Volume 1:
Identifying the Workforce to Respond to a National Imperative

...The Next Generation Air Transportation System (NextGen)

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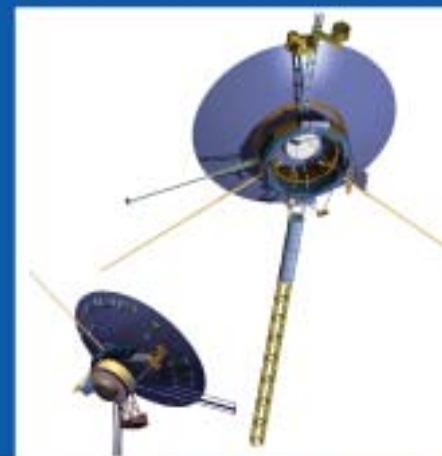National Academy of
Public Administration®

A Report by a Panel of the

NATIONAL ACADEMY OF
PUBLIC ADMINISTRATION

For the Air Traffic Organization of the Federal Aviation Administration

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Volume 1:
Identifying the Workforce to Respond to a National Imperative—The Next Generation Air Transportation System (NextGen)

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FOREWORD

While it is one of the safest and most reliable systems in the world, the Nation's air transportation system must undergo a fundamental transformation to accommodate what is expected to be a doubling, or possibly tripling, in demand for air transportation by the year 2025. Congress authorized the Next Generation Air Transportation System (NextGen) as the vehicle to meet this national imperative.

The Federal Aviation Administration's (FAA's) Air Traffic Organization (ATO) is responsible for designing, developing, integrating and implementing NextGen systems and procedures, while continuing to operate the current system --7 days a week, 24 hours a day. While the NextGen transition would be a daunting task under optimum circumstances, ATO must lead this transition at a time when its workforce is also in a state of flux, with attrition and potential retirements expected to rise dramatically by the year 2012. Recognizing that its future workforce may be very different from its current workforce, ATO engaged the Academy to help it:

- Identify the skills needed by the non-operational/acquisition workforce to accomplish the transition to NextGen

- Identify strategies for acquiring the necessary workforce competencies

While the Academy has provided guidance in this report to help FAA identify and hire the right workforce to make the NextGen transition, past efforts cast doubt on whether ATO can successfully lead the overall transition to NextGen. The Academy believes that the nation would be best served by a unified and aggressive assessment of FAA's overall readiness to successfully complete this critical mission. Such an assessment should focus on identifying not only the human capital challenges but also the organizational and environmental challenges that FAA faces as it moves forward with the NextGen transition.

America's air transportation system is vital to the continued health of our nation's economy, and it has an important role in maintaining our global economic standing. Successful transition to NextGen is critical, and will require resources, internal leadership and unwavering commitment from Congress and the next Administration.

The Academy was pleased to undertake this study. I would like to thank the Academy Fellows and the other domain experts who served on this important Panel. Their insights and guidance were extremely valuable. I would also like to thank the FAA and ATO leaders and staff, as well as other stakeholders for their time and cooperation. Finally, I extend my thanks to the study team for its hard work and dedication in producing this important and timely report.

Jennifer L. Dorn
President and Chief Executive Officer

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ACRONYMS

Academy	National Academy of Public Administration
AAS	Advanced Automation System
AFGE	American Federation of Government Employees
AFL-CIO	American Federation of Labor and Congress of Industrial Organizations
AFSCME	American Federation of State, Country and Municipal Employees
ARA	Associate Administrator for Research and Acquisition
ATO	Air Traffic Organization
COO	Chief Operating Officer
DARPA	Defense Advanced Research Projects Agency
DAU	Defense Acquisition University
DHS	Department of Homeland Security
DoD	Department of Defense
DOT	Department of Transportation
ECQ	Executive Core Qualifications
ELD	Employee Leadership Development
ESP	Executive Success Profile
FAA	Federal Aviation Administration
FAI	Federal Acquisition Institute
FY	Fiscal Year
GAO	Government Accountability Office
GE	General Electric
GS	General Schedule
HQ	Headquarters
HR	Human Resources
IG	Inspector General
INCOSE	International Council on Systems Engineering
IPA	Intergovernmental Personnel Act
IT	Information Technology
JPDO	Joint Planning and Development Office
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NATCA	National Air Traffic Control Association
NextGen	Next Generation Air Transportation System
NFFE	National Federation of Federal Employees
OEP	Operational Evolution Partnership
OMB	Office of Management and Budget
OPM	Office of Personnel Management
MDP	Management Development Plan

MLD	Manager Leadership Development
MSPB	Merit Systems Protection Board
MWP`	Managerial Workforce Planning
NSF	National Science Foundation
PMLD	Prospective Manager Leadership Development
R&D	Research and Development
SoS	System of Systems
SME	Subject Matter Expert
STARS	Standard Terminal Automation Replacement System
STEM	Science, Technology, Engineering, and Mathematics
TL	Technical Leadership
TRACON	Terminal Radar Approach Control
VP	Vice President

EXECUTIVE SUMMARY

INTRODUCTION

Transforming the nation's air transportation system is a national imperative. The current system is one of the safest in the world, but it is experiencing unprecedented challenges: demand for air transportation is outpacing capacity; delays, cancellations, and diverted flights are increasing at alarming rates; and new and different types of aircraft are creating gridlock in the skies. Added to these challenges is an aging infrastructure, making the system's reliance on ground-based radars operationally obsolete and increasingly inefficient. Greenhouse gas emissions and other environmental concerns are arising from inefficient use of aircraft and airspace, and security concerns are growing. These problems cannot be addressed by upgrading or minimally changing the current system. A total transformation is needed.

To address this national imperative, in 2003, Congress mandated creation of the inter-agency Joint Planning and Development Office (JPDO) in the Federal Aviation Administration (FAA) to lead the nation in transitioning to the Next Generation Air Transportation System (NextGen)—a system that must safely accommodate what could be a triple increase in air traffic by the year 2025. NextGen is envisioned as a major redesign of the air transportation system that will take the nation into a new paradigm of aviation by replacing ground-based radar technology and voice communication with precision satellite navigation; digital, networked communications; an integrated weather system; increased security; and tailored individual flight paths.

The JPDO is responsible for coordinating and integrating the efforts of private industry and the federal agencies that have a role in the NextGen transformation. In addition to the FAA, several other federal entities have key roles in the NextGen transformation, including the Departments of Transportation, Defense, Homeland Security, and Commerce, as well as NASA and the White House Office of Science and Technology Policy. FAA has the largest role in this effort and is primarily responsible for developing and implementing the policies, systems and technology necessary to achieve the NextGen vision, while safely operating the current air transportation system 24 hours a day, seven days a week.

FAA must undertake this national challenge despite doubt created by its past efforts to modernize. While recent projects have been more successful, over the past 25 years FAA's modernization projects have experienced substantial cost overruns, lengthy delays, and significant performance shortfalls. Due to its problem-plagued past, the U.S. Government Accountability Office (GAO) has designated FAA's modernization program a high-risk information technology investment since 1995. Consequently, FAA is under significant and increasing pressure to deliver a new air transportation system.

Within FAA, the Air Traffic Organization (ATO) is responsible for moving air traffic safely and efficiently, and therefore, has the lead role in developing and integrating the systems and operational procedures for NextGen. ATO recognizes that this system-wide transformation demands the highest level of organizational excellence and performance and has begun to formally address its workforce challenges to accomplish the NextGen transformation. ATO

engaged the National Academy of Public Administration (National Academy) to conduct a workforce needs analysis to respond to the following two tasks:

- Identify the skill sets required by the non-operational (acquisition) workforce, including, but not limited to, the technical and contract management skills needed to successfully design, develop, test/evaluate, integrate and implement NextGen

- Define strategies to obtain the expertise needed to design, develop, test/evaluate, integrate, and implement the complex activities inherent in the transition to NextGen

The Panel conducted the study in two phases. Phase I started on June 18, 2007 and ended on December 31, 2007, when the National Academy Panel issued its *Preliminary Findings and Observations*. Phase II covered the period from January 1, 2008, through September 30, 2008, and results in the publication of this final report. The National Academy's study was accomplished through extensive research and analysis that included a literature review to identify elements of success and validated competencies, benchmarking against other organizations, interviews with FAA officials and stakeholders, colloquia with subject-matter experts, a roundtable discussion with ATO's Vice Presidents (VPs), and focus groups with employees.

PANEL FINDINGS AND RECOMMENDATIONS

The Panel's report is presented in two volumes. Volume 1 contains the Panel's responses to the two tasks and a discussion of additional implementation challenges and recommendations to address them. Volume 2 contains five Occupational Family Competency Models, General Competencies, and a separate Leadership Competency Model reflecting the results of the research conducted in both phases of the study.

Recommended Acquisition Workforce Competencies

In the early stages of its research, the Panel learned that ATO will rely primarily on the acquisition workforce to design, develop, test/evaluate, integrate, and implement the numerous complex systems and processes that comprise NextGen. ATO groups its acquisition workforce into five broad occupational families:

- Program/Project Management
- Systems Engineering
- Research
- Business/Financial Management
- Contracting

The Academy study team's research, therefore, focused on identifying the technical competencies needed for these five groups, but also sought to identify the systems integration and other skills needed to ensure that NextGen programs and systems are successfully integrated to achieve the necessary operational improvements.

Recommended Occupational Family Competencies

The Panel identified several new competencies (not previously identified by ATO) and others that will require greater emphasis. Of primary importance across the five families are:

- Strategic Alignment
- Strategic Planning
- Stakeholder Management
- Program/Project Planning Processes
- Program/Project Management Processes
- Systems Engineering Management
- Risk Management
- Systems Integration
- Requirements Analysis
- Software Development
- Human Factors Engineering
- Systems Concepts
- System of Systems Capability
- System Safety
- Integration and Verification
- Validation
- Integration of Fields of Specialization
- Systems Thinking
- Acquisition Planning
- Business Case Development
- Benefit-Cost Analysis
- Risk Analysis and Internal Controls
- Reconciliation and Financial Reporting
- Financial Budget and Data Analysis
- Contractor Performance Management
- Contract Administration

Recommended General Competencies

The Panel's research also identified the general competencies that will be important to NextGen success. Included among these are:

- Accountability
- Written Communication
- Oral Communication
- Teamwork
- Collaboration
- Strategic Planning
- Customer Service

- Interpersonal Skills
- Integrated Thinking

Recommended Strategies to Acquire and Retain Acquisition Workforce Competencies

A comprehensive approach to identifying strategies requires that ATO review existing human resources flexibilities made possible under FAA's 1996 Human Resources Reform legislation, review all of the Government-wide flexibilities available, and create new flexibilities to address unique needs. The Panel has presented FAA with strategies for consideration in acquiring both leadership skills and other skills needed for the NextGen transition. Among these are:

- Aggressively market the NextGen vision
- Build internal software development skills
- Enhance internal research and development skills
- Develop a strategic approach to pipeline recruitment issues
- Develop an Acquisition Intern Program
- Work collaboratively with FAA to develop a more integrated approach to NextGen workforce planning
- Establish a formal process to fully integrate human capital planning with acquisition planning
- Create a knowledge management/transfer program

Recommendations to Address NextGen Implementation Challenges

The Panel's research identified several additional challenges that must be addressed to ensure a successful transition to NextGen. The Panel believes that FAA's success will depend, in large measure, on its ability to address these challenges and create an environment where critical competencies can be retained.

<u>Implementation Challenge: Leadership Competencies</u>

The Panel learned from its Phase I literature review that leadership is the single most important element of success in large-scale systems integration efforts; thus, the Panel also focused on identifying the specific competencies needed to lead the workforce through the NextGen transition.

To identify the specific leadership competencies critical to NextGen, the Panel first examined the FAA leadership program to learn how FAA currently develops its leaders. Based on its review of FAA's model, the Panel concluded that the agency has developed a comprehensive competency-based leadership program, but ATO must take a different approach to developing its leaders. The Panel identified the following competencies as most critical to NextGen.

- Accountability and Measurement
- Building Teamwork and Collaboration
- Communication
- Interpersonal Relations and Influence

- Agility
- Collaborative Public Management
- Strategic Thinking and Integration

The Panel has also provided specific recommendations to acquire critical NextGen leadership competencies. These include:

- Design and develop a leadership systems integration laboratory
- Design a technical leadership development program
- Hire external executives to partner with ATO managers
- Work with FAA to tailor existing leadership programs to support NextGen
- Implement supervisory pay to attract strong supervisors

Additional Implementation Challenges and Recommendations

The Panel identified several additional challenges that may impede the progress of NextGen. The following is a summary of these challenges with recommendations to mitigate their impact.

NextGen Plans
In conducting its factfinding, the National Academy team learned that ATO does not yet have adequate documentation translating general concepts into detailed NextGen plans. In response to this issue, ATO reported that a process has been implemented to create detailed plans, and ATO expects to issue a more detailed NextGen Implementation Plan in January 2009.   The Panel recommends that ATO make developing this new Plan a priority and that it be communicated to the workforce, stakeholders, and Congress.

Accountability and Metrics
Experts who understand the challenges of large-scale efforts like NextGen consistently pointed to performance accountability as a critical element of success.   While the NextGen Implementation Plan is described as the mechanism by which FAA holds itself accountable for its NextGen commitments, ATO does not yet have detailed timelines, milestones, and metrics supporting its NextGen plans. The Panel recommends that FAA develop and implement detailed timelines and associated metrics to ensure accountability in achieving NextGen objectives.

Labor-Management Relations
FAA's workforce is highly unionized, and ATO's ability to successfully transition to NextGen will require that the agency successfully engage the unions that represent its employees. The Panel recommends that FAA and ATO develop and implement a strategy to engage the unions that represent employees involved in NextGen-related activities. While some progress has been made over the last four years, more needs to be done to ensure that FAA's labor-management relations do not adversely impact the NextGen transition.

Integration of NextGen Programs
The Panel found that ATO service units which have a role in the NextGen transition may not have clear, straightforward business processes that support the transition.   Rather, the business processes in place may be more supportive of ATO's operational mission than its long-term

NextGen vision. The Panel recommends that ATO evaluate the business processes embedded in service unit operations to ensure that they also support the integration of NextGen program.

Research and Development Partners

Subject Matter Experts who participated in the colloquia cautioned that NextGen cannot succeed by doing "business as usual." In this regard, continuing to rely on one or two providers for critical research and development (R&D) work may not serve ATO well in the future. The Panel recommends that ATO evaluate the approach used to identify R&D partners, with a view toward increasing competitiveness and infusing the organization with fresh perspectives.

Human Resources (HR) Operations

The National Academy study team's research revealed that human resources (HR) services for NextGen are shared between FAA's Assistant Administrator for Human Resources and HR staff in ATO, with neither group fully understanding or embracing the roles and responsibilities of the other. Additionally, senior managers in ATO expressed concerns about the availability of adequate HR support to staff NextGen positions. The Panel recommends that FAA and ATO evaluate the structure and content of their HR operations and services to ensure that both are optimally designed to support NextGen.

CONCLUDING PANEL COMMENTS

The Panel expects FAA to take the necessary steps to meet the human resources challenges associated with its transition to NextGen. Commissioning this study represents an important step, but it is just one of many critical actions fundamental to NextGen's success. The Panel is confident that its recommendations and strategies will give ATO clear guidance on recruiting, hiring and developing employees with the competencies it needs, as well as strategies for acquiring those employees. However, the Panel is much less confident that the right organizational environment currently exists within FAA and ATO to acquire and retain the necessary competencies. In this regard, the Panel has identified several critical challenges.
If left unresolved, these challenges have the potential to derail this important national imperative.

The Panel is encouraged by several steps taken recently by ATO that seem to acknowledge the validity of these concerns—implementing strategies to communicate the NextGen vision; assessing the NextGen governance structure; and planning a long-term assessment of ATO's culture. While these steps seem properly focused, it is too early to determine how effective they will be in paving the way for NextGen. Going forward, ATO's leaders need to ensure that these efforts are not overshadowed by the pressing demands of day-to-day operations.

It should not be assumed, however, that overcoming these challenges will guarantee success; NextGen cannot be accomplished by the actions of FAA and ATO alone. Achieving the NextGen vision will require that FAA work closely with a complex mix of public and private organizations over an extended period of time. Additionally, FAA should continue to work within the national educational system to shape the appropriate curricula to support NextGen workforce needs.

NextGen is distinguished from past attempts to modernize by the fact that the consequences of failure extend far beyond ATO. NextGen is a national imperative, and ATO needs to follow through and complete its efforts to reshape its workforce and its culture to lead this challenge. The stakes are high, and failure is not an option. Our nation's economic viability and security are inextricably linked to ATO's ability to rise to this challenge.

CHAPTER 1
BACKGROUND

ORIGINS AND PURPOSE OF THIS STUDY

Our nation's current air transportation system has served the country well since the 1950s, and it continues to be one of the safest and most reliable systems in the world. However, our system may have become a victim of its own success; it can no longer accommodate the ever-increasing demand for air transportation while also ensuring safety and mitigating environmental impact.

When Congress passed Vision 100[1] endorsing the concept of the Next Generation Air Transportation System (NextGen), it acknowledged the serious burden on the current system and the potential consequences of continuing to operate under a system that is no longer adaptable to meet increased demand. The expectation is that NextGen will accommodate a doubling, or even tripling, of air transportation by the year 2025. These capacity demands cannot be accomplished by "refreshing" existing technology or adding new systems. A complete transformation of the nation's air transportation system is needed. NextGen represents this all-encompassing transformation.

NextGen envisions a system that will take the nation from ground-based radar technology and voice communication into the second century of aviation using satellite-based navigation, updated communications, and improved weather and traffic management capabilities. The Federal Aviation Administration's (FAA's) Air Traffic Organization (ATO) has responsibility for leading and managing the overall transition to NextGen, while safely operating the current air traffic control system, 24 hours a day, seven days a week.

FAA AND ATO MISSIONS

FAA Mission

FAA is a major component of the U.S. Department of Transportation. FAA currently has approximately 45,000 employees performing its mission of ensuring the safety of civil aviation. The agency's key functions include the following:

- Safety Regulation: This involves issuing and enforcing regulations and standards covering manufacturing, operating, and maintaining aircraft.

- Airspace and Air Traffic Management: FAA operates a network of airport towers, air traffic control centers, and flight service stations.

- Air Navigation Facilities: FAA builds or installs visual and electronic aids to navigation; and maintains, operates, and assures the quality of these facilities. FAA also sustains

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[1] Public Law No. 108-176, Vision 100—Century of Aviation Reauthorization Act, December 12, 2003.

other systems to support air navigation and air traffic control, including voice and data communications equipment, radar facilities, computer systems, and visual display equipment at flight service stations.

- Research, Engineering, and Development: FAA researches and develops the systems and procedures needed for a safe and efficient system of air navigation and air traffic control. The agency develops better aircraft, engines, and equipment and tests and evaluates aviation systems, devices, materials, and procedures.

- Commercial Space Transportation: FAA regulates and encourages the U.S. commercial space transportation industry.

- Civil Aviation Abroad: FAA promotes aviation safety and encourages civil aviation abroad.

ATO Mission

ATO is the operations arm of FAA. ATO is the nation's air navigation service provider with the mission of providing the safe and efficient air transportation. Unlike most government agencies, the ATO is set up as a performance-based organization whose customers are commercial and private aviation and the military. ATO is made up of more than 35,000 controllers, technicians, engineers and support personnel whose daily efforts keep the national airspace system moving.

STUDY SCOPE, OBJECTIVES, AND METHODOLOGY

With this study, ATO is addressing concerns raised by oversight organizations regarding the workforce challenges it faces with the transition to NextGen. Both the U.S. Government Accountability Office (GAO) and the Department of Transportation's (DoT's) Inspector General (IG) raised questions about whether the ATO has in place the workforce needed to support the transition to NextGen. In November 2006,[2] following a review of ATO's efforts to organize and plan for NextGen, GAO issued a report with a recommendation that the Secretary of Transportation direct FAA to take the following action:

> "Given the technical complexity of the implementation of NextGen and FAA's past experiences, ***undertake a formal exploration of FAA's strengths and weaknesses with regard to the technical … and contract management expertise*** that will be required to define, implement, and integrate the numerous complex programs and systems inherent in the transition to NextGen."

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[2] U.S. Government Accountability Office. *Next Generation Air Transportation System: Progress and Challenges Associated with the Transformation of the National Airspace System.* GAO-07-25. (Washington, D.C.: November 2006).

In a similar report,[3] DoT's IG included the following recommendation:

> "*Determine what skill sets and expertise with respect to software development and systems integration will be required* by the ATO and JPDO—and how they will be obtained—to manage and execute NextGen initiatives."

ATO recognizes that a successful transition to NextGen is dependent upon more than acquisition of new technology and that proper planning to meet its human capital requirements is equally important. In its FY 2007 Strategic Human Capital Planning Document, ATO acknowledges that: "*Longer term, ATO must be prepared to support the development and implementation of the Next Generation air traffic control system, known as NextGen*."

This study represents ATO's efforts to begin to address, in a more systematic way, the workforce challenges associated with NextGen.

