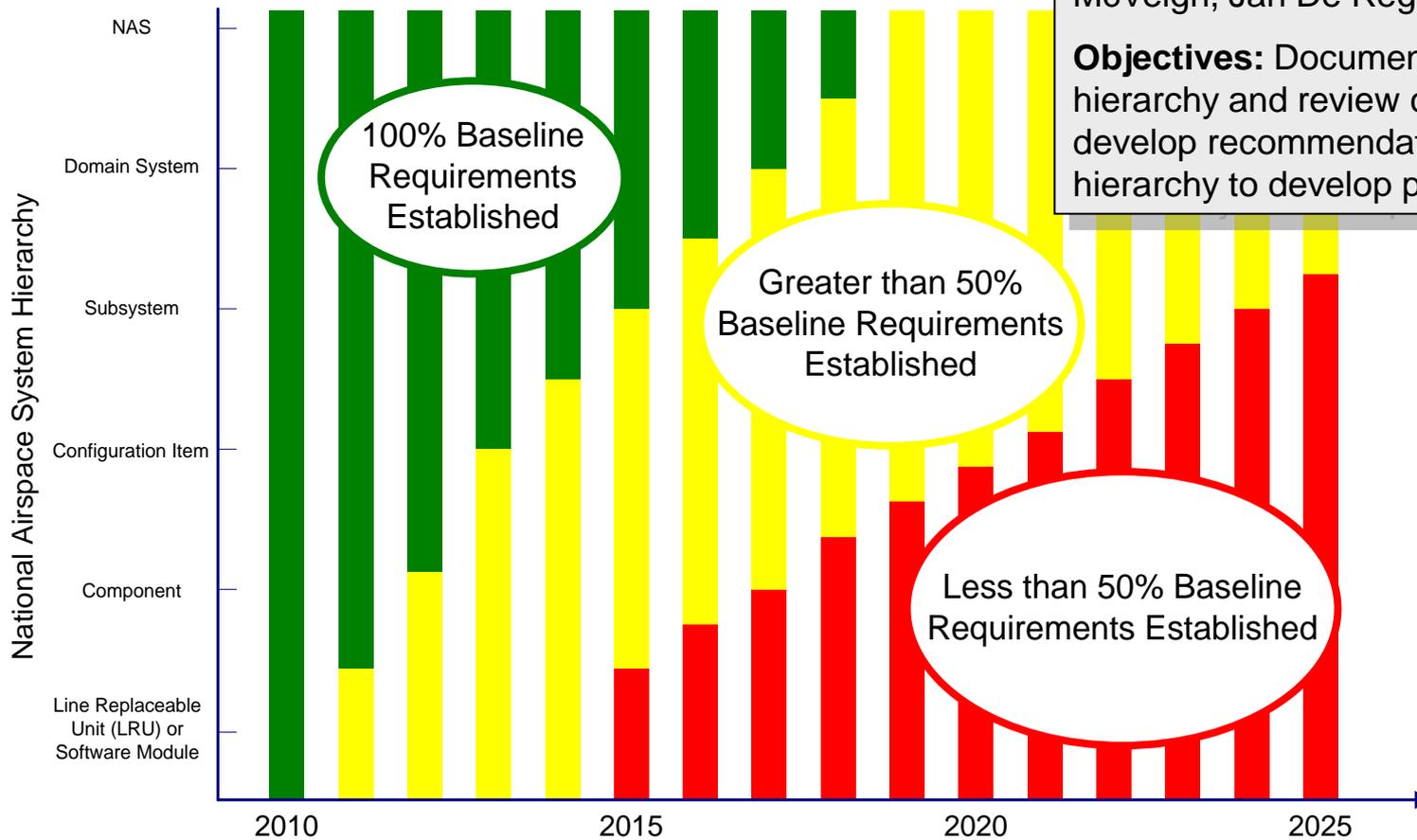


# NAS Hierarchy Tiger Team

**Team Lead:** James Winbush

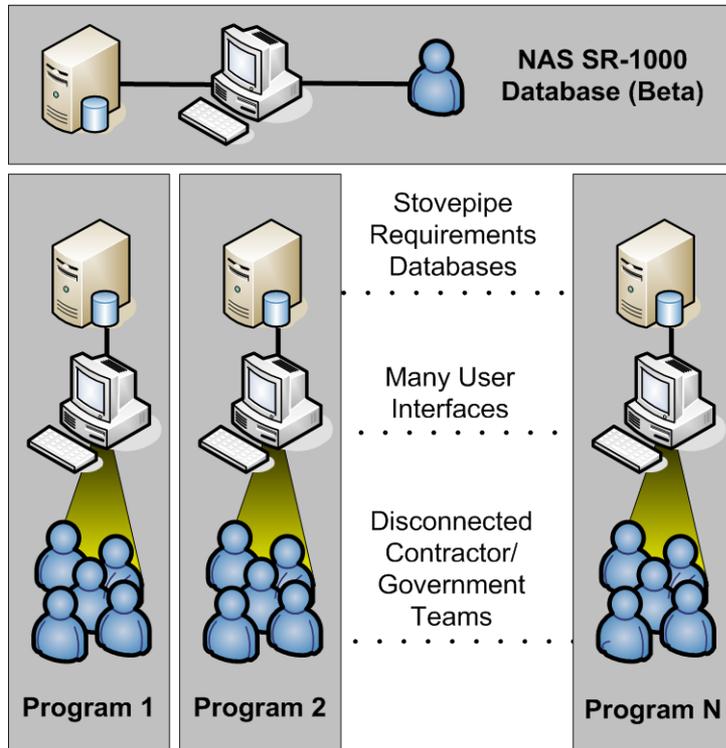
**Team:** Glen Hewitt, Linda Suppan, Fernando Anzola, Vince Telfer, Mike McVeigh, Jan De Regt

**Objectives:** Document the purpose of the hierarchy and review current approaches; develop recommendations; use approved hierarchy to develop processes and tools.

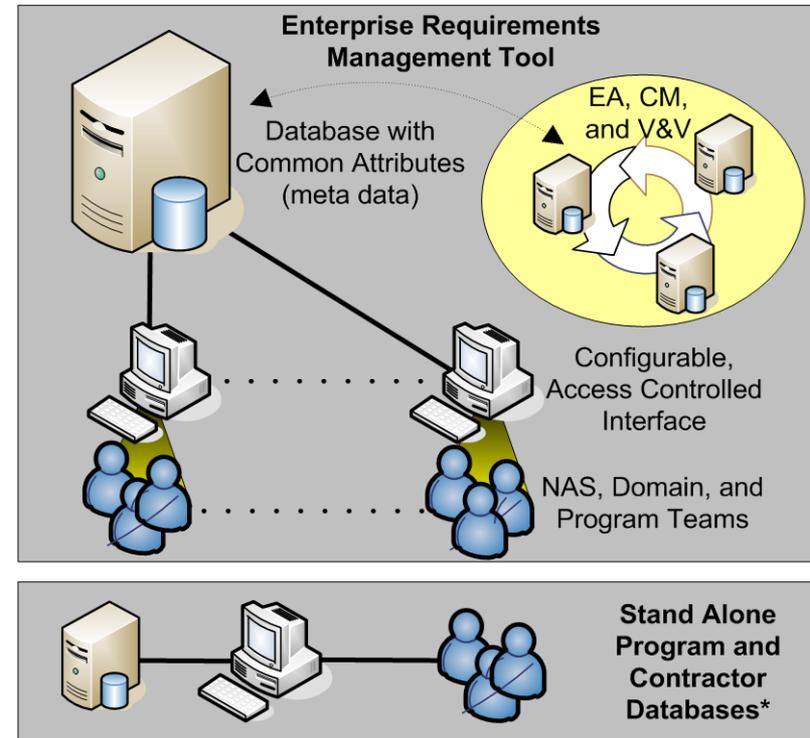


# R&IM Tools Tiger Team

**Current Requirements Management Tool Architecture (as is)**



**NAS Requirements Management Tool Concept Architecture (to be)**



**Team Lead:** Usmaan Javed

**Team:** Eric Hoover, John Frederick, Bob Pfoff, Diana Shelton, Vince Telfer, Mike McVeigh

**Objectives:** Develop recommendations for a requirements database with vertical and horizontal integration from NAS CONOPS down to program documentation. Provide an implementation plan.