Study Objectives

In June 2007, ATO engaged the National Academy to help it address the specific workforce challenges involving NextGen. The National Academy was asked to undertake two specific tasks:

- Task 1: Identify the skill sets required by the ATO non-operational workforce (acquisition) workforce, including, but not limited to technical and contract management skills needed to successfully design, develop, test/evaluate, integrate, and implement NextGen

- Task 2: Define the strategies to obtain the expertise necessary to design, develop, test/evaluate, integrate and implement the complex activities inherent in the transition to NextGen

In order to provide the ATO the most comprehensive and useful responses to the two specific tasks, the National Academy interpreted the requirements as follows. For Task 1, the National Academy Panel determined that its response should encompass not only "skill sets" but also the knowledge requirements and behavioral indicators that describe successful application of these skills. This approach led the Panel to develop complete competency models, rather than a one-dimensional listing of skills. The resulting competency models provide the ATO more complete information that can be used to shape the hiring, as well as training and development criteria for the affected workforce. To respond to Task 2, the Panel directing this study determined that, in addition to identifying strategies to acquire the expertise needed to support NextGen, it should also provide strategies for retaining those skills by addressing, in the broadest possible way, the elements of leadership, change management, and governance that must be in place to support employee retention.

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[3] U.S. Department of Transportation, Office of Inspector General. *Joint Planning and Development Office: Actions Needed to Reduce Risks with the Next Generation Transportation System.* Report Number: AV-2007-03. (Washington, D.C.: February 2007).

By performing the two tasks in this framework, the Panel's objective was to help ATO identify not only skills but all of the contributing elements that must be in place to ensure a successful transition to NextGen.

Study Methodology

The Academy conducted this study in two phases: Phase I began in June 2007 and ended in December 2007, when the Panel issued its *Preliminary Findings and Observations*. Phase II began in January 2008 and ends with the publication of this report.

This study was conducted using the National Academy's standard methodology. Virtually all Academy activities are conducted through Panels composed of Academy Fellows and others with expertise in the specific study topics. A study team comprised of individuals with subject-matter expertise is assembled to support the Panel by conducting the necessary research, analysis, and writing. The Panel directs, reviews and approves the study team's work.

The Academy appointed five Fellows to the expert Panel directing and overseeing this study. Two Panel members recommended by FAA were also appointed to the Panel. Appendix A provides names and brief biographies for all Panel members, including their relevant experience and expertise. During the course of this study, the Panel met six times to provide direction and guidance on the study, to review the progress of the study team's work, and to critique project deliverables.

The study team conducted extensive research and analysis to gain a full understanding of the goals and objectives of the NextGen transformation, the ATO workforce, its organizational environment, the challenges facing the agency in transitioning to NextGen, the competencies required and the strategies for acquiring those competencies. The research methodology included a variety of factfinding approaches:

- **Benchmarking**: The study team conducted two separate but related benchmarking efforts. In the first effort, the team identified and benchmarked against public and private sector organizations that have successfully managed large-scale systems integration efforts. This research included reviewing and analyzing relevant reports and literature and consulting with other sources to identify the elements of success and lessons learned from similar large-scale systems integration efforts. The results of this research provided insights on the elements of leadership, change management, and governance that are critical to the NextGen transition. The second benchmarking effort involved identifying existing sources with validated competencies applicable to the workforce covered by this study. In Phase I of its research, the study team identified the Federal Acquisition Institute (FAI), the Defense Acquisition Institute and the International Council on Systems Engineering (INCOSE) as key sources of competencies. In Phase II, the study team identified another important source: the Competency Standard for Complex Project

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Managers.[4] The study team also visited General Electric's John F. Welch Leadership Development Center to learn about GE's approach to leadership development and change management. Additionally, the team benchmarked against competency models of other Federal agencies, including NASA and the National Institute of Health.

- **Analysis of Workforce Data**: To understand the workforce covered by the study tasks, the project team analyzed data provided by staff of the FAA Assistant Administrator for Human Resources, as well as additional, more refined data provided by the ATO's human capital contacts. This data was used to determine the occupational coverage and characteristics of the workforce, thereby facilitating the identification of competencies, gaps between the skills that currently exist in the workforce and those needed in the future, and strategies for acquiring competencies.

- **Interviews**: Interviews were a key part of the study team's research. Starting in August 2007 through July 2008, the study team interviewed or contacted over 80 individuals, including ATO managers and key staff with NextGen-related responsibilities; key FAA stakeholders; key stakeholders in other Federal agencies, including NASA, DoD, and GAO; key officials of public and private sector organizations who provided information and best practices in managing and executing large-scale systems integration efforts; and key stakeholders in academia. Appendix B provides a comprehensive list of individuals contacted and interviewed during the course of the study.

- **Field visit**: To learn more about the research and technology development work performed by ATO in support of NextGen, the study team visited the William J. Hughes Technical Center in Atlantic City, New Jersey. The Technical Center is the FAA's aviation research and development and test and evaluation facility. Technical Center programs include testing and evaluation in air traffic control, communications, navigation, airports, aircraft safety, and security.

- **Colloquia**: In Phase II, the study team conducted two colloquia with subject matter experts to obtain their insights and perspectives on the competencies needed by the non-operational/acquisition workforce to support the transition to NextGen and strategies that can be used to acquire those competencies. In addition, the colloquia participants were asked to share their advice and opinions on the broader leadership and organizational challenges ATO faces in planning the transition to NextGen. A total of 18 executive-level leaders, some of whom were former FAA managers, attended the colloquia. Appendix C provides a list of colloquia participants.

- **Focus Groups**: In Phase II, the study team conducted focus groups with employees at the FAA Headquarters in Washington, D.C., and the William J. Hughes Technical Center in Atlantic City, New Jersey. The study team worked with the FAA Labor Relations staff (reporting to the FAA Assistant Administrator for Human Resources) to develop a

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[4] The public version of the Competency Standard for Complex Project Management was released in 2006. It was authored by Dr. David H. Dombkins and is managed by the College of Complex Project Managers.

process for identifying focus group participants through collaboration with managers and union representatives. Once employees were identified, the study team communicated directly with these employees individually via a memorandum inviting them to participate in the focus groups. Understanding that the selected employees' knowledge of NextGen could be uneven, the memorandum instructed participants to prepare for the focus groups by reviewing an on-line "Preparation Module" containing background information about NextGen and the National Academy's study. Additionally, participants were asked to respond to specific questions about their past work experience with NextGen transformational programs. In preparation for the focus groups, the study team analyzed this preliminary information and used it to frame discussions in the sessions.

- **VP Roundtable**: To gather input from ATO's senior leadership team, the Panel conducted a roundtable discussion with the VPs of ATO service units. The objective of this session was to gather qualitative information from these leaders about the competencies needed now and in the future to support NextGen; what business processes they have in place to perform the systems integration needed for NextGen; and what factors may influence ATO's capability to acquire, develop, and retain critical competencies.

The study team analyzed data from all of the above sources, identified competency gaps, and drafted competency models designed to fill the gaps between existing competencies and those needed now and in the future. These drafts were then distributed for validation by ATO VPs and external subject-matter experts who participated in the colloquia. Chapter 4 includes a complete description of the analytical and validation processes used to create the competency models.

As the study team conducted its research to identify competencies, the team also sought input on how the competencies could be acquired. The study team first met with the appropriate human capital officials, including FAA's Assistant Administrator for Human Resources (and designated staff) to gain a complete understanding of FAA's human capital planning efforts, the degree to which existing strategies and tools have been successful in acquiring the current workforce, and the degree to which these approaches are considered applicable in obtaining future talent. In addition, the study team met with acquisition officials to try to ascertain the approaches the agency uses to make decisions on acquiring skills via contract and any other methods other than hiring individuals as part of the permanent workforce. Using this baseline information, the study team assessed various alternatives to fill the gaps in competencies represented in the competency models. The strategies identified in Chapter 6 were selected as the most appropriate and feasible to implement in the ATO organizational environment.

CHAPTER 2
NEXTGEN ENVIRONMENT AND CHALLENGES

FAA articulates its mission in a single statement: to provide the safest, most efficient aerospace system in the world. However, the simplicity of its mission statement belies the agency's current challenge—to lead a total transformation of the nation's air transportation system by the year 2025 while maintaining high safety levels and improving performance in the current system. This is one of the most challenging efforts faced by any federal agency, and while the FAA is not singularly responsible for its accomplishment, the agency has the lead responsibility for developing and integrating the systems, processes and procedures that will comprise NextGen, while continuing to operate the safest system in the world—24 hours a day, seven days a week. ATO, which has the primary mission of moving air traffic safely and efficiently, will lead this effort for FAA.

To fully understand the challenge that ATO is facing, one must look beyond the specific tasks that are the subject of this study and develop an understanding of the complexity of the organizational environment in which ATO's workforce challenges must be addressed. A more complete understanding of this environment and the associated challenges provides the appropriate backdrop for identifying the competencies needed by the non-operational (acquisition) workforce and the most feasible strategies for acquiring those competencies.

THE NEXTGEN IMPERATIVE—WHY ATO MUST DELIVER

The nation's air transportation system has reached a critical point. In 2006, 750 million passengers flew in U.S. airspace, and the FAA estimates that between the years 2012 and 2015, one billion passengers could fly each year, with some models projecting more than two billion passengers by the year 2025[5].

This increased demand is accompanied by increased performance issues. The Department of Transportation's IG noted in a recent study[6] that nearly 28 percent of flights were delayed, cancelled, or diverted in 2007 and that airlines' on-time performance (72 percent) was the worst in the last 10 years. Delay periods also increased, with late arrivals averaging 57 minutes, up nearly three minutes from 2006. A total of 54,000 flights experienced taxi-in and taxi-out times of one to five hours or more—an increase of nearly 42 percent over 2006. In 2008, on-time gate arrivals and departures are at 73.3 percent and 75.03 percent respectively. Marion Blakey, the former FAA Administrator, estimated that delays caused by air traffic will be 62 percent higher in 2014 than in 2004. Added to the problem of delays, is the annual total of 285 actual operational errors that has already exceeded the year-to-date goal of not more than 252.[7]

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[5] www.jpdo.gov.
[6] *Actions Needed To Improve Airline Customer Service and Minimize Long, On-Board Delays*. September 27, 2007 http://www.oig.dot.gov/StreamFile?file=/data/pdfdocs/CC2007105Senate.pdf
[7] https://employees.faa.gov/org/linebusiness/ato/

An article in *The New York Times*[8] predicted that America will have three times as many planes in the air by 2025, including "thousands of tiny jets, seating six or fewer, at airliner altitudes, competing for space with remotely operated drones that need help avoiding midair collisions, and with commercially operated rockets carrying satellites and tourists into space." The article went on to observe that: "For every five controllers now working, the …(FAA)… will need to hire and train four more by 2015, to replace those who retire or change jobs."

The business case for NextGen is compelling. The aviation industry contributes approximately $640 billion to the U.S. economy and accounts for more than 9 million jobs[9] and about $314 billion in wages.[10] If the air transportation system cannot meet future demands, and if it cannot accommodate changing business models, the cost to our nation in terms of delays, cancellations, and lost business opportunities will be dramatic. If the NextGen vision is not realized, by 2022, FAA estimates that this failure would cost the U.S. economy $30 billion annually in lost economic activity. That number grows to more than $40 billion by 2033. [11] The costs of delays alone are huge—the Senate Joint Economic Committee estimates that last year, flight delays alone cost passengers, airlines, and the U.S. economy over $40 billion. Additionally, the Travel Industry Association estimates that air travelers avoided over 41 million trips last year—leading to lost revenues and taxes of over $26 billion.[12]

Added to the potential economic impact of continuing with the current air transportation system is the environmental impact caused by inefficient aircraft and crowded airspace. Reducing greenhouse gas emissions is a national priority, and the current air transportation system with its outdated technology and fragmented systems will continue to exacerbate this growing environmental concern.

Balanced against these factors is the safety of current air travel which former Administrator Blakey stated is: "the golden age of safety—the safest period in the safest mode in the history of the world."[13] The drop in the fatal accident rate was about 65 percent over a 10 year period. Thus, the question arises: How can the FAA continue to maintain high safety standards and achievements while increasing system capacity and reducing system delays?

To deal with these demands on the current air traffic system, the nation must transform its aging air transportation system to be more responsive to the social, economic, political, and technological changes that are evolving worldwide. The current system is inherently limited in its ability to grow and adapt to this level of demand. A dramatically different approach to air traffic control is needed because the current approach—ground-based radars and limited use of

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[8]"Flying the Crowded Skies: Challenges for Aviation.**"** NY Times. January 15, 2007 http://www.nytimes.com.
[9] http://www.jpdo.gov/library.asp.
[10] Ibid.
[11] www.jpdo.gov.
[12] Statement of Henry Krakowski, Chief Operating Officer, Air Traffic Organization before the Senate Committee On Commerce, Science, And Transportation, Subcommittee On Aviation Operations, Safety, And Security on the Outlook For Summer Air Travel: Addressing Congestion And Delays, July 15, 2008.
[13] Marion C. Blakey, Washington, D.C. September 11, 2007 before the Aero Club of Washington, D.C. http://www.faa.gov/news/speeches/news_story.cfm?newsId=9532.

automation—is becoming operationally obsolete. NextGen is the nation's solution to this problem.

As described by FAA, NextGen will entail precision satellite navigation; digital, networked communications; an integrated weather system; layered adaptive security; and more. NextGen will employ networking technology that updates itself with real-time shared information and tailors itself to the individual needs of all U.S. aircraft. NextGen's computerized air transportation network will enable aircraft to immediately adjust to ever-changing factors such as: weather, traffic congestion, aircraft position, flight trajectory patterns, and security issues. When NextGen is fully implemented, many pilots and dispatchers will be able to select their own flight paths, and demand and capacity imbalances will be worked collaboratively between FAA air traffic managers and flight operators. The impact of weather will be reduced through the use of improved information sharing, new technology to sense and mitigate the impacts of weather, and the integration of weather information into automation to improve decision-making. New procedures will improve airport surface movements, reduce spacing and separation requirements, and better manage the overall flows into and out of busy metropolitan airspace to provide maximum use of the highest demand airports. During busy traffic periods, NextGen will rely on the ability of aircraft to fly precise routes into and out of many airports to increase throughput. Below is a summary of the eight key NextGen capabilities.

Table 2-1
Eight Key Capabilities of NextGen[14]

Capability	Description
Network-Enabled Information Access	Information will be available, secure and usable in real time for different Communities of Interest and air transportation domains. This greater accessibility will enable distributed decision making and improve the speed, efficiency, and quality of decisions and decision making.
Performance-Based Operations and Services	Regulations and procedural requirements will be described in performance terms rather than in terms of specific technology or equipment.
Weather Assimilated into Decision Making	Real-time weather information will be available to pilots and controllers to enhance operations and improve decision making.
Layered Adaptive Security	Security will be built upon "layers of defense," technology, procedures, and policies that help reduce the overall risk of a threat causing harm to the system. NextGen security will adapt its systems and procedures to the current risk level, depending on the situation rather than being bound to an inflexible "one-size-fits-all" approach.
Broad-Area Precision Navigation (PNT)	Pilots will receive services where and when they are needed, in nearly all conditions. Geographic and weather constraints will no longer be factors in the system. Instead, pilots will have the ability to define their desired flight paths based on their own objectives.
Aircraft Trajectory-Based Operations	Pilots will have the ability to tailor individual flight paths based on the four-dimensional trajectories, which include altitude, longitude, and latitude, plus time, of other aircraft. Each aircraft will both transmit and receive precise positioning information, telling it where and when it and others will cross key points along its path.
Equivalent Visual Operations	With improved information tools and displays, aircraft will have the ability to determine where other planes are without having to physically see them. This capability in combination with PNT services will increase accessibility, both on the ground and during arrivals and departures.

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[14] www.jpdo.gov.

Capability	Description
Super Density Operations	New procedures will maximize the amount of traffic through both the busiest airports and airspace. There will be improved airport ground movement, and reduced spacing and separation standards between aircraft in the sky, while maintaining safety and security. Controller and pilots will better manage the flow of traffic in and around busy metropolitan areas, maximizing use of all airspace.

PAST EFFORTS TO MODERNIZE THE AIR TRANSPORTATION SYSTEM

Over the past 25 years, FAA's efforts to modernize the air transportation system have had mixed results. Two previous efforts---the Advanced Automation System (AAS) and the Standard Terminal Automation Replacement System (STARS)---generally contributed to negative external perspectives on FAA's ability to effectively transition to NextGen. In a recent report, GAO reported that STARS was one of two key NextGen systems that significantly exceeded its budget and experienced major schedule slippage.[15]

Advanced Automation System

Begun in the early 1980's, AAS, which was planned to rebuild the air traffic control system, has been described as an example of "how the Government's best intentions can be defeated when there is a constantly changing bureaucracy with a dearth of leaders who can manage complex projects."[16] After over a decade of effort and costs incurred of $5.9 billion, the FAA abandoned the project and adopted a more modest approach to provide new screens and workstations to controllers. The agency acknowledged that $500 million had been spent on software that would never be used. In testimony given just before the project was abandoned, GAO observed[17] that there were several major factors contributing to AAS implementation difficulties:

- FAA and IBM's (the prime contractor) development and implementation plan, including cost and schedule estimates, was overly ambitious.

- FAA did not provide adequate oversight of IBM's performance, and IBM's lack of progress did not surface in a timely manner.

- FAA was indecisive in resolving issues about basic requirements.

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[15] U.S. Government Accountability Office. *Next Generation Air Transportation System: Status of Systems Acquisition and the Transition to the Next Generation Air Transportation System. GAO-08-1078. (Washington, D.C.: September 2008).

[16] *Flight to Nowhere: A Special Report; Ambitious Update of Air Navigation Becomes A Fiasco*. Matthew L. Wald. N.Y. Times. January 29 1996.
http://query.nytimes.com/gst/fullpage.html?res=9501E2DE1039F93AA15752C0A960958260&sec=&spon=&pagewanted=print

[17]*Advanced Automation System: Implication of Problems and Recent Changes*. GAO. April, 1994.
http://archive.gao.gov/t2pbat3/151350.pdf

GAO also noted in a subsequent study[18] that: "FAA's organizational culture has been an underlying cause of the agency's acquisition problems. Its acquisitions were impaired because employees acted in ways that did not reflect a strong commitment to mission focus, accountability, coordination, and adaptability." An FAA-funded study,[19] conducted by the Center for Naval Analysis, supported GAO's assessment and also noted that "FAA's culture discouraged program officials from reporting news of cost increases, schedule delays, and performance problems with the AAS project. This suppression of bad news prevented top management from taking early action."

Standard Terminal Automation Replacement System

In 1996, FAA contracted with the Raytheon Corporation for a system using commercially available technology to replace controller workstations with new color displays, processors, and computer software. This system was to be deployed throughout the National Airspace System (NAS) with very little software development and required the installation of STARS in 172 facilities at a cost of $940 million. The schedule called for implementation to begin in 1998 and be completed in 2005. FAA controllers and equipment technicians testing an early version of the system in 1997 raised concerns about the functioning of the new equipment. FAA addressed these concerns by changing the software development approach. The new approach required more software customization which significantly increased both the costs and time required for system implementation.

By 2004, changes to STARS' cost and schedule added $500 million more for 122 fewer systems than originally planned. A GAO study in 2005[20] noted that "According to FAA, the original Commercial Off-the-Shelf acquisition strategy that limited the involvement of controllers and maintenance technicians to just prior to deployment caused unplanned work for the agency because it had to revise its strategy for acquiring and approving STARS; this contributed to an increase in the overall cost of STARS of $500 million and a schedule extension of 5 years to deploy the system to its first site. The interaction of these factors also contributed to the agency's ability to deploy STARS at only 47 of the 172 facilities initially planned."

In light of these past experiences, the Panel believes that ATO's success in leading the transition to NextGen will depend, in part, on its willingness to review its past efforts and learn from challenges and mistakes.

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[18] *Aviation Acquisition. A Comprehensive Strategy is Needed for Cultural Change at FAA*. GAO/RCED-96-159. http://www.gao.gov/archive/1996/rc96159.pdf

[19] *FAA Advanced Automation System Program Assessment*. The Center for Naval Analyses, CAB94-30.10, Apr. 1994.

[20] U.S. Government Accountability Office. *National Airspace System: FAA Has Made Progress but Continues to Face Challenges in Acquiring Major Air Traffic Control Systems.* GAO-05-331. http://www.gao.gov/new.items/d05331.pdf

THE JOINT PLANNING AND DEVELOPMENT OFFICE

In 2003, Congress acknowledged that a coordinated national effort would be needed to transform the nation's air transportation system, and it mandated creation of the Joint Planning and Development Office (JPDO) to lead the transformation. The JPDO represents an unprecedented cross-agency collaboration that brings together seven federal entities, including FAA, the Departments of Transportation, Defense, Homeland Security, Commerce, and NASA; and the White House Office of Science and Technology Policy. Section 109 of the law (Vision 100) requires that the Secretary of Transportation establish the JPDO within FAA to "manage work related to the Next Generation Air Transportation System." Vision 100 specifically charged the JPDO with creating and executing an integrated national plan for NextGen, to include a transition plan for the implementation of that system. To ensure that industry input is obtained at every stage of NextGen's development, Congress directed steps to create a close relationship with private sector partners. This relationship is made possible through the NextGen Institute which has over 200 industry members who are involved in the development of the JPDO's major planning documents. In essence, the JPDO is responsible for developing and managing a public/private partnership that has been formed to achieve a critical national objective. Figure 2-1 shows the JPDO's top-level organizational structure.

Figure 2-1[21]
Top Level JPDO Organization
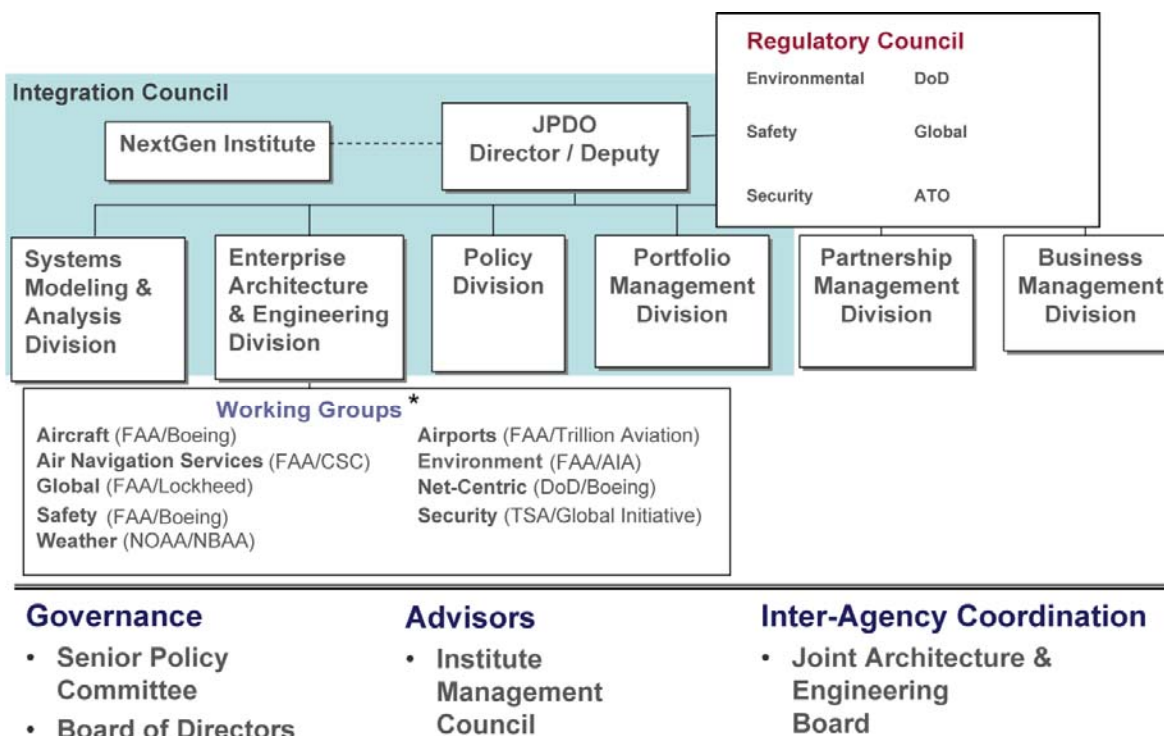
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[21] www.jpdo.gov.

Prior to the establishment of the JPDO, the federal Government's responsibility for the various elements of the air transportation system was dispersed among several agencies, each with its own program responsibilities, policies, priorities, and budgets. NextGen requires that the JPDO partner agencies institutionalize coordination and alignment of their separate agency activities relevant to NextGen, including policies, programs, budgets, acquisitions, research and development, and the sharing of best practices.

To date, the JPDO has drafted initial versions of several high-level technical planning documents, including the *Business Case for the Next Generation Air Transportation System, v1.0* (August 2007), the *NextGen Enterprise Architecture, v2.0* (June 2007), and the *NextGen Concept of Operations, v 2.0* (June 2007). In addition, a *NextGen Integrated Work Plan* has been drafted and is currently under revision.

Figure 2-2 depicts the foundational strategic planning that the JPDO has accomplished.

Figure 2-2[22]
NextGen Foundational Strategic Planning
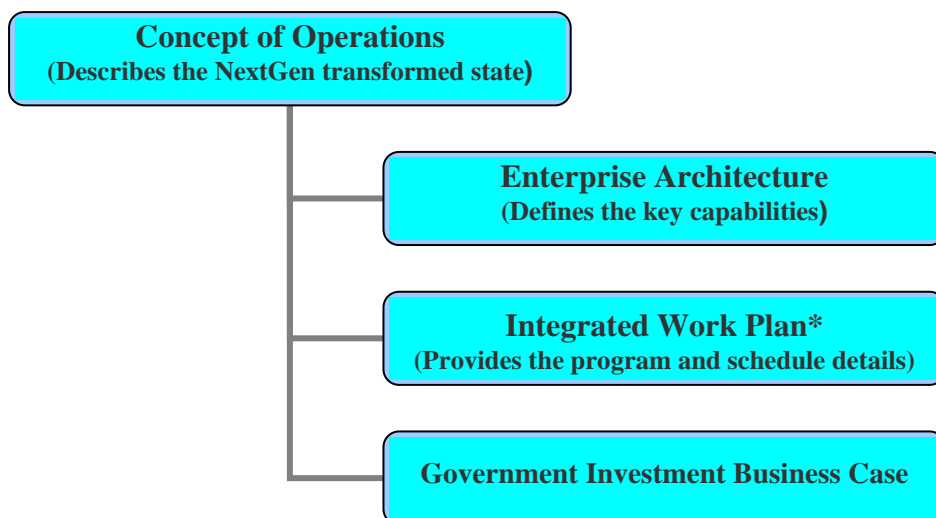
* This document is still in draft form and has not yet been released.

Notwithstanding these efforts, external reviewers continue to question the JPDO's effectiveness, noting that little progress has been made in translating the NextGen vision into concrete plans that can be implemented by the partner agencies. Although the JPDO was formed in 2003, the collaborative relationship between the partner agencies was not formally documented until June 2008. Further, in a report released on July 14, 2008,[23] addressing the Department of Transportation's budget, the Senate Committee on Appropriations commented: "FAA must translate initial concepts and ideas into real programs with specific requirements, milestones, and

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[22] Ibid.

[23] U.S. Senate Committee on Appropriations. *Transportation, Housing, and Urban Development, and Related Agencies Appropriation Bill, 2009*. 110th Cong., 2d sess., 2008.S.Rept. 3261.

cost estimates." The Committee also noted that "FAA has not yet brought detail to how the agency will accomplish the NextGen transformation." Additionally, the Committee noted that although the Enterprise Architecture continues to evolve, "FAA cannot yet delineate its requirements or develop realistic cost estimates. For this reason, the Committee does not feel confident that FAA knows how it will move from the current system to NextGen." The Committee also commented that it is extremely troubled by the fact that none of the budget justifications, planning documents, or enterprise architecture documents detail how each initiative in NextGen will reduce delays and congestion between now and 2025.

The Panel applauds ATO's efforts to address its NextGen workforce needs but believes that the agency will face enormous challenges in the absence of more specific and concrete planning documents that lay out a clear description of NextGen requirements, timelines, and metrics. ATO's NextGen Implementation Plan (previously called the Operational Evolution Partnership), developed in June 2008, provides a description of how the agency is shifting its focus from concept definition to execution with seven solution sets, each of which describes a specific NextGen operational capability. While the solutions described in the Implementation Plan describe commitments and timelines, these timelines set annual goals and lack the level of detail suggested by the Senate Appropriations Committee. Additionally, the NextGen Implementation Plan does not set forth metrics for tracking accomplishments or associated costs, which are both critical to successful planning. The NextGen Portfolio Work Plan, still under development, may come closer to meeting these expectations.

HOW ATO FITS INTO THE FAA STRUCTURE

FAA was created by the Federal Aviation Act of 1958. The agency's present name was adopted in 1967 when FAA became a part of the Department of Transportation. FAA considers regulation of civil aviation safety to be its most important mission, but it also has several other key missions, including:

- Encouraging and developing civil aeronautics;

- Developing and operating a system of air traffic control and navigation for both civil and military aircraft;

- Researching and developing the National Airspace System (NAS);

- Developing and carrying out programs to control aircraft noise and other environmental effects of civil aviation; and

- Regulating U.S. commercial space transportation.

FAA is led by an Administrator and a Deputy Administrator; three Associate Administrators report directly to the Administrator and direct the line-of-business organizations that carry out the agency's principal functions. The Chief Counsel and the ten Assistant Administrators also report to the Administrator. The Assistant Administrators oversee other key programs such as Human Resources, Financial Services, and Civil Rights. Figure 2-3 shows the current FAA organizational structure.

Figure 2-3
FAA Organizational Chart

Chief of Staff
Center for Early Dispute Resolution

ADMINISTRATOR AOA
DEPUTY ADMINISTRATOR ADA

Chief Operating Officer Air Traffic Organization (ATO) AJO

Assistant Administrator for Civil Rights ACR

Chief Counsel AGC

Assistant Administrator for Government & Industry Affairs AGI

Assistant Administrator for Communications AOC

Assistant Administrator for Human Resource Management AHR

Assistant Administrator for Security & Hazardous Materials ASR

Assistant Administrator for International Aviation API

Assistant Administrator for Financial Services ABA

Assistant Administrator for Regions and Center Operations ARC

Assistant Administrator for Aviation Policy, Planning & Environment AEP

Assistant Administrator for Information Services AIO

Office of Accountability Board AHA
Office of Corporate Learning AHD
Office of HR Field Operations AHF
Office of Labor Mgmt Relations AHL
Office of HR Mgmt Prgms & Policies AHP

Office of Hazardous Materials AEU
Office of Emergency Oper & Communications AEO
Office of Operations AHS
Office of Internal Security & Investigations AIN

Office of Europe, Africa & Middle East AEU
Office of Asia-Pacific APC
Office of Western Hemisphere AWH

Office of Budget ABU
Office of Financial Controls AFC
Office of Financial Management AFM

Alaskan Region AAL
Central Region ACE
Eastern Region AEA
Great Lakes Region AGL
New England Region ANE
Northwest Mountain Region ANM
Southern Region ASW
Southwest Region ASW
Western-Pacific Region AWP
Mike Monroney Aeronautical Center AMC
Aviation Logistics Organization ALO

Office of Environment & Energy AEE
Office of Policy & Plans APO

Office of Information Tech Enterprise AES
Office of Information Systems Security AIS
Office of Information Tech Optimization AOT
Office Information Tech Research & Dev ARD

Associate Administrator for Commercial Space Transportation AST

Associate Administrator for Airports ARP

Associate Administrator for Aviation Safety AVS

Office of Airport Safety & Standards AAS
Office of Airport Planning & Programming APP

Office of Accident Investigation AAI
Federal Air Surgeon AAM
Flight Standards Service AFS
Aircraft Certification Service AIR
Office of Air Traffic Oversight AOV
Quality, Integration & Executive Service AQS
Office of Rule Making ARM
Aviation Safety Analytical Service ASA

July 2008

JPDO

Service Center
Technical Training
Terminal
Technical Operations
En Route & Oceanic
Systems Operations

VP for Acquisition and Financial Services
Sr. VP for NextGen and Operations Planning
Sr. VP for Operations
Sr. VP for Finance
Sr. VP for Strategy and Performance
Communications
VP for Safety

In December 2000, President Clinton signed an Executive Order establishing ATO as a performance-based organization within FAA. ATO was created by consolidating FAA's Air Traffic and Research and Acquisition (ARA) lines of business into one organization. ATO was formally established in November 2003 with responsibility for the day-to-day operations of the National Airspace System. ATO employees comprise almost 80 percent of the total FAA workforce, and the daily efforts of 33,000 controllers, technicians, engineers, and support personnel keep airplanes moving. ATO prides itself on its safety record. With more than 7,000 takeoffs and landings per hour, and more than 660 million passengers and 37 billion cargo revenue ton miles of freight a year, it safely guides approximately 50,000 aircraft through the National Airspace System every day.[24] ATO is headed by a Chief Operating Officer (COO),

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[24] http://www.faa.gov/about/office_org/headquarters_offices/ato/.

who reports directly to the FAA Administrator. The COO is responsible for leading and managing the daily operations.

When this study began, ATO's structure consisted of nine service units, each headed by a Vice President (VP) at the senior executive level reporting to the COO. These nine service units included:

- *Acquisition and Business Services*, which is responsible for acquisition policy, contracting, and quality assurance services. It also provides information technology services and some human resource management services. In addition, it oversees flight services program operations, workforce development, and controller training.

- *Communications Services*, which is responsible for keeping ATO employees, Congress, and the aviation industry informed about developments in the organization.

- *En Route and Oceanic Services*, where air traffic controllers manage aircraft at the highest levels over the U.S. and far out into the Atlantic and Pacific oceans. Controllers at 20 air route traffic control centers coordinate with Terminal, Technical Operations and Systems Operations services to provide seamless air traffic services. En Route and Oceanic Services provides safe, secure and efficient air traffic services to ATO customers operating in the National Airspace System, as well as international airspace assigned to U.S. control.

- *Terminal Services,* where air traffic controllers are positioned in Terminal Radar Approach Control towers (TRACONs) and airport towers to safely and efficiently guide aircraft in and out of airports across the country. TRACONs are FAA facilities that house air traffic controllers who use radar displays and radios to guide aircraft approaching and departing airports generally within a 30- to 50-mile radius up to 10,000 feet, as well as aircraft that may be flying over that airspace.[25] Terminal Services is responsible for the delivery of terminal services and implementing new technology to support all terminal operations.

- *Technical Operations,* where approximately 9,000 employees make sure that more than 41,000 pieces of equipment operate every day.

- *Systems Operations,* which provides overall national guidance for air traffic procedures and airspace issues, traffic flow management for the National Airspace System, and requirements for weather observation and reporting standards. Systems Operations is the focal point for daily ATO interface with the Department of Defense (DoD) and the Department of Homeland Security (DHS) regarding air transportation security issues.

- *Finance Services*, which is responsible for financial metrics, comparative analysis productivity measures, business case evaluation and competitive sourcing.

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[25] http://www.faa.gov/news/fact_sheets/news_story.cfm?contentkey=4009.

- *Operations Planning,* which is responsible for preparing ATO for the air traffic of tomorrow and the strategies and solutions that achieve national and international goals by taking the lead in developing the Next Generation Air Transportation System.

- *Safety*, which is responsible for monitoring ATO's transcendent level of safety by tracking, reporting and analyzing performance. It also develops policies, processes and training for safety improvement.

Figure 2-4 shows the ATO organizational structure that was in place until May 2008, when ATO established a new Senior VP for NextGen and Operations Planning to replace the VP for Operations Planning. The workforce performing acquisition functions directly supporting the NextGen transition were, and continue to be, dispersed throughout all of the service units except Communications.

Figure 2-4
ATO Structure (pre-July 2008)
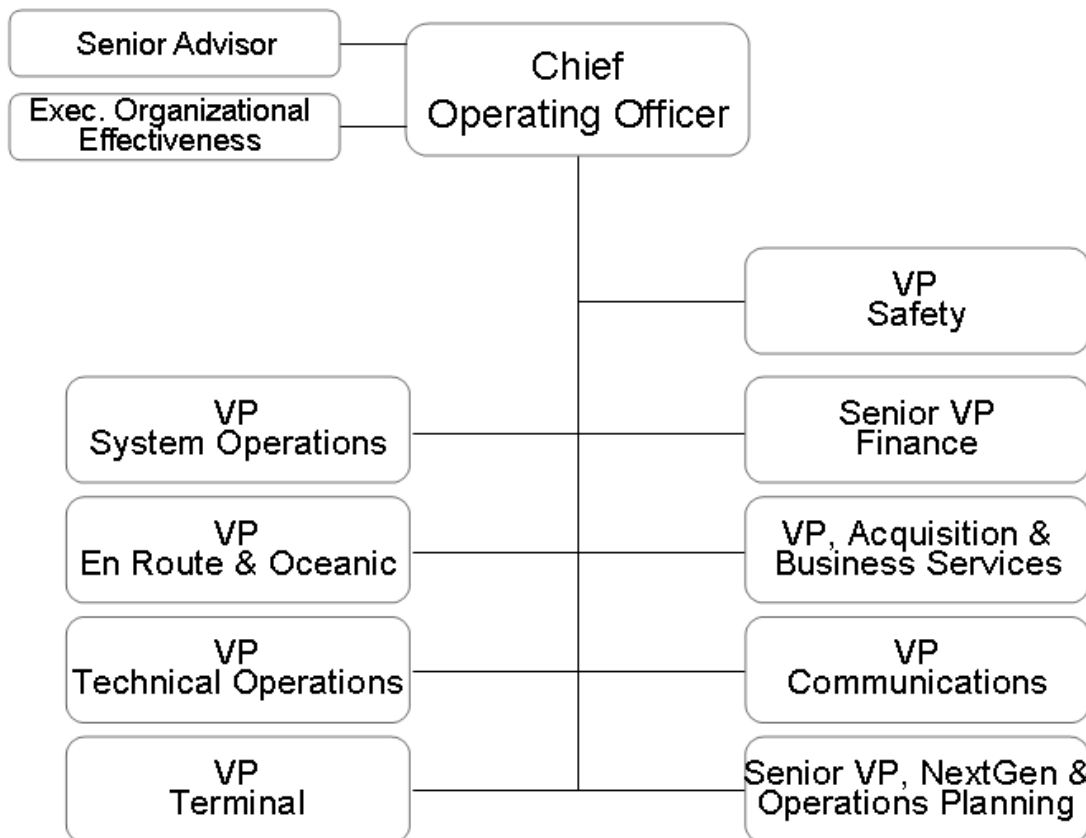
Reorganization of July 2008

Effective July 14, 2008, ATO implemented a reorganization designed to help the agency "define its strategic direction, emphasize operations, and position the organization to better achieve its objectives."[26] The reorganization separated ATO's operational functions from its strategic functions and created two new *Senior* VP positions reporting to the COO. The two new senior VPs are: Senior VP for Operations and Senior VP for Strategy and Performance. Including the existing Senior VP for Finance and the new Senior VP for NextGen and Operations Planning, ATO now has four Senior VPs. The Senior VP for Operations will have lead responsibility for integrating ATO's operational functions, while all four senior VPs will participate with the COO in ATO's overall strategic planning efforts. Two additional VP positions were also created—one to direct technical training and a second to manage service center operations.

With respect to workforce management, it is important to note that the reorganization shifts the functions of Workforce Services, Leadership and Professional Development, and Model Workplace and Diversity from the VP for Acquisition and Business Services and places them under the direction of the newly created Senior VP for Strategy and Performance. Equally important to the NextGen transition, the JPDO now reports to the Senior VP for NextGen and Operations Planning, rather than to the COO. These organizational changes are intended to help ATO strengthen its strategic planning and execution capabilities, modernize its technical training, implement best practices in workforce development, and integrate its organizational activities. Consistent with its new organizational structure and focus on planning, ATO expects to develop and implement its first strategic plan by the end of the fiscal year to identify and prioritize its most important goals.

Changes in the ATO structure are depicted in Figure 2-5.

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[26] ato.faa.gov.

Figure 2-5
Changes in ATO Structure, effective July 2008
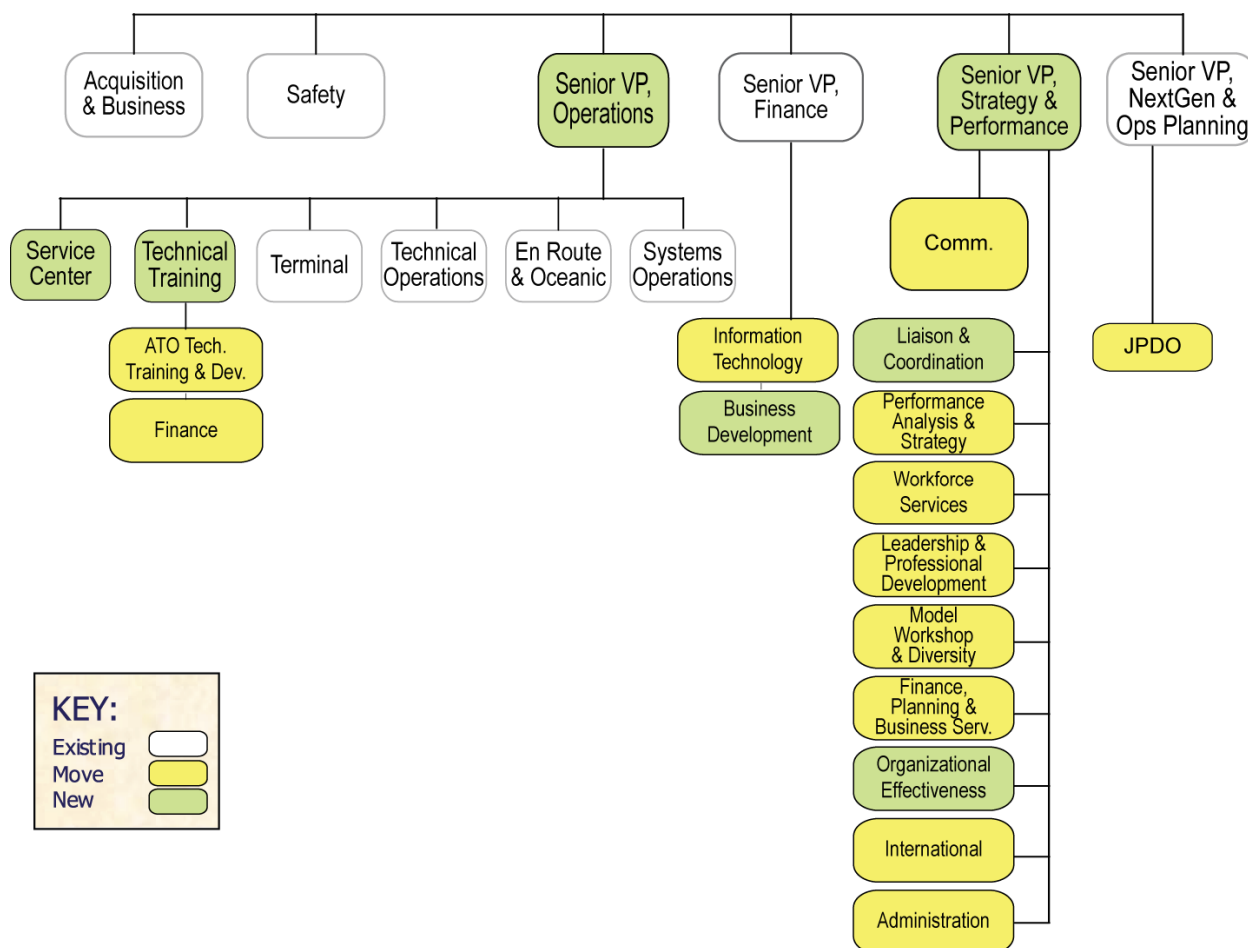
NextGen GOVERNANCE[27]

Within the ATO structure, the Senior VP for NextGen and Operations Planning has overall responsibility for leading the transition to NextGen. As previously noted, the JPDO no longer reports to the Administrator, but to the new Senior VP position, which now has three subordinate elements engaged in NextGen planning and implementation. These are:

- *NextGen Integration and Implementation Office*, headed by a senior executive position, reporting to the ATO COO for policy and overall direction and to the Senior VP for NextGen and Operations Planning for day-to-day guidance. This office develops and maintains the NextGen Implementation Plan and will be deeply involved in NextGen systems integration, monitoring the progress of NextGen development and implementation efforts, and facilitating key collaboration processes.