# SEI CMMI for Development will provide the framework for R&IM Process Improvement

- **Using the continuous representation of the Requirements Management (REQM) process area**
- **Will parse the maturity levels by –**
  - People: what specific staff need to be in place to achieve the planned performance?
  - Process: what are the specific process results that will indicate success?
  - Tools: what specific tools will be needed to perform the process?
  - Documentation: what specific document should be produced?
- **Will also apply the maturity levels at both the system (project) level and SoS level (program, enterprise)**



# R&IM Goals and Progress Tracking

Process Improvement Category	Capability Level									
	1 Performed		2 Managed		3 Defined		4 Quantitatively Managed		5 Optimizing	
People	Requirements managers establish and obtain commitment to requirements.	Program	Staff levels of effort estimates are developed, training is provided, stakeholders are identified and engaged, roles and responsibilities are defined.	Program	Determine people to collect the work products, measures, measurement results, and improvement information.	Program	Individuals identified to set goals and monitor performance against goals.	Program	All participants in the requirements management process work towards continuous improvement.	Program
		SoS		SoS		SoS		SoS		SoS
Processes	Obtain an understanding of and commitment to requirements, manage changes, and maintain bi-directional traceability.	Program	Organizational policy and requirements management plans are followed. Configuration control process defined. Evaluate adherence to requirements management processes.	Program	Project's process is tailored from organization's standard processes. Understand process qualitatively by defining metrics for requirements (i.e., status of requirements traceability, staffing plan, training goals, and stakeholder participation).	Program	Quantitative objectives are assigned to process metrics. Adjustments are made to processes that do not meet goals.	Program	Continuous improvement is ensured and lessons learned are incorporated. Root causes are identified and corrective action taken.	Program
		SoS		SoS		SoS		SoS		SoS
Tools	Tools established to manage configuration control of requirements and bi-directional traceability.	Program	Tools for requirements tracking, traceability, volatility, and scheduling are available and used.	Program	Tools, such as requirements traceability reports, identified to collect metric data and measure the status of requirements.	Program	Tools incorporate a method to track the variability of requirements metrics.	Program	Corrective actions are integrated into the requirements repository, configuration control system, and measurement techniques.	Program
		SoS		SoS		SoS		SoS		SoS
Documentation	Document stakeholder and requirements evaluation criteria, analysis against criteria, and an agreed-to set of requirements with bi-directional traceability.	Program	Organizational policy and requirements management plans are documented. Responsibilities, stakeholders, and requirements baselines documented.	Program	Record status of processes against the plan.	Program	Document levels of non-compliance and corrective actions.	Program	Document the root causes of problems and lessons learned. Corrective actions lead to updates to plans and documents.	Program
		SoS		SoS		SoS		SoS		SoS

Draft model and assessment to be finalized by the R&IM Working Group.



# Working Group Vision

## Process Improvement Initiatives (prioritized by Working Group):

- **Process:** develop a R&IM Process with roles and responsibilities
- **Tools:** establish a requirements database tool(s) with vertical and horizontal integration from NAS CONOPS down to Program documentation
- **Documentation:** establish a NAS hierarchy and related document tree
- **Performance Measurement:** establish mechanism to validate NAS performance measures in the context of R&IM
- **Tool Integration:** align R&IM database with Enterprise Architecture and Functional Analysis
- **People:** Estimate the scale of the R&IM work over the next several years (i.e., staff level of effort)
- **Training:** Assess the quality / value of the current R&IM training courses
- **Business Practice Integration:** link the R&IM WG with other NAS systems engineering organizations/working groups/initiatives
- **Documentation:** update baseline of the “as-is” with detailed performance measures



# Working Group Vision (continued)

## **Other Working Group Activities:**

- Develop and communicate the NAS R&IM vision and working group initiatives
- Capability Diagnostic Model to develop metrics and reporting
- Update Acquisition Best Practices Toolkit, SEM, and AMS as appropriate

## **Related Activities:**

- Business Process Management (BPM) Tool for Systems Engineering
- Systems Engineering Management Plan (SEMP)



# R&IM and V&V Process Relationship

- While R&IM drives the left side of the Vee, the right is centered on V&V
- V&V goals need to be part of the R&IM process early
- Requirements should be written with V&V metrics at the forefront