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[27] FAA's *NextGen Implementation Plan*, Overview 2008, June 2008.

- ***Operations Planning,*** which manages FAA's research and technical development, Enterprise Architecture, systems engineering, performance modeling, and other key NextGen functions.

- ***Joint Planning and Development Office,*** which having developed the foundational documents for NextGen, will now focus on the long-term NextGen vision and ensuring FAA's alignment with partner government agencies and other stakeholders that contribute to the overall NextGen effort.

In addition to the Senior VP for NextGen and Operations Planning, two other management structures are responsible for NextGen decision making and progress monitoring:

- ***NextGen Review Board*** (formerly the Operational Evolution Partnership (OEP) Review Board): This Board is co-chaired by the Director, NextGen Integration and Implementation Office and the Director, JPDO. The membership of this Board include representatives of the key FAA and ATO lines of business and staff offices. The Board provides oversight, status, prioritization, and guidance on existing and proposed NextGen initiatives. It assesses funded research and development programs and drives R&D budget plans. The NextGen Review Board provides a detailed assessment of NextGen initiatives and provides recommendations to the NextGen Management Board.

- ***NextGen Management Board*** (formerly the OEP Associates Team): Chaired by FAA's Deputy Administrator, this Board takes an "enterprise approach" to developing and executing FAA's NextGen plan. All key agency lines of business are represented on the Board, which arbitrates and has the authority to resolve emerging NexGen implementation issues. The Board's key functions include: measuring the progress of deployments and of key activities that support decision making; ensuring essential resources are available, including prioritizing resources as necessary; issuing policies and guidance affecting NextGen; and identifying specific leaders within their organizations who will be accountable for delivering specific system changes.

Figure 2-6 below depicts the NextGen Integration Management Governance Structure.

Figure 2-6
NextGen Integration Management
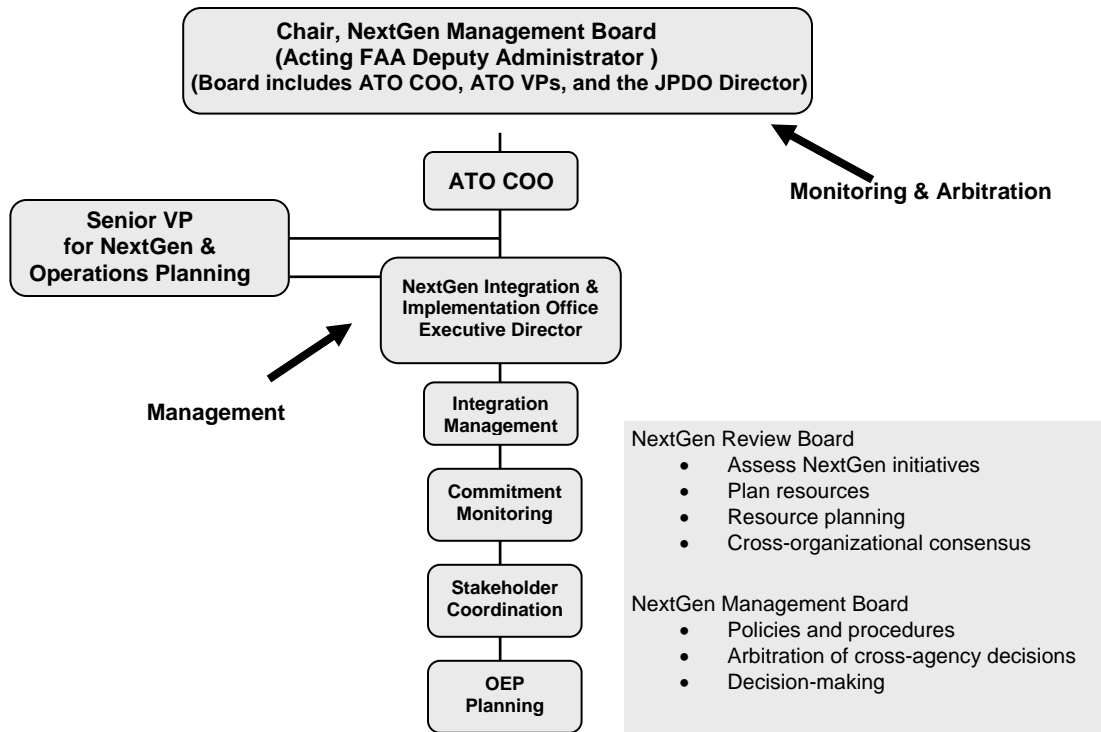
The Panel is concerned about the inherent complexity of the NextGen governance structure, especially the decision-making process for funding and authorizing NextGen initiatives. (Figure 2-7 below). The process described to the Panel in December 2007 requires initial approval by the VP for Operations Planning (now NextGen and Operations Planning) and the JPDO Director. If agreement is reached to proceed, the initiative is then reviewed by the NextGen Management Board. If it clears the line of business budget approval process, then it proceeds to execution.

When this study was initiated, the Operational Evolution Partnership (OEP) was described as FAA's plan by which the agency would hold itself accountable to its owners, customers, and the aviation community for its progress toward the NextGen vision. In June 2008, FAA replaced "OEP "with "NextGen," in an effort to bring greater transparency and clarity to its NextGen efforts. At that time, FAA issued a new NextGen Implementation Plan. However, the Panel did not find clear indications of how ATO service units have focused their efforts to support the NextGen transition. The study team learned that key positions in the service units are responsible for NextGen planning in their respective units, but questions remain as to how the internal business processes have been tailored to support key NextGen programs.

Notwithstanding its complexity, the Panel accepts that the NextGen governance structure and NextGen Implementation Plan have the potential to be successful—but only if there is clear and consistent leadership from the FAA Deputy Administrator and the COO. At the end of Phase I, the Panel advised: "It is important that these two leaders communicate their support for the OEP integration management plan and hold leaders throughout FAA and ATO accountable for fulfilling their NextGen commitments. It is not enough for the ATO leaders to commit resources to fund NextGen initiatives. There must be a clear commitment to the NextGen vision at all levels of the organization, starting with the FAA and ATO leaders, particularly the Deputy Administrator and COO, manifested by their commitment to spend their personal time in all scheduled meetings. They must model the commitment they communicate and seek from subordinate leaders."

Figure 2-7[28]
NextGen Governance
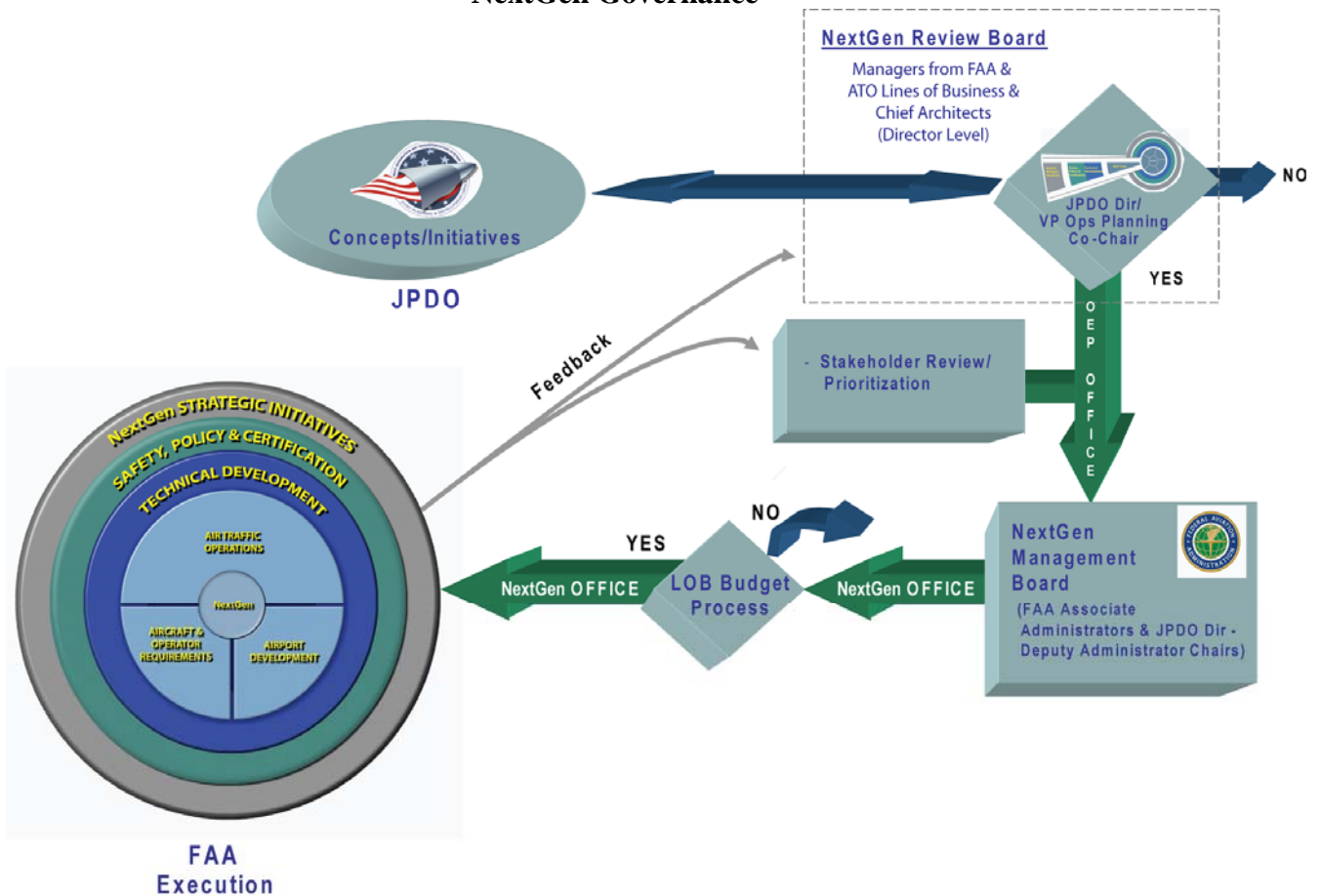
THE ATO LABOR-MANAGEMENT ENVIRONMENT

Added to the ATO's complex NextGen governance structure is the litigious labor-management environment in which the NextGen transition will occur. FAA has approximately 45,000 employees nationwide and internationally, and approximately 37,000 (80 percent) of those employees are represented by unions. Relations between FAA management and the unions have been strained for years. The largest FAA union, National Air Traffic Control Association (NATCA), was certified in 1987. It is one of the strongest and most influential labor unions in the federal sector and is an affiliate of the American Federation of Labor and Congress of Industrial Organizations (AFL-CIO). NATCA has over 20,000 members and represents not only controllers but other safety-related professionals, including engineers, traffic management coordinators and staff specialists.[29] When the National Academy began its study in 2007, the Assistant Administrator for Human Resources reported that there were over 380,000 active grievances filed by union members, most of whom are represented by NATCA. Between then and August 2008, the number has increased to over 400,000.

FAA's Personnel Reform legislation of 1996 permits the agency to bargain with unions over compensation under limited circumstances if the agency is making changes in the personnel system that was first put in place in 1996. FAA has liberally interpreted these provisions to allow the agency to bargain over wages with each of its unions on an ongoing basis. When FAA began bargaining with NATCA in 2005, neither side predicted that after nine months, including four weeks of mediation by the Federal Mediation and Conciliation Service, the negotiations would reach an impasse. The parties failed to reach agreement on several proposed articles affecting compensation and benefits, as well as work rules, for three NATCA bargaining units. The union rejected an agency proposal that preserved the current salaries and benefits for the existing workforce while still saving taxpayers nearly $1.9 billion over the next five years. FAA's assessment of the union's pay proposal was that, while achieving limited cost savings in the first few years, it would revert back to guaranteed increases and keep pay scales close to their current levels for all controllers, essentially deferring expenses, nullifying any initial savings and retaining an excessive pay structure for the long term.[30] When no agreement was reached, as required by law, FAA's Administrator submitted the agency's proposals, along with NATCA's proposals and objections, to Congress. When Congress failed to act after the 60-day review period provided under the law, FAA's proposal was implemented.

Within ATO, three unions represent most of the bargaining unit employees in the acquisition workforce covered by this study: American Federation of State County, and Municipal Employees (AFSCME), American Federation of Government Employees (AFGE), and the National Federation of Federal Employees (NFFE). They are located at either FAA Headquarters or at the William J. Hughes Technical Center. All three unions expressed a desire to have their employees participate in the focus groups, and all expressed an interest engaging on NextGen.

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[29] www.natca.org.

[30] http://www.faa.gov/news/press_releases/news_story.cfm?contentKey=4048.

FINDINGS

Accomplishing the transition to NextGen would be difficult for any organization, but ATO's challenges are even greater. Not only is the technical work complex, but the challenges created by the litigious labor-management environment, lack of clear accountability, and inherently complex governance structure in which this work must be performed threaten to derail this effort. In light of these findings, ATO will need to take a deliberate and comprehensive approach to identifying the workforce skills needed to accomplish this transition. The Panel's findings with respect to the environment in which the NextGen transition will occur are as follows:

1. The inherent complexity of the NextGen governance structure, especially the decision-making process, is a potential threat to success.

2. Clear, consistent leadership and clear lines of accountability are needed for a successful transition to NextGen.

3. There is no clear strategy for engaging labor unions on NextGen.

RECOMMENDATIONS

The Panel offers the following recommendations to mitigate the challenges in the FAA/ATO environment that threaten a successful transition to NextGen:

1. **The Panel recommends that FAA review the NextGen governance structure, especially the process used to make decisions affecting NextGen acquisitions.** While the Senior VP for NextGen and Operations Planning has overall responsibility for leading the transition to NextGen, the authority delegated to this position is weakened by a combination of boards and fragmented decision-making that may affect the timeliness and quality of key program decisions. For this governance structure to work effectively, the Panel further recommends that the FAA Deputy Administrator, as well as the ATO COO take personal responsibility for providing clear, consistent leadership for NextGen. They must demonstrate their commitment to the NextGen vision so that managers, employees and stakeholders understand that it is a priority.

2. **The Panel recommends that FAA and ATO develop and implement a strategy to engage labor unions on NextGen.** FAA's workforce is highly unionized, and ATO's ability to successfully transition to NextGen will require that the agency successfully engage the unions that represent its employees. To ensure NextGen success, FAA's leaders will need to find ways to break through the obstacles that have impeded successful relations with its unions and create a new set of guiding principles for managing these relationships.

CHAPTER 3
THE ATO WORKFORCE AND ITS CHALLENGES

ATO is the largest component of FAA. Its workforce of approximately 33,000 controllers, technicians, engineers and support personnel plan and conduct the activities that keep air traffic moving day in and day out. ATO groups its workforce into two major categories: operational and non-operational.

In order to understand the full scope of ATO's workforce challenges and the potential impact on the transition to NextGen, the National Academy study team gathered information on both the operational and the non-operational components of the workforce and the specific challenges of each. While the operational workforce is not the subject of this study, the Panel asserts that ATO cannot adequately plan for the transition to NextGen without also addressing its workforce challenges in the operational workforce—the end-users of NextGen technology.

THE OPERATIONAL WORKFORCE

ATO's operational workforce includes approximately 15,000 Air Traffic Control Specialists (2152 series) and approximately 6,000 Airway Transportation System Specialists (2101 series). (ATO does not employ a significant number of Aviation Safety Inspectors; these positions exist largely in Aviation Safety, a different component of FAA.) Air Traffic Controllers are responsible for keeping aircraft separated in the air and on the ground to prevent collisions, to organize and expedite the flow of traffic, and to provide information and other support for pilots. Airway Transportation System Specialists (technicians) install, test, troubleshoot, repair and certify radar, communications equipment, navigational aids, airport lighting, and backup power—everything that air traffic controllers and pilots use outside of the cockpit for safe flight.[31]

ATO's workforce planning efforts for the operational workforce are comprehensive and well documented in FAA's five-year Human Capital Plan (FY 2006 – 2010). Additionally, a 10-year staffing plan for Air Traffic Controllers was initially developed in 2004, and is refined each year. Yet, there are still concerns as to the adequacy of the FAA's planning to meet its needs in the controller and safety inspector workforces. DoT's IG recently noted [32] that FAA must continue to address attrition in these two critical workforces. Specifically, the IG expressed concern that FAA is still facing challenges in ensuring that it has the right number of fully certified controllers and inspectors at the right locations. The IG further noted that as a result of the high level of controller attrition, FAA is facing a fundamental transformation in the composition of its controller workforce. While the size of the controller workforce remained constant from April 2004 to September 2007, the overall percentage of controllers in training has increased by 53 percent, and FAA must hire and train 17,000 new controllers over the next decade to replace

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[31] ATO's FY2007 *Strategic Human Capital Planning Activities*, June 2007.
[32] U.S. Department of Transportation, FAA's Fiscal Year 2009 Budget Request: Key Issues Facing the Agency, Statement of the Honorable Calvin L. Scovell, III CC-2008-043. (Washington, D.C.: February 2008.

over 15,000 current controllers who are expected to retire or leave the agency. To further complicate this situation, new air traffic controllers are leaving at dramatically higher rates, raising concerns about FAA's ability to retain employees in this critical occupation and ultimately deal with a surge of retirements.

In June of this year, GAO reported to Congress that FAA projects 14 percent of new hires will leave this fiscal year. That rate is more than double the 6 percent who left in 2006 and well above the 9 percent who left last year, GAO said.[33] Over the next 10 years, FAA will be dealing with this massive hiring need at the same time it is engaged in transforming the National Airspace System. This will require FAA to train its current staff of controllers to use the new technologies at the same time it hires and trains new controllers to operate both the existing and the new technologies. Further, it points to the need for FAA to re-evaluate the kind of competencies needed by the operational workforce that will be the end-users of the NextGen technology and begin to re-shape the operational workforce concurrently with the non-operational workforce. FAA's Assistant Administrator for Human Resources identified several factors that seemed to mitigate the significance of attrition in controller positions. First, she explained that hiring has increased and some "over-hiring" is done; so some increase in attrition is not unexpected. Second, she reported that some attrition may simply be a result of large numbers of controllers reaching retirement eligibility. Finally, it was noted that there fewer controllers are needed in some geographic areas, which may account for some attrition. While these factors may help to explain the high attrition rates, they do not reduce the need for strong workforce planning.

The IG noted that FAA is also facing substantial challenges in safety oversight due to potential attrition in its inspector workforce. FAA has about 4,100 inspectors to oversee a dynamic and rapidly changing industry, which includes 118 commercial air carriers, almost 5,000 foreign and domestic repair stations, over 700,000 active pilots, and over 1,600 approved manufacturers.[34] Since over half of the inspector workforce will be eligible to retire in the next five years, FAA must ensure that its hiring efforts keep pace with retirements.

NextGen embraces both the operational and non-operational segments of the workforce, and past history shows that failure to consider the workforce (end-users of new technology) early in the planning process can have disastrous results. FAA and ATO need to begin now to address the impact NextGen will have on its operational workforce and how it will impact the competencies needed by this workforce segment. ATO asserts that its current practice of including end users in workgroups as Subject Matter Experts has allowed the agency to benefit from their expertise while reserving decision making to agency management and allowing the agency the flexibility it needs for implementation. However, it was not clear to the Panel that FAA and ATO are working together to conduct comprehensive workforce planning for both the operational and non-operational segments of the workforce. The Panel believes the time is ripe to start addressing the impact of NextGen systems and procedures on the competencies required by the end-users.

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[33] U.S. Government Accountability Office. *Federal Aviation Administration: Efforts to Hire, Staff, and Train Air Traffic Controllers Are Generally on Track but Challenges Remain.*GAO-09-908T. (Washington, D.C.: June 2008.)
[34] Scovell, February 2008.

THE NON-OPERATIONAL WORKFORCE

In general, the non-operational workforce includes all positions other than the controllers, technicians, and safety inspectors. Some occupations in the non-operational workforce, such as Engineers (800 series) and Information Technology disciplines (334, 391, 854, and 1550 series) have been addressed in FAA's five-year Human Capital Plan, but the remainder of the occupational series in this workforce are not identified as "mission-critical" and are therefore not specifically addressed. Consequently, the Panel is concerned that ATO is developing its own human capital plan, and it is not clear how it will be integrated with FAA's broader human capital planning efforts. FAA's Assistant Administrator for Human Resources explained that human capital planning is being cascaded down into the lines of business in an effort to encourage managers to become more involved. She further explained that her staff provides leadership and guidance for these efforts, and they review and evaluate the results. However, it is not clear how ATO's and FAA organizations are folded into the broader FAA planning efforts.

ATO will rely primarily on the acquisition segment of the non-operational workforce to perform the work necessary to design, develop, test, evaluate, integrate, and implement the numerous complex subsystems that comprise NextGen. ATO defines its acquisition workforce broadly in accordance with guidance issued by the Office of Management and Budget (OMB) Policy Letter 05-01, *Developing and Managing the Acquisition Workforce*.[35] OMB's guidance permits agencies to include a wide range of positions in the acquisition workforce, including: individuals who are substantially involved in defining, determining, and managing requirements; individuals involved in acquisition planning and strategy; individuals who participate in the process of establishing the business relationship to obtain needed goods and services (e.g., contracting process, those involved in the solicitation, evaluation and award of acquisitions); individuals who manage the process after business arrangements have been made to ensure that the government's needs are met (e.g., testing and evaluating, managing and monitoring the manufacturing and production activities, auditing, contract administration, performance management and evaluation, etc.), individuals who arrange disposal of any residual items after work is complete (e.g., property management/disposal); and individuals who support the business processes of these activities, including finance and other subject-matter experts.

Employees in ATO's acquisition workforce perform duties that span the entire NextGen developmental cycle, including research, development, investment analysis, contracting, and solution implementation. This workforce supports all aspects of aviation—from research to the development of new products for aviation safety inspectors, air traffic controllers and other users of the National Airspace System. FAA/ATO executes its acquisition management functions through the lifecycle management process, which is organized into a series of phases and decision points. Figure 3-1 below is a representation of the FAA acquisition lifecycle.[36] The circular representation conveys the principle of seamless management and continuous improvement in service delivery over time.

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[35] April 15, 2005.

[36] *FAA Acquisition Management Policy*, revised 10/2007, http://fasssteditappp.faa.gov/ams/do_action.

Figure 3-1
FAA Acquisition Lifecycle Management Process
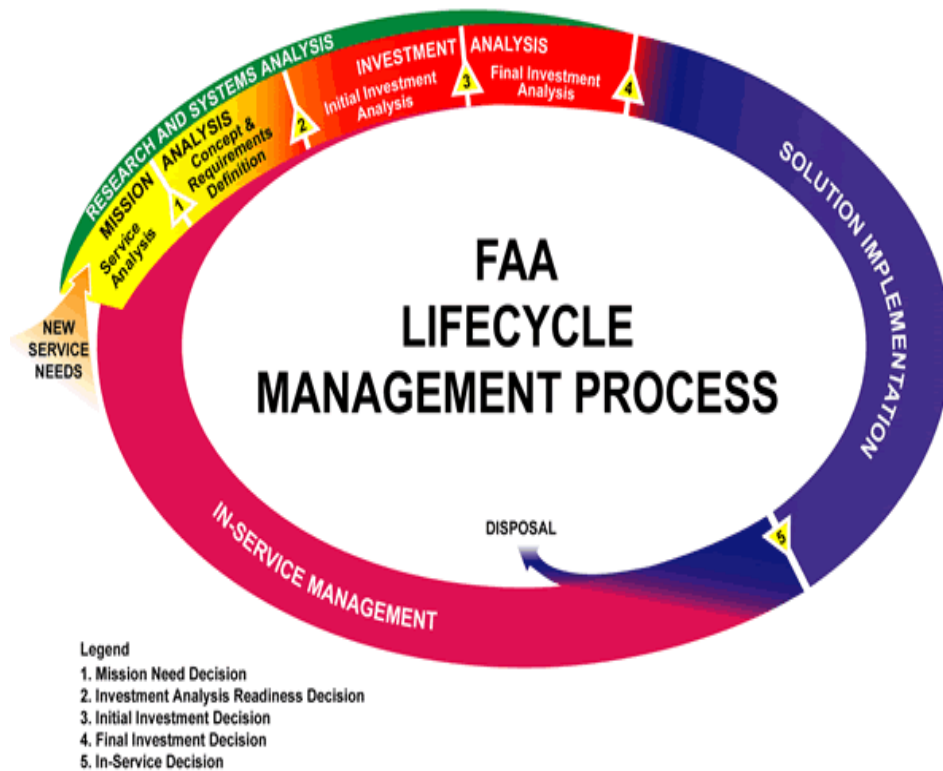
ATO has grouped the acquisition employees who perform work throughout the phases of the lifecycle into five major occupational families:

- Program/Project Management
- Systems Engineering
- Research
- Business/Financial Management
- Contracting

Program/Project Management: This family includes employees who have primary responsibility for managing FAA/ATO's capital investment projects. The work involves establishing, tracking, managing and reporting all facets of capital investment programs and projects including budget, technical requirements, personnel and customer needs. This occupational family supports all phases of the acquisition lifecycle: research and systems analysis, investment analysis, solution implementation, and in-service management. It includes employees who have primary responsibility for managing a major project, a program, or a series of programs (portfolio managers). Typical job series in this family include the program management series (340), the various engineering series (800s), the aviation technical systems specialist series (2186), and the computer specialist series (334).

Systems Engineers:[37]   This occupational family includes Systems Engineers, Chief Systems Engineers, Chief Enterprise Architects, Configuration Managers and Test and Evaluation Engineers. Systems engineering serves two purposes in FAA acquisitions. The first is to ensure acquisitions are conducted from initial requirements to deployment and lifecycle support in a consistent, repeatable, disciplined manner, and that the best engineering business practices are used in acquiring FAA systems which comprise the systems engineering process. The second purpose for systems engineers is to ensure that these acquisitions form an integrated whole. While benefits, cost, policy, and politics will ultimately determine what will be acquired, it is done in a context of integration across the National Airspace System.

In the FAA, human factors engineering is a specialty within the systems engineering family. Human factors engineering is an integral part of systems engineering and assures that human-in-the-loop system performance objectives are met. The application of human factors engineering during all phases of the acquisition lifecycle addresses the role of the human component in system design.

ATO's systems engineers typically occupy the 800 engineering series, and the 180 series for human factors engineers.

Contracting: Employees in this family may be Contracting Officers/Specialists, Contracting Officer's Technical Representatives, Technical Onsite Representatives, or Quality Assurance Officers. Contracting work includes all processes and procedures involved in establishing and tracking contractual relationships. This includes assessing requirements and designing the acquisition strategy; developing an acquisition plan; assisting in the development of statements of work, overall contract terms and conditions, and the generation of cost estimates; making contractor responsibility determinations and determining contractor compliance; negotiating cost or price terms and conditions and requirements; monitoring contractor performance; and assessing work and making payments.

Thus, this occupational group includes employees who are primarily responsible for managing contracts from a strictly procurement perspective as well as an overall acquisition or technical perspective. Responsibilities include representing FAA when dealing with the commitment of resources and financial obligations for the agency, and ensuring government business rules and regulations and statutory requirements are followed.

Most members of the contracting staff are concentrated in the 1102 series with Quality Assurance Specialists in the 1910 series. Contracting Officer's Technical Representatives and Technical Onsite Representatives occupy a wide variety of job series and are therefore difficult to identify as a group.

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[37] **Systems engineering** is an interdisciplinary field of engineering that focuses on how complex engineering projects should be designed and managed. Systems engineers focus on defining customer needs and required functionality early in the development cycle, documenting requirements, then proceeding with design synthesis and system validation while considering the complete problem, the system lifecycle.

Business/Financial Management: Employees in this key occupational family are Business/Financial Analysts and Cost Estimators. They develop, coordinate, and integrate performance-based budgets; develop metrics; manage, track, and report financial transactions; develop cost projections; develop recommendations to mitigate financial risks; and provide financial analysis including analysis of return on investments. Business/financial managers are primarily in the 300 and 500 series.

Research: There are three key roles within the Research occupational family: Research Scientists, Chief Scientists, and Operations Research Analysts. Employees in the Research family are primarily responsible for conducting analyses and studies leading to the development of new technology and for assessing the operational impacts of systems and/or components, including safety and human factors research. Researchers in ATO primarily occupy positions in the 1300 sciences series or the 1500 group and are located at the Technical Center and Headquarters.

Within these five occupational families, the most frequently occurring position titles are: Electronics Engineer, General Engineer, Management and Program Analyst, Computer Specialist, Computer Scientist, Contract Specialist, Operations Research Analyst, and Air Traffic Control Specialist (functioning as subject-matter experts).

Identifying the Acquisition Workforce

Beginning in Phase I and throughout the course of the study, the study team requested data to quantify the full scope of employees who comprise ATO's acquisition workforce. Records were provided for 1,700 positions, but other ATO data sources alluded to the existence of 2,700 positions.   The study team's efforts to determine the basis for the conflicting data were unsuccessful, and ATO's inability to resolve this matter diminished the rigor of the analytical process.

While the five occupational families described above provide a good framework for identifying competencies, clear quantitative data would have enhanced the quality of the analytical process in two ways. First, it would have confirmed that the five occupational families fully account for the entire scope of positions and occupations in the acquisition workforce, thereby assuring a comprehensive set of competencies. Second, it would have provided the basis for a workforce analysis that could be used to inform the Panel's recommendations on strategies ATO can use to acquire the competencies needed for the NextGen transition. Neither of these objectives could be fully met because ATO was unable to clearly and definitively quantify this workforce. The reasons for this situation were never clearly established.

While unavailability of specific data prevented the study team from conducting a rigorous quantitative analysis of the acquisition workforce, some data was provided permitting a limited analysis of ATO's major challenges around attrition and retirement eligibility and trends.

Attrition

To gauge attrition in the acquisition workforce, the study team reviewed data specific for ATO Headquarters and the Technical Center, where most of the acquisition workforce is located. Table 3-1 shows the types and levels of attrition for ATO Headquarters, the Technical Center, and in the field.

Table 3-1
ATO Workforce Attrition in 2007

	ATO Overall		HQ		Technical Center		Field	
Death	42	0.13%	3	0.09%	1	0.10%	37	0.13%
Removal	79	0.24%	4	0.13%	0	0.00%	75	0.26%
Resignation	280	0.85%	10	0.31%	5	0.49%	265	0.92%
Separation	3	0.01%	0	0.00%	0	0.00%	3	0.01%
Termination	85	0.26%	18	0.56%	4	0.39%	63	0.22%
Retirement	1,765	5.33%	151	4.73%	30	2.95%	1582	5.48%
Overall	2,254	6.81%	186	5.83%	40	3.93%	2025	7.01%
2007 Total Employees	33,091		3,190		1,018		28,883	

The data show that ATO's overall attrition rate of 6.81 percent does not differ much from the Government-wide average of approximately 7 percent, with Headquarters and Technical Center attrition being even lower.

Retirement Trends

Retirements have accounted for almost 80 percent of ATO's attrition over the past five years, and the Panel believes that the growing rate of retirement eligibility among the acquisition workforce employees should be a cause for concern as the NextGen transition unfolds. ATO estimates that by the end of 2012, over 36 percent of the overall workforce will be eligible to retire, and based on past retirement trends, 32 percent of the current workforce is likely to retire by 2012.[38] Although the number of actual retirements is projected to be slightly lower than the number of eligible retirees, it still represents almost one third of the workforce. In light of the fact that the mid-term transition to NextGen will occur between Fiscal Year 2012 and 2018, ATO's retirement projections present a major workforce planning challenge. The data demonstrate a compelling need for a workforce strategy that focuses on immediate replacement of skilled employees, in addition to building a pipeline of future talent. The data also highlight the need for a formal knowledge management system that will enable the agency to capture and institutionalize the valuable knowledge of senior employees who are likely to leave the agency.

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[38] *ATO FY 2007 Human Capital Planning Activities*, June 2007.

ATO'S LEADERS

ATO reported that supervisors and managers account for approximately 10 percent of its workforce. At ATO Headquarters and the Technical Center, the largest percentage of supervisors appear to be in the following Service Units:

Headquarters

- Acquisition and Business Service (85)
- NextGen and Operations Planning (52)
- Systems Operations (261)
- Terminal Services (59)
- Technical Operations (69)

W. J. Hughes Technical Center

- NextGen and Operations Planning (57)
- En Route and Oceanic Services (20)

Figures 3-2, 3-3, and 3-4 show the distribution of leaders in all of the ATO service units at ATO Headquarters, at the Technical Center, and in the field.

Figure 3-2
Leadership Ratios in ATO Headquarters Service Units
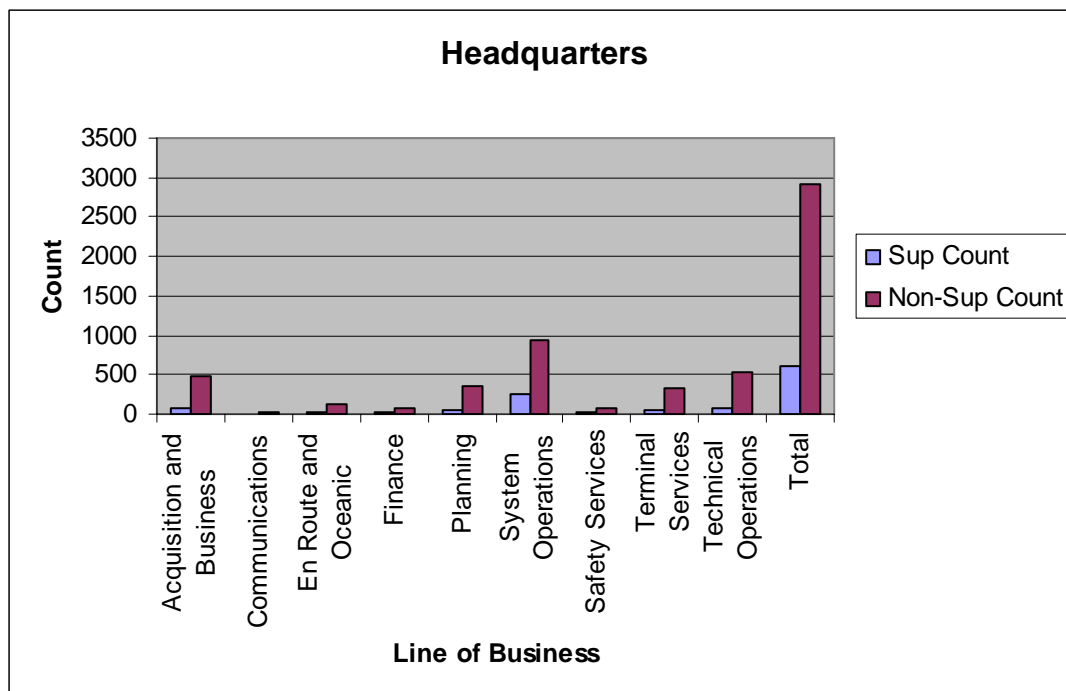
Figure 3-3
Leadership Ratios in W. J. Hughes Technical Center

Technical Center

Bar chart showing Count (y-axis, 0 to 1000) by Line of Business (x-axis): Acquisition and Business, Communications, En Route and Oceanic, Finance, Planning, System Operations, Safety Services, Terminal Services, Technical Operations, Total. Legend: Sup Count, Non-Sup Count.
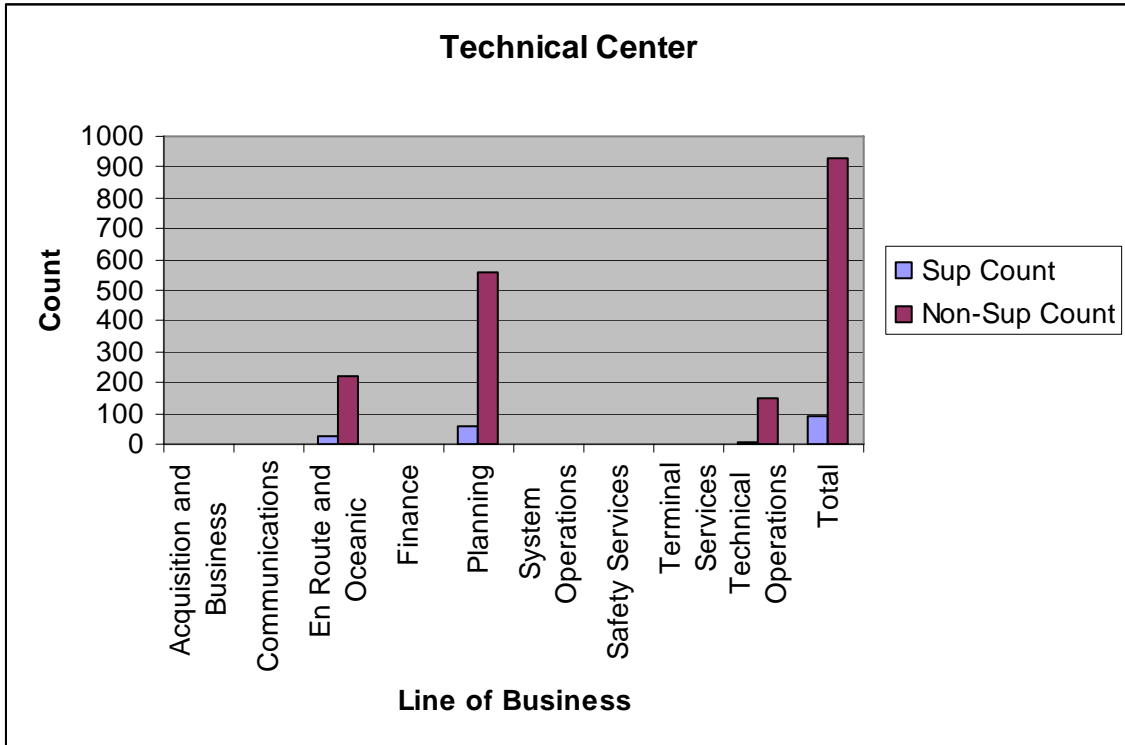
Figure 3-4
ATO Leadership Ratios in the Field

Field

Bar chart showing Count (y-axis, 0 to 25000) by Line of Business (x-axis): Acquisition and Business, Communications, En Route and Oceanic, Finance, Planning, System Operations, Safety Services, Terminal Services, Technical Operations, Total. Legend: Sup Count, Non-Sup Count.
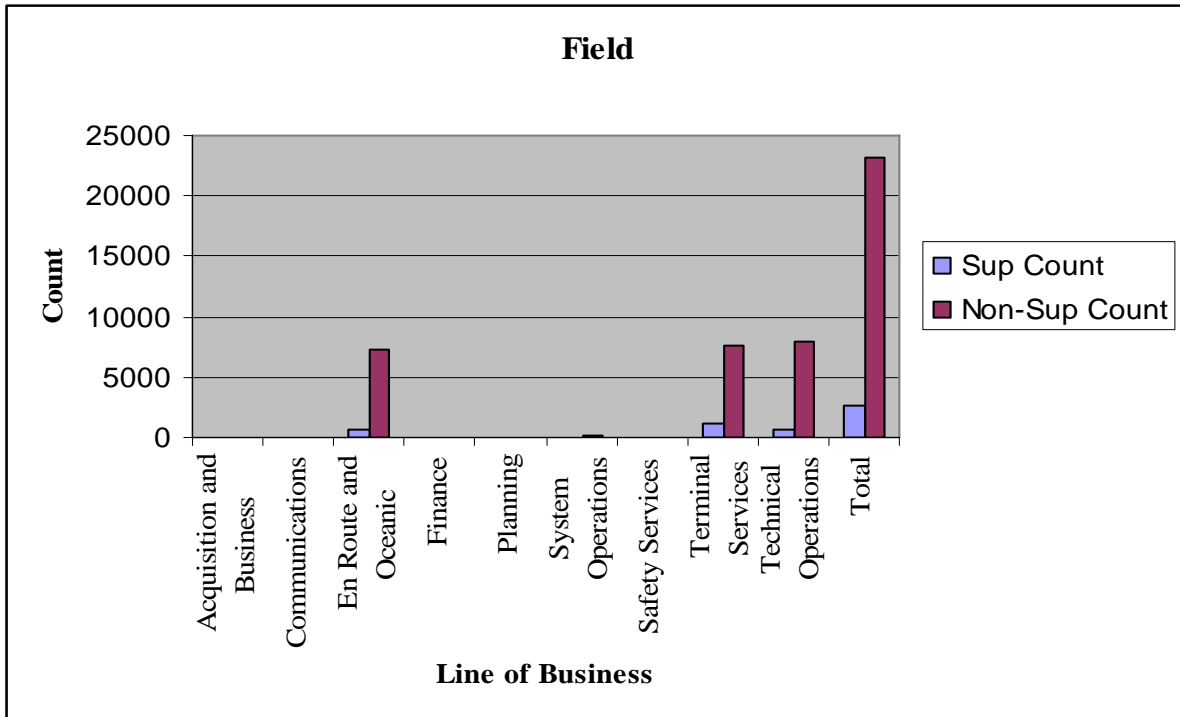
An analysis of the retirement eligibility among acquisition supervisors and managers revealed that 72 percent will be eligible to retire between 2008 and 2025. Thus, in addition to acquiring the skill sets needed by its nonsupervisory acquisition workforce, ATO must also focus on developing the next generation of leaders with the skills needed to lead the agency into the future, while also maintaining a focus on its operational mission. The Panel's Phase I findings concluded that leadership was the single most important element of success for any large-scale change effort. In light of this finding, the Panel believes that ATO's first priority should be developing a strong cadre of leaders with the necessary competencies to lead the NextGen transformation.

ATO'S CONTRACTOR WORKFORCE

As in the case of the acquisition workforce, the study team was unable to determine with any clarity the extent of ATO's contractor workforce. However, from discussions with senior officials, the team learned that ATO augments its permanent workforce with large numbers of contractors on a continuing basis. These contractors perform a wide variety of functions that support the acquisition lifecycle, including research and development, software engineering, and other key functions. One senior official estimated that ATO spends upwards of $1 billion annually on contractor support to buy technical skills that are not available within the ATO federal workforce. However, no data were provided to clearly quantify the full scope of the contractor workforce.

The Panel believes that ATO's inability to accurately quantify its contractor workforce will compromise its workforce planning for NextGen. Without a clear understanding of the full scope of the contractor workforce and the skills provided by that workforce segment, it will be difficult to determine which skills ATO needs to build within its federal workforce.

FINDINGS

ATO is facing challenges in both its operational and non-operational workforces. These challenges may not be insurmountable, but the Panel believes they require a renewed focus on comprehensive workforce planning to address the following findings:

1. It is not clear to the Panel that FAA and ATO are working collaboratively to conduct workforce planning for both the operational and non-operational workforces.

2. The extent to which ATO's human capital plan will be integrated with the broader FAA workforce planning efforts is unclear.

3. Attrition and growing retirement eligibility rate should be of concern as NextGen unfolds and creates an opportunity for ATO to begin reshaping the workforce with employees who bring the requisite competencies to support the NextGen transition.

4. ATO will face a high level of attrition in its leadership ranks and needs to focus on developing a new generation of leaders.

5. ATO's inability to quantify its contractor workforce will compromise workforce planning for NextGen.

RECOMMENDATIONS

The Panel recognizes that FAA and ATO are taking steps to ensure that ATO has the workforce it needs—now and in the future—to effectively transition to NextGen. To strengthen ATO's workforce planning efforts, the Panel provides the following recommendations:

1. **The Panel recommends that ATO work collaboratively with FAA to develop a more integrated approach to its NextGen workforce planning that takes into account all components of the multisector workforce—operational, non-operational, and contractor**. Currently, neither FAA nor ATO appears to be conducting workforce planning in a way that considers the entire scope of the workforce. The acquisition workforce that is the subject of this study comprises approximately 5 percent of the ATO workforce. While this workforce segment is critical in planning the NextGen transition, ATO needs to embrace the concept of multisector workforce planning to include all components of its workforce, and its planning should be integrated with FAA's broader human capital planning efforts. To support a more comprehensive and collaborative approach to workforce planning, the Panel recommends the following additional steps:

   a. Develop a methodology to identify and track the acquisition workforce throughout the employment lifecycle**.** This will help to ensure that ATO's workforce planning encompasses the full scope of positions and occupations in this critical workforce segment.

   b. Conduct a comprehensive assessment of its contractor workforce, document key contractor skills, and determine which skills need to be developed internally.

   c. Assess the impact of NextGen technologies on the competencies needed by the operational workforce, especially controllers. As end-users of NextGen technology, ATO needs to begin now to identify the impact of NextGen on this critical workforce. ATO should also work with FAA to address the attrition, hiring, and training challenges in this workforce and their impact on the transition to NextGen.

   d. Work with FAA to identify and invest in a workforce planning tool that can be used to determine specific staffing levels in critical occupations supporting NextGen. This study did not have as one of its tasks the identification of staffing levels to support NextGen; however, once competencies have been identified and accepted, the Panel recommends that ATO take the next step of identifying appropriate staffing levels. Without this critical information, ATO planning for the NextGen transition will be incomplete.

2. **To address the expected attrition in its leadership ranks, the Panel recommends that FAA and ATO focus on developing the next generation of leaders**. ATO should focus on developing leaders with the specific competencies needed to lead the transition to NextGen. (See Chapter 6.)

3. **The Panel recommends that ATO create a knowledge management/transfer program to ensure that the institutional knowledge of retiring employees in critical occupations is captured and available to support the NextGen transition**. ATO's retirement trends indicate that the organization could lose as much as a third of its workforce over the next few years. Management should begin now to identify and institutionalize the critical knowledge that may be lost with the departure of these employees.

CHAPTER 4
NEXTGEN OCCUPATIONAL FAMILY COMPETENCIES

 The chapter responds the first of the Academy's two tasks: Identify the skill sets needed by the non-operational (acquisition) workforce to design, develop, test/evaluate, integrate and implement NextGen systems and procedures.   The five occupational families of the non-operational/acquisition workforce described in Chapter 3 provide a framework for identifying critical technical competencies needed by the acquisition workforce; however, the Panel believes that they may not be adequate for identifying the full scope of competencies needed to achieve the NextGen vision. In the Panel's view, equally important to NextGen's success is the set of skills needed to work across organizational lines to integrate the "solution sets"[39] creating the continuous operational improvements that NextGen is expected to provide.   With this insight, the Academy staff sought to ensure that its research was comprehensive in its coverage and not limited to the specific technical skills associated with the occupational families, but included additional skills that will be necessary for the successful integration of NextGen programs and technologies.

The Academy staff followed three steps to develop draft competency models for the five occupational families: (1) identify data sources, (2) analyze the data, and (3) construct the models. Figure 4-1 depicts the analytical process used to develop and validate the competency models.

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[39] Solution sets are the activities and capabilities that must be implemented and integrated   to achieve specific NextGen operational improvements.

Figure 4-1
Analytical Approach for Developing Models
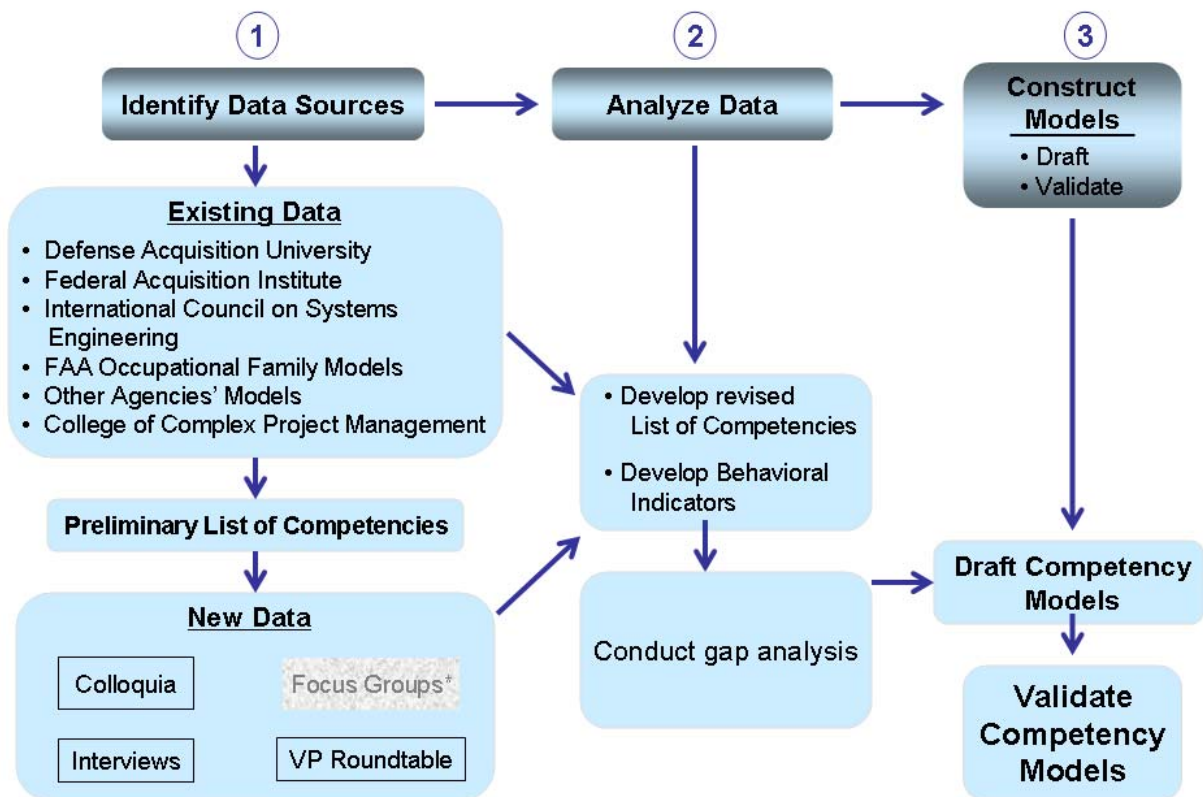
DATA SOURCES

The study team consulted several existing data sources to develop draft competency models for the ATO acquisition workforce:

- *Defense Acquisition University (DAU)*: DAU is a military training establishment that trains military and civilian DoD personnel in Acquisition, Technology and Logistics, including Leadership and Program Management. DAU is in the process of developing a DoD-wide competency management process. The process includes defining competencies for the primary workforce-related applications: program management; contracting; systems planning, research, development and engineering; acquisition logistics; business, cost estimating and financial management; and other functional areas of focus. The Academy team examined DAU's Career Field Certification and Core Plus Development Guides to identify the competencies needed by employees in the various occupations and positions that make up the acquisition workforce. Core Plus represents an enhanced career field certification and development framework designed to guide acquisition professionals to competency development beyond the minimum standards

required for certification, based on specific types of assignments within an acquisition function or career field.

- *Federal Acquisition Institute (FAI):* FAI fosters and promotes the development of a professional acquisition workforce across the federal government. In collaboration with federal agency acquisition subject matter experts, FAI defined the acquisition workforce in terms of roles and responsibilities and defined and validated the appropriate competencies for each. FAI has outlined competencies for the acquisition workforce, to include the following roles: Contracting, Competitive Sourcing, Program and Project Management, Contracting Officer Technical Representative, and Architecture and Engineering. The competencies were developed to provide a framework for agencies to focus on training, development, and career management for the acquisitions workforce. The study team examined the general business competencies and the technical competencies for each acquisition role when developing its preliminary set of competencies in Phase I.

- *The International Council on Systems Engineering (INCOSE*): Founded in 1990, INCOSE is a not-for-profit membership organization. Its mission is to advance the state of the art and practice of systems engineering in industry, academia, and government. Members work together to advance their technical knowledge, exchange ideas with colleagues, and collaborate to advance systems engineering. There are 39 working groups operating under seven technical committees focused on Education and Research, Modeling and Tools, Process and Improvement, Systems Engineering Management, Systems Engineering Initiatives, Standards, and Systems Engineering Applications. The Academy team referred to INCOSE's Guide to Systems Engineering Body of Knowledge with embedded competencies to identify competencies for the Systems Engineering occupational family.

- *FAA/ATO Occupational Family Competencies*: In addition to reviewing the above sources, the Academy staff examined the work already done by ATO to identify competencies for the five occupational families. The Academy staff learned that acquisition workforce competencies were identified, validated, and assessed for the predecessor organization to ATO, the Office of the Associate Administrator for Research and Acquisitions (ARA). In addition, the Office of Leadership and Professional Development in the ATO Acquisition and Business Services unit identified the acquisition workforce in accordance with OMB Policy Letter 05-01 and aligned the competencies identified by the ARA with this guidance. In January 2008, FAA issued a new policy for development and certification of acquisition program and project managers. In that policy, FAA defined a set of core competencies that are considered essential for successful program and project management, as well as experience, training, and certification requirements that support the development of core competencies. The Academy study team examined these core competencies and associated developmental requirements and considered them in drafting its competency models for the Program/Project Management occupational family.

- *Other Agencies' Models*:   The study team benchmarked against competency models developed by other agencies, including NASA and the National Institutes of Health.

- *College of Complex Project Management*: Additional research in Phase II led the study team to the Competency Standard for Complex Project Management developed by the College of Complex Project Management and released by Australia's Department of Defence in 2006.[40]   The goal of this document was to expand on traditional project management competencies by identifying nine new competencies required for managing complex projects, along with the underpinning knowledge and special attributes that distinguish complex project managers from traditional project managers. The standard describes complex projects as characterized by uncertainty and non-linearity; they are best viewed as dynamic and evolving systems. The new competency standard also establishes a benchmark against which future complex project managers can be identified and developed by providing greater depth in the definition of behaviors in the workplace. The study team consulted the Competency Standard for Complex Project Management in refining its competency model for the Program/Project Management occupational family.

PLAN FOR DEVELOPING MODELS

The study team augmented information obtained from existing data sources with "new" data gathered from the colloquia, additional interviews, focus groups, and the VP Roundtable to complete its qualitative data.   The data were then used to refine the list of preliminary competencies, develop a revised set of competencies, and identify behavioral indicators that describe how successful performers demonstrate the competencies.

The plan for developing draft models was predicated upon gathering sufficient quantitative employee input from the focus groups to refine the preliminary list of competencies. However, participation in the focus groups was much lower than expected. The Academy planned a total of 16 focus group sessions—eight at ATO headquarters in Washington, D.C., and eight at the Technical Center in Atlantic City. To gather comprehensive input from these sessions, the Academy study team requested the participation of 10 percent of the acquisition workforce (approximately 170 of the 1700 employees for which records were provided). However, ATO identified a total of only 32 employees (1.8 percent participation) in both locations to participate in the focus groups--barely enough to fill two sessions in each location—one with supervisors and one with non-supervisory staff.

ATO management did not provide a specific explanation for the low level of employee participation in the focus groups. Prior to conducting the sessions, the Academy Panel engaged national representatives of the three unions representing the acquisition workforce, and they all expressed a desire to have their employees participate in the focus groups. A member of the Academy Panel met with FAA's Labor Relations staff and developed an approach for engaging management and the unions to identify participants for the focus groups. Memoranda, signed by

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[40] The Competency Standard for Complex Project Management was authored by Dr. David H. Dombkins, Deputy Chair of the College of Complex Project Managers.

the VP for Operations Planning (now Senior VP for NextGen and Operations Planning) detailing the study objectives and focus group methodology were sent to each ATO VP requesting their support; however, ATO management failed to populate the focus groups as planned to elicit input from ATO managers and employees. While there may be other explanations for the low participation in the focus groups, the Panel perceives that it is a manifestation of FAA management's inability to actively engage the labor unions in NextGen workforce planning.

As a result of the extremely limited input from ATO employees, the Panel has relied on data largely obtained from external sources—including other validated models--to construct and validate the competency models. While the Panel believes that the models could have been improved with more feedback from current employees, the Panel is confident that the extensive information obtained from external sources establishes their validity.

Research literature on large-scale change efforts like NextGen clearly indicates that employee involvement is critical to success. Without employee participation, as NextGen moves forward, the Panel believes that ATO may seriously compromise its ability to address its workforce planning needs and, ultimately its ability to effectively transition to NextGen.

HOW THE DRAFT MODELS WERE DEVELOPED

In Phase I, the Academy study team reviewed its primary data sources and conducted a series of interviews to gather information on the competencies needed by the acquisition workforce to support the transition to NextGen. An analysis of Phase I data indicated that the workforce required to design, develop, test/evaluate, integrate and implement NextGen systems and procedures will be comprised primarily of: highly skilled scientists, researchers, engineers, program managers, contract and procurement specialists, and business/financial specialists. Systems engineering, particularly with an understanding of the human factors discipline, emerged as the most critical occupation.

From its Phase I research, the Academy study team and Panel developed a preliminary set of competency tables for each of the five occupational families, mapped to the appropriate acquisition lifecycle and NextGen phase. This approach enabled the Academy to determine which occupations and competencies are most critical at each stage of the acquisition lifecycle.

The most critical competency areas needed for the five occupational families were identified as:

- Systems integration
- Large-scale, complex program management
- Project management
- Communication
- Systems thinking

In addition to identifying technical competencies required for each of the five occupational families, the Panel identified the most critical General competencies needed to ensure successful

integration of NextGen systems and procedures. These included: Communication, Customer Service, Flexibility, Integrated Thinking, and Integrity/Honesty.

In Phase II, the study team developed a plan to test and refine the preliminary competencies identified in Phase I. Using "new" data gathered from the colloquia, the VP Roundtable, additional interviews, and focus groups with employees, the study team confirmed that all of the competencies identified in Phase I are still applicable. Then, the team conducted a "gap analysis" to identify the gaps between competencies identified in Phase I and the competencies identified from the new data sources. The gap analysis showed that the Panel's observations about the critical competencies were supported by the new data. From this analysis, the Academy staff identified several new competencies (not previously identified by ATO) needed to support the transition to NextGen and determined that some competencies already identified will require greater emphasis. Additionally, data gathered from the colloquia, Phase II interviews, and other data sources contributed to the identification of the underlying knowledge and skills required for each competency as well as the behavioral indicators that describe how successful performers demonstrate possession of the competencies. These additional data were used to construct draft competency models for the five occupational families.

The draft competency models confirmed that the preliminary competencies identified in Phase I are still valid, and that there continues to be overlap in the competencies required in the five occupational families. The final models reflect some new occupational family competencies, as well as those that are more critical than others for the NextGen transition. Additional competencies needed to ensure successful integration of NextGen systems are grouped under General competencies; these include Integrated Thinking, Teamwork, Collaboration, Oral Communication, and Written Communication, which were determined to be most important.

Table 4-1 summarizes the key findings incorporated into the draft Occupational Family Competency Models. Existing competency documents (FAA's policy on career development and certification for program/project managers issued in January 2008 and ATO's FY 2007 ATO Strategic Human Capital Planning Activities) were used as the baseline for identifying the competencies below. "New" competencies are competencies not previously documented by ATO. While some of the competencies may exist in FAA's Employee Leadership Competency Model, the data below are specific to the acquisition workforce competencies. Volume 2 of this report provides the complete competency models and the supporting data used to construct the models.

Table 4-1
Summary of Findings for Draft Occupational Family Competencies

Occupational Family	New Competencies	Competencies Requiring More Emphasis
Program/Project Management	• Strategic Alignment • Organizational Awareness • Stakeholder Management • Portfolio Management • Systems Thinking and	• Program Project Planning Processes • Program/Project Management Processes • Capital Planning and

Occupational Family	New Competencies	Competencies Requiring More Emphasis
	Integration • System Safety • Acquisition Planning • Benefit-Cost Analysis • Information Technology Architecture • Configuration Management • Information Security/Network Security • Information Technology Performance Assessment • Infrastructure Design • Systems Lifecycle • Data Management	Investment Assessment • Risk Management • Business Case Development • Earned Value Management • Requirements Analysis • IT Systems/Network Security • Contractor Performance Management
Systems Engineering	• Systems Concepts • System Design: Concept Generation • System Design: Design for… • System Design: Functional Analysis • System Design: Interface Management • System Design: Interface Management • System Design: Maintaining Design • System Design: Modeling and Simulation • System Design: Solution Selection • System Design: System Robustness • "System of Systems "Capability Issues • Enterprise and Technology Environment • Stakeholder Management • System Safety	• Enterprise Integration • System Design: Human Factors Engineering • Integration and Verification • Technical Engineering Expertise

Occupational Family	New Competencies	Competencies Requiring More Emphasis
Research	• Software Development • Systems Security • Human Factors Engineering • Human Factors Physical and Psychological Process • Hardware and Software Human Interface Design • Multidisciplinary Analysis	• Statistical Analysis • Risk Management
Business/Financial Management	• Project Management • Strategic Planning • Organizational Forecasting • Performance Management • Financial Systems Functionality • Software Capability • Management Processes • Grants Management • Software Capability • Risk Analysis and Internal Controls • Security Controls • Auditing • Management Control Concepts and Principles	• Financial Management • Risk Analysis and Internal Controls • Federal Budgeting • Agency Budgeting
Contracting	• Performance Management • Defining Government Requirements in Commercial/Non-Commercial Terms • Defining Contractual/Business Relationships • Proposal Analysis and Evaluation	• Acquisition Strategy Development • Requirements/Contract Management

The critical General competencies needed to successfully integrate NextGen programs, systems, and procedures are summarized in Table 4-2 below.

Table 4-2
Summary of Findings for General Competencies

New Competencies	Competencies Requiring More Emphasis
	- Written Communication - Teamwork - Collaboration - Strategic Planning - Customer Service - Interpersonal Skills - Integrated Thinking - Accountability - Creativity and Innovation

HOW THE MODELS WERE VALIDATED

As in the case of constructing the models, the Academy staff revised its approach due to the limited input from employees. However, the Panel notes that a large majority of the competencies identified in the draft models were obtained from existing validated sources; therefore the absence of a rigorous validation process does not weaken the final models. The revised validation approach involved gathering input on the draft models from the 18 external subject matter experts who participated in the colloquia and the ATO VPs. Respondents were asked to rate the Occupational Family and General competencies. They were instructed to rate only those occupational families in which they have experience or subject-matter expertise. A total of 10 responses were received.

The revised validation approach is described in Table 4-3 below.

Table 4-3
Competency Model Validation Process

	Validation Process
Who:	➢ ATO senior managers (VPs) who participated in the VP Roundtable ➢ Non-FAA subject matter experts (SMEs) who participated in the colloquia
Content Focus:	➢ Rate the: o importance of each draft competency o frequency, or how often each competency is required o difficulty to learn/develop the competency ➢ Consider occupational, general and leadership competencies

	Validation Process
	➢ Comment on the behavioral indicators for each competency
How: Gather Data	➢ Competency ratings obtained from both ATO VPs and the external SMEs
How: Approach and Timing	➢ Validation activities conducted *concurrently* with ATO VPs and external colloquia SMEs ➢ The data collection period: six working days
How: Technical	➢ Data gathered in a web-based environment, which supports the ability to collect quantitative ratings and enhance statistical analysis capabilities
Output	➢ Quantitative ratings of: importance, difficulty to learn/develop, and frequency for each competency within each job family ➢ Summary analysis of ratings

ANALYSIS OF THE VALIDATION RESULTS

The validation process confirmed that all competencies documented in the draft competency models are needed. It also identified the competencies considered most important, those most frequently used, and those most difficult to learn or develop. Below is a summary analysis of the validation results for the Occupational Family and General competencies. No ratings were received for the Contracting competencies, and no data were received on the behavioral indicators. Appendix D provides the results of the validation process, and Apperndix E is a summary analysis of the results for the five occupational families.

Program/Project Management

A total of five respondents rated the Program/Project Management competencies. For the rated competencies, there was a strong correlation between importance and frequency of use. All of the competencies rated Extremely Important or Important were also rated Frequently or Very Frequently Used. Additionally, about a third of these were also rated as Difficult or Very Difficult to Learn. For example, "Risk Management" was rated as Extremely Important and Very Frequently Used by 100 percent of respondents, and 60 percent rated it either Difficult or Very Difficult to Learn.

The Panel's analysis of the validation responses shows that ATO's primary focus should be on the following 21 technical Program/Project Management competencies:

- Risk Management
- Strategic Alignment
- Organizational Awareness
- Program/Project Planning Processes
- Program/Project Management Processes
- Stakeholder Management
- Requirements Analysis

- Technical Expertise
- Systems Thinking and Integration
- Systems Engineering Management
- Test and Evaluation Management
- Acquisition Planning
- Contract Administration
- Contractor Performance Management
- Cost Estimating
- Financial Planning
- Budget Execution
- Systems Integration
- System Safety
- Benefit-Cost Analysis
- Capital Planning and Investment Assessment

Systems Engineering

Only two respondents rated the Systems Engineering competencies. Again, there was a high level of correlation among the competencies rated as Extremely Important or Important and those rated Very Frequently or Frequently used. For example, the competency "System of Systems Capability Issues" was rated Extremely Important and Very Frequently Used. It was also rated Very Difficult to Learn by both respondents. Additionally, of the 15 competencies rated Extremely Important or Important, over a third were also rated Very Difficult or Difficult to Learn. The respondents did not agree on the importance or the frequency of use of the technical engineering disciplines, but they did agree that "Integration of Fields of Specialization" is Extremely Important and will be Very Frequently Used.

The Panel's analysis of the ratings shows that ATO should focus primarily on the following 17 Systems Engineering competencies that have not been documented by ATO:

- Systems Concepts
- System of Systems Capability Issues
- Managing Stakeholder Requirements
- System Design: Concept Generation
- System Design: Functional Analysis
- System Design: Human Factors Engineering
- System Design: System Robustness
- System Design: Modeling and Simulation
- Enterprise and Technology Environment
- Integration and Verification
- Validation
- Transition to Operation
- Integration of Fields of Specialization
- Lifecycle Process Definition
- Planning, Monitoring, and Controlling

- System Safety
- Trend Analysis

Business/Financial Management

Two respondents rated the Business/Financial Management competencies. Of the 19 competencies rated, 13 were rated either Extremely Important or Important by both respondents, and three of these same competencies were rated Frequently or Very Frequently Used. None of the competencies was rated Very Difficult to Learn, but one respondent rated nine competencies Difficult to Learn. The other competencies were rated Somewhat Difficult or Easy to Learn. Several of the Extremely Important/Important competencies, while not used very frequently, were rated Difficult to Learn.

The Panel believes that the results show that ATO should focus on hiring and/or developing Business/Financial Management employees with the following 17 critical competencies:

- Financial Budget and Data Analysis
- Financial Management
- Federal Budgeting
- Agency Budgeting
- Financial Systems Functionality
- Software Capability
- Strategic Planning
- Organizational Forecasting
- Risk Analysis and Internal Controls
- Management Control Concepts and Principles
- Auditing
- Reconciliation and Financial Reporting
- Productivity Improvement Systems and Business Reengineering Processes
- Project Management
- Organizational Forecasting
- Security Controls
- Management Processes

Research

Only one respondent rated the Research competencies. All 11 competencies were rated as either Extremely Important or Important, and all 11 were rated as Frequently Used or Very Frequently Used. Six of the 11 competencies were rated Very Difficult or Difficult to Learn. From these results, the Panel believes that ATO's hiring of employees with research skills should focus primarily on the following competencies:

- Software Development
- Prototype Modeling
- System Security
- Networks
- Human Factors Engineering
- Human Factors Physical and Psychological Process
- Hardware and Software Human Interface Design
- Risk Management
- Multidisciplinary Analysis
- Statistical Analysis
- Network Analysis

General

A total of eight respondents rated the General competencies. The following competencies were all rated as Extremely Important or Important and Very Frequently or Frequently Used by a majority of the respondents.

- Written Communication
- Oral Communication
- Teamwork
- Collaboration
- Effective Management of Customer Expectations
- Customer Service
- Interpersonal Skills
- Integrated Thinking

Integrated Thinking and Effective Management of Customer Expectations were both rated highly by at least 50 percent of respondents across all three validation areas.

FINDINGS

ATO management did not make an adequate number of acquisition workforce employees available to participate in the focus groups to test and refine the preliminary competencies. This may seriously compromise its ability to address workforce planning needs and ultimately its ability to successfully transition to NextGen.

The Panel finds that ATO has made significant progress in identifying Occupational Family Competencies. However, the Panel's research indicates that a number of critical competencies have not been identified and documented, and many of those that have been identified will require more emphasis to successfully transition to NextGen.

The Panel's research and validation of competencies identified the most important Occupational Family and General competencies, their frequency of use, and the level of difficulty involved in

learning or developing those competencies. Based on the validation results, the Panel identified the following competencies that it believes ATO should focus on acquiring or developing.

a. Program/Project Management: ATO should focus on 21 competencies, including the following competencies that have not been documented by ATO:

1. Strategic Alignment
2. Organizational Awareness
3. Stakeholder Management
4. Portfolio Management
5. Systems Thinking and Integration
6. System Safety
7. Acquisition Planning
8. Benefit-Cost Analysis
9. Information Technology Architecture
10. Configuration Management
11. Information Security/Network Security
12. Information Technology Performance Assessment
13. Infrastructure Design
14. Systems Lifecycle
15. Data Management

b. Systems Engineering: ATO should focus on 17 key competencies that have not been documented by ATO:

1. Systems Concepts
2. System of Systems Capability Issues
3. Managing Stakeholder Requirements
4. System Design: Concept Generation
5. System Design: Functional Analysis
6. System Design: Human Factors Engineering
7. System Design: System Robustness
8. System Design: Modeling and Simulation
9. Enterprise and Technology Environment
10. Integration and Verification
11. Validation
12. Transition to Operation
13. Integration of Fields of Specialization
14. Lifecycle Process Definition
15. Planning, Monitoring, and Controlling
16. System Safety
17. Trend Analysis

c. Business and Financial Management: ATO should focus on 17 critical competencies, including the following competencies that have not been documented by ATO:

1. Project Management
2. Strategic Planning
3. Organizational Forecasting
4. Performance Management
5. Financial Systems Functionality
6. Software Capability
7. Management Processes
8. Software Capability
9. Risk Analysis and Internal Controls
10. Security Controls
11. Management Control Concepts and Principles

d. Research: ATO should focus on   the following competencies not previously identified by ATO:

1. Software Development
2. Systems Security
3. Human Factors Engineering
4. Human Factors Physical and Psychological Process
5. Hardware and Software Human Interface Design
6. Multidisciplinary Analysis

e. Contracting: Although none of the Contracting competencies were validated due to lack of response, the Panel believes that ATO should focus on the following new competencies:

1. Performance Management
2. Defining Government Requirements in Commercial/Non-Commercial Terms
3. Defining Contractual/Business Relationships
4. Proposal Analysis and Evaluation

f. General: Although no new General competencies were identified, the Panel believes that ATO should focus on the following General competencies:
1. Written Communication
2. Oral Communication
3. Teamwork
4. Collaboration
5. Customer Service
6. Interpersonal Skills
7. Integrated Thinking

RECOMMENDATIONS

The Panel's recommendations with respect to its findings on the Occupational Family and General Competencies are as follows:

1. **The Panel recommends that ATO conduct a pilot to implement one of the competency models in this report.** As part of this pilot, ATO should first communicate and gain buy-in on the new competencies from to employees, managers, and human resources staff and confirm their importance.

2. **The Panel recommends that FAA and ATO prioritize the competencies and develop specific plans to strengthen acquisition workforce competencies critical to NextGen.** Within each occupational family, the Panel identified some competencies that either have not been identified by ATO or require more emphasis. These should be given priority in ATO's workforce planning for NextGen.

CHAPTER 5
RECOMMENDED STRATEGIES FOR ACQUIRING AND RETAINING COMPETENCIES

To establish a baseline for identifying strategies for acquiring the skills needed by the acquisition workforce, the National Academy's study team examined the recruitment and retention flexibilities available under the FAA's own human resources (HR) system, which is exempt from most provisions of Title 5 U.S. Code. Considering the FAA's HR flexibilities, other Government-wide flexibilities, and data gathered from interviews with internal and external sources, the study team developed a preliminary set of ideas for ATO's consideration as ways to acquire the skills needed for NextGen and presented these ideas in its Phase I deliverable. In Phase II, the study team shifted from general concepts and established programs to specific, concrete strategies tailored to address the challenges in ATO's unique organizational and cultural environment.

In conducting its interviews with ATO staff, the study team learned of a number of efforts already underway to increase ATO's marketing, outreach, and recruitment activities to support NextGen. These efforts are in the initial stages of development, but are impressive, nonetheless. Interviewees reported that ATO has only been actively engaged in outreach activities for a couple of years, but the work being done, if it comes to fruition, will lay a solid foundation to support NextGen. ATO is partnering closely with the FAA Outreach and Marketing staff in a variety of balanced outreach and recruitment activities. These include increased presence at job fairs, Internet postings and targeted recruitment via emails, and magazine ads. The ATO staff reported that some marketing materials focused on NextGen have already been developed to address needs in the acquisition workforce, and in partnership with the ATO Communications staff, a NextGen Recruitment website has been developed. Also, efforts are underway to create a NextGen brand to market NextGen as a long-term opportunity. These efforts indicate a clear understanding of the need for specific tailored NextGen related marketing and outreach.

The strategies below take into account the efforts already underway in ATO to attract and hire employees with the competencies needed for the NextGen transition.

FRAMEWORK FOR IDENTIFYING STRATEGIES

If ATO is to be successful in transitioning to NextGen, the organization will need to adopt a more integrated approach to acquiring and retaining skills, building on three basic principles.

1. First, to the maximum extent possible, ATO should use the recruitment and retention tools already available. There are a number of existing flexibilities available to Federal agencies government-wide, some of which were not available when FAA implemented its personnel reform. A summary of the flexibilities that might be more beneficial to ATO is provided in Appendix I. Appendix J provides a complete list of "high impact"

flexibilities that have been mapped to the career patterns that typical Federal positions follow.[41]

These flexibility tools should be examined, along with FAA's unique personnel flexibilities, to ensure that ATO managers have access to the full spectrum of recruitment and retention flexibilities. Although FAA's HR system is exempt from Title 5[42], it has the flexibility to review and adopt any of the government-wide flexibilities that it considers more beneficial in accomplishing its workforce planning and management objectives. The Panel believes that a concerted effort should be made to educate ATO managers on the flexibilities available to them.

2. Second, ATO should design additional flexibilities to meet its unique needs, including new, innovative ways to bring in personnel from the private sector. NextGen is a unique, evolving transformation of air transportation system, and the workforce strategies that support it will also need to be uniquely designed to meet those evolving needs.

3. Third, ATO must develop and implement effective tools and processes that support efforts to recruit and retain a skilled workforce. Successful implementation of the strategies identified will depend, in large part, on clear supporting processes.

Based on the study team's research of existing flexibilities, data gathered from several key sources, and success stories of other agencies, the Panel has identified the following recommended strategies that ATO could use to acquire and retain the competencies identified as critical to NextGen. The strategies are presented for journey-level employees and entry-level employees.

JOURNEY-LEVEL EMPLOYEES

- ***Build Internal Research and Development Capabilities.*** In a recent report,[43] GAO noted that FAA continues to face challenges in meeting the research and development (R&D) requirements of NextGen. GAO pointed out the importance of applied R&D and noted that there is a lack of clarity around how NextGen-related research will be conducted and by whom. GAO explained that in the past, NASA performed a significant portion of the research critical to NextGen, but NASA is now engaging in more fundamental research and less developmental work and demonstration projects of the type that would be critical to NextGen. Thus, it is unclear how the full scope of R&D needs associated with NextGen will be met. Unless this issue is resolved, technology transfers to industry for further development could delay the transition to NextGen. This concern was reiterated in a recent report issued

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[41] U.S. Office of Personnel Management. *Career Patterns: A 21*st* Century Approach to Attracting Talent.* Washington, D.C.: June 2006.
[42] Title 5 of United States Code-Government Organization and Employees.
[43] U.S. Government Accountability Office. *Federal Aviation Administration: Challenges Facing the Agency in Fiscal Year 2009 and Beyond.* GAO-08-460T. (Washington, D.C.: February 7, 2008).

by GAO,[44] in which questions were raised about which entities will fund and conduct the research that is needed to define and demonstrate new NextGen technology. GAO noted that FAA's budget requests have increased to help provide the needed R&D funding for NextGen, and NASA and FAA have developed a strategy to identify, conduct, and transfer research from NASA to FAA to help bridge the gap between NASA's research and FAA's need to implement new technology. However, these developments did not eliminate GAO's concerns about FAA's ability to meet NextGen's developmental research needs in a timely manner.

- *Model the DARPA Approach for Acquiring Program Management Skills*. The Panel's research revealed that the ability to hire program managers with experience in managing large-scale, complex programs will be critical to NextGen success. In particular, external interviewees and colloquia participants highlighted the need for strong skills in this area. However, the Panel does not believe that ATO's approach to hiring program managers will be adequate to support NextGen, and that other approaches should be considered. One approach is that used by the Defense Advanced Research Projects Agency (DARPA).[45] DARPA is the central research and development organization for DoD. It manages and directs selected basic and applied research and development projects for DoD, and pursues research and technology where risk and payoff are both very high. DARPA hires program managers for only 4 to 6 years. The agency believes that the best way to foster new ideas is to bring in new people with fresh outlooks. New people also ensure that DARPA has very few institutional interests besides innovation, because new program managers are willing to redirect the work of their predecessors—and even undo it, if necessary. Since program managers are not at DARPA for a career, they are willing to pursue high-risk technical ideas even if there is a reasonable chance the idea will fail since they are not invested in careers at DARPA. DARPA may offer basic pay not to exceed Level IV of the Executive Schedule and may provide additional annual payments beyond basic pay not to exceed (1) $25,000, (2) 25 percent of annual basic pay, or (3) the annual rate of basic pay for Level I of the Executive Schedule.

- *Develop Internal Software Engineering Skills.* The Panel's research revealed that ATO relies heavily on contractors to perform the software engineering work in support of NextGen technology and that software engineering skills are not significantly represented in the acquisition workforce. As NextGen evolves, ATO staff will need stronger software engineering skills to create the governing policy documents, manage the technical requirements, and approve the deliverables for large-scale contracts involving sophisticated software development efforts. Further, the study team learned that there is a growing need for software engineering skills to be developed as part of the evolving systems engineering field.

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[44] U.S. Government Accountability Office. *Next Generation Air Transportation System: Status of Systems Acquisition and the Transition to the Next Generation Air Transportation System*, GAO-08-1078 (Washington, D.C.: September 2008).
[45] www.darpa.mil.

ATO would be well served by identifying and developing the software engineering skills it needs as an integral part of the competency set for its researchers and systems engineers. In coordination with the Stevens Institute of Technology, ATO has designed a Graduate Certificate Program in Systems Engineering. However, the program does not reflect the evolving "intersection" of systems engineering and software engineering that will be critical to a successful transition to NextGen.

- ***Explore Options for Implementing Critical Pay***. Under the Federal Workforce Flexibility Act of 2004, agencies can request authority to use Critical Pay as a means of attracting talented individuals to critical positions who would not otherwise accept or stay in Government jobs at lower rates of pay. Under this authority, OPM can grant authority to set basic pay at a rate up to the rate for Level I of the Executive Schedule (currently $191,300). Positions eligible for Critical Pay require a very high level of expertise in a scientific, technical, professional, or administrative field and are crucial to the accomplishment of an agency's mission. Through separate legislation, the Internal Revenue Service has implemented this authority with some success and could be a source of advice and "lessons learned" for ATO. Additionally, several Department of Defense laboratory demonstration projects use Critical Pay as a way to compensate senior scientists and engineers who are engaged primarily in research and who secondarily perform managerial or supervisory duties. FAA's Assistant Administrator reported that new legislation may be required to implement Critical Pay authority. As the transition to NextGen evolves and the level of technical and professional expertise needed becomes clearer, ATO should consider working with FAA to explore this authority, tailored to its unique NextGen needs.

- ***Use Vacancy Announcements Strategically to Support NextGen***. As more highly-skilled employees retire over the next few years, ATO will need strategies to immediately attract and hire replacements to obtain the expertise needed for the NextGen transition. Competition for talent in highly technical occupations is fierce, and to compete successfully, ATO will need to market the importance of the NextGen mission and generate excitement around being a part of it. In a recent study, "In Search of Highly Skilled Workers,"[46] the Merit Systems Protection Board offered several recommendations to agencies to improve hiring of upper level (grades 12-15 of the General Schedule) employees. The MSPB noted that agencies need to develop a hiring strategy that uses a comprehensive recruitment plan that includes (but is not limited to): (1) doing more to highlight their missions in vacancy announcements and ads to appeal to potential applicants and (2) improving the quality of vacancy announcements.

    Based on a review of a critical NextGen position, the Panel is concerned that FAA's vacancy announcements for NextGen positions may not adequately convey the importance of the NextGen mission or the unique requirements of NextGen work. The vacancy announcement is not only a marketing tool—it is also the first step in the assessment process, as it is the basis upon which potential applicants determine whether or not they meet the requirements of the job. Thus, it is important to clearly articulate the requirements for skills and

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[46] U.S. Merit Systems Protection Board. *In Search of Highly Skilled Workers- A Study on the Hiring of Upper Level Employees from Outside the Federal Government*. Washington, DC, February 2008.

experience, while simultaneously "selling" the position. ATO managers will need to ensure that vacancy announcements clearly describe the work to be done in a way that distinguishes NextGen positions from others. For example, a vacancy announcement for a General Engineer position with responsibility for managing a key NextGen program should include a description tailored to the unique requirements associated with NextGen program management and integration responsibilities. In other words, vacancy announcements should mirror, not mask the importance of the NextGen mission and its unique requirements. Similarly, vacancy announcements should include selective placement factors[47] that enhance, rather than limit the potential to recruit the best qualified candidates. ATO managers should work closely with FAA's HR staff to ensure that selective factors do not have the effect of eliminating qualified employees.

- ***Consider Modeling the National Science Foundation (NSF) Program Officer and Management "Rotator" Program.*** This program allows researchers from academia to work on various projects for one to three years. Approximately half of NSF's 700 science and engineering personnel serve on non-permanent appointments. Rotators are usually university professors, department heads and deans, scientists, researchers, and administrators from non-profit organizations and private firms. They serve as Visiting Scientists, Engineers and Educators or on detail through the Intergovernmental Personnel Act (IPA).[48] Rotators keep "fresh blood flowing into these intensely demanding jobs, and they bring new perspectives to the agency."[49] ATO should consider this program as a strategy to enhance its internal research capabilities.

ENTRY-LEVEL EMPLOYEES

A second study recently completed by the MSPB assessed how Federal agencies can better attract and select qualified applicants for entry-level positions to build a pipeline for journey-level positions.[50] Findings from this study indicate that new hires average about 33 years of age and have at least 1 to 5 years of prior full-time work experience. The study found that a significant percentage of new hires were looking for traditional benefits as well as alternative benefits, such as flexible working arrangements and telecommuting. As a result, MSPB concluded that agencies need to use a balanced set of strategies to attract and recruit new hires and market what is important to them in the context of the agency's mission. In light of the challenges associated with NextGen, the following strategies may be beneficial to ATO:

- ***Develop a Strategic Approach to Address Pipeline Issues.*** Entry-level employees are the fundamental source for building a pipeline, and the ability to hire entry-level employees in Science, Technology, Engineering, and Math (STEM) occupations will be critical to the

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[47] Selective placement factors are special qualifications in addition to minimum qualifications. Applicants who do not meet these requirements are ineligible for consideration.
[48] National Academy of Public Administration. *NASA: Balancing a Multisector Workforce to Achieve a Healthy Organization.* February 2007, p. 217.
[49] http://www.ucar.edu/communications/quarterly/winter04/rotation.html
[50] U. S. Merit Systems Protection Board. *Attracting the Next Generation: A Look at Federal Entry-Level New Hires.* (Washington, D.C.: January 2008).

successful transition to NextGen. ATO needs to take a more strategic approach to creating a pipeline of talent to meet its future NextGen workforce needs. ATO could look to NASA for best practices in this area. One NASA strategy, in particular, could give ATO more direct influence over curricula leading to degrees that are relevant to NextGen. Specifically, NASA's Education Office recently hired a full professor to map critical competencies back to degree programs that will be relevant to several specific functional areas. The plan is to shape the calls for scholarships to reflect the skills NASA will need. ATO should model this strategy for NextGen using the competencies provided by this study.

The study team learned that ATO has a number of initiatives in progress or under development that may improve the agency's ability to hire in STEM occupations. For example, ATO is developing a "NextGen Intern Program" (designed to be similar to the previous Co-op program) that will prepare qualified students for careers in occupational areas critical to NextGen. The objective is to identify 30-40 unencumbered slots that will be dedicated to this program in order to provide selected students an opportunity to continue their education while receiving on-the-job development under the direction of senior ATO staff. Implementation of this program will be an important step toward developing the skills "in-house" that will be needed for NextGen programs, but this and other efforts should be part of a broader, more strategic approach to recruiting entry-level employees.

- *Market Benefits that Appeal to New Hires*. To attract and retain entry-level employees, ATO needs to develop, implement, and market benefits and programs that are important to new employees. MSPB's study found that entry-level new hires are well-educated. Specifically, CPDF data show that, in FY 2005, 56 percent of these new hires had an undergraduate degree and 19 percent had education beyond the undergraduate level. The Panel learned that FAA does not yet have an approved Student Loan Repayment Program or a Tuition Reimbursement Programs, but these programs could prove beneficial in hiring entry-level employees.

- *Work with Educators to Build K-12 Education Modules*. ATO has an established relationship with School of Systems and Enterprises at the Stevens Institute of Technology. Stevens also has a Center for Innovation in Engineering and Science Education (CIESE) which has several grants to increase student engagement in science and technology. The program works with K-12 educators to develop education modules using real time data and technology. One module has students use navigational information to predict flight paths for airlines (and reinforces instructions in vectors). FAA could help develop a new module which might be applicable to the needs of NextGen. CIESE is looking for students to have hands on activities in designing and testing scientific principles in a collaborative way.

ALL EMPLOYEES

In addition to the strategies identified for the two workforce segments, the following strategies are applicable to the entire acquisition workforce.

- *Aggressively Market NextGen as a Unique Mission*. The Panel believes that FAA's communication and marketing of NextGen as unique mission may not be adequate. ATO should identify additional ways to aggressively market NextGen as a mission that is as exciting as it is challenging. One strategy ATO could explore is working with OPM to ensure the widest possible communication of the NextGen mission and brand both within and outside of the Government. Recently, OPM's use of a television recruitment campaign to increase awareness of the exciting and rewarding careers available in the Federal government has resulted in heightened interest in Federal jobs, and this could bode well for NextGen recruitment efforts. ATO could partner with OPM to repeat this successful venture for NextGen.

- *Build a Culture of Learning and Education*. If the transition to NextGen is to succeed, FAA and ATO need to begin now to shift to a culture of learning and education to meet the challenges that lie ahead.   While 30 of the 31 executives (97 percent) in ATO **with acquisition related responsibilities** have a bachelor's degree or higher, the data for the rest of the workforce paints a different picture. Approximately 50 percent of the headquarters workforce (where the largest portion of the acquisition workforce resides) has a college degree or higher; at the W.J. Hughes Technical Center, this number grows to approximately 61 percent. As eligible employees retire, ATO should focus on replacing those employees with a more highly-educated workforce.

SUMMARY OF RECOMMENDED STRATEGIES

Table 5-1 presents is a summary of strategies, mapped to the workforce segment, which the Panel recommends that ATO use to acquire the skills needed for the transition to NextGen. This summary includes existing HR flexibilities in Appendix H, as well as new strategies described in this chapter.

Table 5-1
Summary of Strategies

Strategies for Acquiring Highly Skilled (Journey-Level) Employees
• Build internal R&D capability
• Use vacancy announcements more strategically
• Model the DARPA approach to hiring program managers
• Build internal software development skills
• Increase use of On-the-Spot Hiring authority
• Increase use of temporary appointments
• Increase use of IPA assignments
• Expand use of Recruitment, Retention, Relocation incentives
• Expand use of pay flexibilities
• Expand use of pay flexibilities Finalize policy and implement the plan to hire retired annuitants to fill critical vacancies in the acquisition field (P.L.109-313)
Strategies for Acquiring Entry-Level Employees
• Develop an Acquisition Intern Program
• Expand use of Federal Aviation Student Intern Program (FASIP)
• Hire expertise to strategically map competencies to curricula
• Fully utilize and expand partnerships with universities and other organizations to create a pipeline for STEM occupations
• Work with educators to enhance the K-12 pipeline
• Finalize and implement the Student Loan Repayment Program
Strategies for Acquiring All Skill Levels
• Aggressively market the NextGen mission
• Build a culture of learning and education
• Provide dedicated HR support for staffing NextGen positions

FINDINGS

ATO is taking positive steps to attract and retain the acquisition workforce it needs for the NextGen transition. To support and enhance ATO's efforts, the Panel identified a number of existing and potentially new HR tools that could be beneficial to ATO in filling gaps in skills and expertise. The Panel's findings with respect to strategies that can be used to acquire critical skills are as follows:

1. In the past, NASA performed a significant portion of the research critical to NextGen, but it is not clear how future NextGen-related research and development will be conducted.

2. ATO relies heavily on contractors to perform the software engineering work in support of NextGen technology and should consider building internal competencies in this area.

3. ATO lacks the internal capacity to perform the complex software engineering work critical to NextGen programs and should develop this competency in its permanent workforce.

4. FAA and ATO do not appear to be using vacancy announcements strategically to support the NextGen. Using vacancy announcements more strategically could prove beneficial.

5. ATO has not yet implemented a strategic approach to building a pipeline for recruiting employees in STEM occupations. A pipeline of future talent is critical to NextGen success.

6. FAA and ATO can do more to aggressively market NextGen as a unique and challenging mission. Attracting talented employees will likely be improved with a clear and engaging message about NextGen.

RECOMMENDATIONS

ATO's ability to acquire and retain the workforce it needs for the NextGen transition will require that FAA work with ATO to maximize use of existing flexibilities and create new ones when needed. The Panel recommends that:

1. **ATO expand its internal R&D capability**. This could be done by establishing an internal "Skunk Works" organization with a high degree of autonomy to work on advanced R&D projects.

2. **FAA and ATO model the DARPA approach for acquiring program management skills**. This approach would provide a continuous flow of high level program managers into the organization to lead NextGen programs.

3. **ATO work with the Stevens Institute to develop a program to focus on software engineering skills as part of its systems engineering program**. Software engineering skills are critical to NextGen success, and ATO needs to take steps to develop internal capacity in this area.

4. **ATO work with FAA's HR staff to create vacancy announcements that are clear and engaging while establishing the NextGen mission as a national priority**. Vacancy announcements should highlight the critical nature of NextGen work and generate interest and excitement for potential applicants.

5. **ATO work with FAA to complete and implement the proposed Student Loan Repayment Program policy and establish a Tuition Reimbursement Program.** This should prove valuable in attracting new hires with the necessary credentials.

6. **ATO hire professional education personnel to map critical competencies back to degree requirements.** This should have a positive impact on curricula leading to degrees that support NextGen programs.

CHAPTER 6
IMPLEMENTATION CHALLENGE: LEADERSHIP COMPETENCIES

Why is organizational change difficult? The question is: why has anyone thought that organizational change in government would not be difficult? [51]

Phase I of this study included a review and summary of the literature regarding large-scale, complex organizational change in both the public and private sectors. Unsurprisingly, the review found that most organizations—public and private—struggle with these complex integration efforts, usually for the same reasons, although public organizations have some unique characteristics which make things even more complicated. The most important outcome of this review was the finding that while having people with sound technical and contract management skills is critical to successfully implementing complex systems changes, the most important elements for a successful effort—such as making needed organizational and cultural changes and garnering broad support and stakeholder involvement—are the responsibilities of leaders. While systems engineers and program and project managers are essential to successfully implementing NextGen, leadership, strategic thinking, careful planning, and understanding the unique challenges of public sector organizations are the critical success factors.

Phase II builds on the earlier work and focuses on the leadership competencies needed to implement NextGen. FAA provided the study team with materials relating to their existing leadership programs, which the team has used as the "baseline" for this effort to identify NextGen leadership competencies. There were advantages to doing this: the programs are built around FAA culture, and, it helps to identify the leadership competency "gaps" for making NextGen happen.

FIVE PERSPECTIVES ON LEADERSHIP

The FAA Leadership Program: Leadership Success Profiles

FAA began developing an executive competency model in 1999. Working with a consulting firm, it formed an executive committee of senior line and staff executives to consider various models. With approximately 100 models to choose from, the committee eventually settled on five or six for in-depth analyses. The goal, as stated by senior FAA human resources officials, was to develop a pragmatic model that identified executive core qualifications (ECQ's) and provided definitions and key characteristics (activities or behaviors) associated with each of the ECQ's. The model would be used to identify and develop new executives as well as to evaluate the performance of existing executives.

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[51] *Challenges to Organizational Change: Facilitating and Inhibiting Information-Based Redesign of Public Organizations.* Jane E. Fountain. National Center for Digital Government. Kennedy School of Government. Harvard University. 2007.

This committee eventually built a model—the *Executive Success Profile[52]*—that had four executive core qualifications,[53] referred to in FAA as *Dimensions* and a total of 16 competencies, with three to five competencies identified for each dimension:

- *Dimension:* <u>Achieving Results</u>

  Competencies
  - Managing Organizational Performance
  - Accountability and Measurement
  - Problem Solving
  - Business Acumen
  - Customer Focus

- *Dimension:* <u>Leading People</u>

  Competencies
  - Building Teamwork and Cooperation
  - Building A Model EEO Program
  - Developing Talent

- *Dimension:* <u>Building Relationships</u>

  Competencies
  - Communication
  - Building Alliances
  - Interpersonal Relations and Influence
  - Integrity and Honesty

- *Dimension:* <u>Leading Change</u>

  Competencies
  - Strategy Formulation
  - Vision
  - Agility
  - Innovation

The Committee further refined the model by identifying *Behavioral Anchors* which are specific illustrations of how the competencies could be demonstrated. The example below shows the relationship between the Dimension *Achieving Operational Results,* one of its five Competencies*, Managing Organizational Performance* and the six Behavioral Anchors

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[52] A cross-agency executive committee also developed, validated, and approved an Employee Leadership Profile.

[53] The "Dimensions" used by FAA are similar to the Office of Personnel management's five <u>Executive Core Qualifications for Senior Executives: Leading Change</u>; <u>Leading People</u>; <u>Results Driven</u>; <u>Business Acumen</u>; and, <u>Building Coalitions.</u>

associated with that competency. According to FAA Human Resource leaders, the Dimensions and Competencies are intended to be applied uniformly across FAA, but FAA organizations can tailor the (100+) Behavioral Anchors to individuals or organizations. A Line of Business can add its unique performance indicator to the appropriate competency but none of the FAA-wide validated ones can be removed. With the agreement of Human Resources, organizations can also vary the "weights" given to each dimension; that is, they can tailor the relative importance of each dimension for evaluating individual performance or assessing qualifications.

There are two other important considerations to keep in mind when reviewing FAA's program: First, annual appraisals and promotion applications for individuals are evaluated based on how they match up against the Dimensions and Competencies. FAA guidelines require all four dimensions be addressed in vacancy announcements, and the total weight assigned to the dimensions must be at least 50 percent of the total. The dimensions also must be incorporated into all executive and managerial annual performance plans, as well as assessments of probationary executives and managers. Second, the Executive Core Qualifications also provide the basis for leadership development programs for employees at all levels of FAA, from newly-hired clerical staff to senior executives. The Dimensions and Competencies are the same for all; only the Behavioral Anchors (referred to as *Performance Indicators* below the Executive Level) are changed for the various programs. Figure 6-1 is an example of FAA's Executive Success Profile.

Figure 6-1
Example of FAA's Executive Success Profile

<u>**Dimension:**</u> Achieving Operational Results

<u>**Definition**</u>: *Successful executives apply a variety of techniques to deliver results. They establish clear, measurable objectives for the organizations and the people they manage. They adjust organizational operations to capitalize on lessons learned from both successes and failures. They make tough decisions to solve complex problems. They appropriately allocate resources to correspond to organizational priorities. They understand their clients' requirements and focus on delivering high quality products and service to satisfy those requirements.*

<u>**Competency:**</u> Managing Organizational Performance

<u>**Behavioral Anchors**</u>

- ☐ Sets key individual and organizational performance objectives
- ☐ Effectively addresses individual and organizational performance issues
- ☐ Adjusts the way work is performed to meet changing conditions and demands
- ☐ Instills a sense of pace and urgency into the organization and seeks to maintain momentum
- ☐ Takes corrective actions to ensure that critical programs meet budget and schedule requirements

Adopts new management systems and technology to improve quality and productivity

In addition to the Executive Success Profile discussed above, the other two leadership competency models FAA uses are the Managerial Success Profile and the Employee Leadership Profile. Key developmental platforms supporting these models include:

A. **Employee Leadership Development—**aimed at non-supervisory staff.

B. **Prospective Manager Leadership Development**—targets people looking to move into first-line supervisory positions (called Front Line Managers at FAA).

C. **Manager Leadership Development—**aimed at existing managers.

D. **Executive Leadership Development—**aimed at executives.

The 16 competencies are used for development at the employee level and for selection, development, probationary assessment and performance management at the managerial and executive levels. The development guides provided for each of the programs outline agency sponsored and external training as well as on-the-job developmental activities. Other formal curricula and developmental programs (e.g., Program for Emerging Leaders and Senior Leadership Development Program) provide additional developmental platforms.

Figure 6-2 represents the FAA approach to leadership development**.**

Figure 6-2
FAA Leadership Development Components

Validating the Model

In 2006, FAA revalidated the 16 managerial competencies. A total of 1,323 managers (23 percent of the total population) representing different levels of management, lines of business and work settings, participated in this revalidation project by completing electronic questionnaires. The results showed that all 16 *competencies* were important for accomplishing FAA's mission and should be retained. The analyses also showed that three *performance indicators* should be replaced by newer ones that were validated during this project.

FAA has recently conducted an OPM-mandated annual Leadership Assessment to determine the relative competence levels of its approximately 5,600 managers. The FAA version of the assessment uses the 16 competencies evaluated on a 7-level scale. The scale includes four levels of competence and three transition levels that help describe most people's real-life career progression. This was the first year that scores were based on ratings from both the individual manager and the manager's supervisor. Overall, mean scores in 2008, which were based solely on self-ratings, fell somewhat compared to those in 2007, but continued to be at or slightly above target for most competencies.

In 2006, FAA conducted two surveys to determine the effectiveness of its Managerial Workforce Planning (MWP)[54] during the first year of the system. One survey focused on new front-line managers and the other on supervising managers of new managers. FAA reports that the overall results of the survey for new managers showed a high rate of accomplishment for the learning and development activities required during the probationary period although the results of the survey outcomes were not significant since over 50 percent of new managers that responded had not yet attended the training class for new managers. The survey of supervising managers suggests a high rate of acceptance and effectiveness for the MWP learning and development activities.

Summary of FAA's Leadership Program

FAA's leadership program is very comprehensive in its approach and supporting structures. It considers all the employees of the agency—from entry level staff through executives—to be in a position to take a leadership role within their own areas of responsibility and helps them prepare for the next level of responsibility. It also provides ample means for any interested party to access the support needed to improve his or her leadership competencies.

The comprehensive approach to Managerial Workforce Planning for selecting, training, and managing the performance of managers based on a set of competencies is relatively new having been put into place in January 2005. The data on the effectiveness of this system collected through FAA's competency revalidation study, managers' survey, and OPM's Leadership Assessment indicate that the approach is taking hold as a basic building block for leadership development at the agency.

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[54] FAA's integrated system for selecting, training, and managing the performance of managers based on a set of competencies

The effectiveness of executive development is not as thoroughly analyzed. The executive level program is the least structured and scrutinized of FAA's four leadership program platforms. This is not surprising in that executive development at Federal agencies is often an area of weakness as noted by a 2007 OPM report[55]: *A quick review of some of the largest agencies and their current practices revealed only a few agencies with development approaches characterized by active planning, strategic approaches and oversight. More typical were ad hoc approaches to development and a perception that executives are already well equipped and need little continuing development.* The report also noted that executive development in the Federal Government is primarily self-initiated, but that larger private companies report a more purposeful and structured approach.

An additional factor to consider is that because FAA has its own pay system, OPM officials are not as aware of its executive development activities and cannot readily comment on how the program is succeeding. This puts FAA at somewhat of a disadvantage in terms having OPM compare its development programs with those of other agencies.

In summary, given the comprehensiveness of FAA's leadership program, the *platform* for providing the appropriate training and professional experience needed by NextGen leaders exists. But, to be successful, the program needs to focus on some key competencies already included in the program as well as consider some other aspects of leadership development as detailed below.

Academy's Colloquia of Senior Leaders

Two colloquia were held at the Academy during April 2008 to seek advice from senior executives with broad experiences in the public and private sectors about the knowledge requirements, skills and leadership competencies needed to deliver NextGen. The participants included government executives, executives from aerospace and information technology industries, as well as academia. Much of the focus of the colloquia was on the type of technical workforce and skill sets needed to make NextGen a success, but there were several questions asked of the participants that considered the roles of senior leaders:

- What are the most important things leaders need to do to ensure the success of NextGen?

- How would you define success for NextGen? What criteria should be used to assess that success?

- What (else) needs to happen to ensure the success of NextGen?

While the answers were wide-ranging, there was an overall perception among the participants that NextGen was struggling and that success was anything but assured. Several common themes came out during the discussions, most notably (Specific perspectives from the participants are in italics):

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[55] Snapshot of Executive Development In the Federal Government Thought Leader Forum Washington, DC. April 10, 2007.Prepared by: OPM Executive Resources Staff.

- Defining NextGen. There was a widespread belief that there needs to be a better definition of the essential components of NextGen.

Clearly define the vision of NextGen, communicate it, gain support for it...

There was a general agreement among the participants that the program is not clearly defined in the minds of its key stakeholders including FAA employees, the airline industry, members of Congress and the American public. Without this clarity, it will be extremely difficult to transition to NextGen.

- Describing Success. Articulating NextGen objectives in terms of operational improvements was seen as critical to its success. Just as important was to make it clear that there was no 'big bang' type of system conversion but rather a series of incremental changes that collectively, would revolutionize air transportation.

The goal of NextGen is to meet the future demand of air travel efficiently and safely. This implies that NextGen has to deliver capabilities that are actually being used in the system. Also NextGen is not turned on by a switch in 2025. It happens all along the way to 2025. Hence success is a series of operational capabilities delivered on a timeline.

Describing success in terms understandable to those outside the Agency (e.g., the general public) was also seen as essential.

City-to-city travel time is reduced by 50 percent and intercontinental travel time by at least two-thirds.

- Committing to the Program. A number of participants believed that FAA leaders do not seem entirely committed to NextGen:

Currently there is great controversy internally about the value of NextGen.

The program also could be better sold to a sometimes skeptical workforce.

The workforce needs to understand why NextGen is crucial for the success of the organization—"burning platform"—and every member of the work force needs to understand the role they will play in making it a success.

- Metrics and Accountability. There were a lot of comments and a fair amount of discussion on the importance of having good metrics in place to determine if NextGen is meeting expectations and establishing accountability.

The metrics need to be clear and unambiguous.

Need key measurable metrics that everyone can understand and rally around!

There was a widespread belief that it is difficult if not impossible to grow and maintain stakeholder support absent these measures.

- Funding Issues. Ensuring that NextGen has a reliable funding stream was seen as critical.

If NextGen is a national priority then the funds to do it need to rise above the $2.5 billion a year level that is unchanged since the 1980s.

- Culture. There were many observations regarding the impact of FAA's organizational culture on NextGen implementation. The agency's culture is embedded in its primary mission focused on daily operations, but NextGen introduces the requirement for long-term strategic planning and the introduction of new technology where the end-users have resisted this type of change in the past.

  FAA has a very tough problem to solve in how to change the culture to one that will accept new technology.

  Some participants noted the tensions that arise when an organization like FAA, with its necessary focus on day-to-day operations, has to also plan and implement long-term, strategic programs such as NextGen.

  NextGen is an air traffic management system, and therefore not well suited to the FAA organization and culture.

  For some, this issue of culture change at FAA represents the single biggest challenge facing the Agency's leaders. Absent this change, the ability of FAA to implement NextGen successfully is in doubt.

- Communications. A common thread that runs through all the themes is the need for better communications regarding NextGen. Better defining what NextGen is; explaining what success looks like, how it will be measured and who will be accountable for achieving it; and getting support and buy-in from staff at all levels of the organization and outside stakeholders will take leaders who can plainly and forcefully communicate a clear vision for NextGen.

Colloquia participants were also asked to rate the leadership competencies used in FAA's Leadership program in terms of their importance to making NextGen happen. The rating scale is as follows:

- *5—Extremely Important. Without this, NextGen would likely fail; it is a critical requirement*

- *4—Important. This is key to the success of NextGen; without this, transformation to NextGen would be difficult or yield poor results*

- *3—Marginally Important. This will enhance the transformation to NextGen*

- *2—Somewhat Unimportant. This is a "nice to have," but not critical to the success of NextGen*

- *1—Not important At All. This not required at all for success of NextGen*

Table 6-1 lists how the colloquia attendees rated the relative importance of FAA's 16 leadership competencies to implementing NextGen.

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Table 6-1
FAA Leadership Competencies

LEADERSHIP COMPETENCIES	SCORES
Integrity and Honesty [Building Relationships]	4.56
Building Teamwork and Cooperation [Leading People]	4.50
Vision [Leading change]	4.45
Communication [Building Relationships]	4.45
Strategy Formulation [Leading change]	4.39
Accountability and Measurement [Achieving Results]	4.39
Managing Organizational Performance [Achieving Results]	4.34
Building Alliances [Building Relationships]	4.22
Customer Focus [Achieving Results]	4.06
Problem Solving [Achieving Results]	3.95
Innovation [Leading change]	3.89
Agility [Leading change]	3.78
Interpersonal Relations/Influence [Building Relationships]	3.61
Developing Talent [Leading People]	3.61
Business Acumen [Achieving Results]	3.50
Building a Model EEO Program [Leading People]	2.61

Colloquia participants were also sent a follow-up survey to validate the competency models (both technical and leadership) the Academy is recommending to FAA.

Although the discussions, observations and answers to questions provided by colloquia participants were wide-ranging, there are several important observations that can be made from the overall colloquia process:

- The groups did not see NextGen as currently successful.

- There are strong doubts about the FAA's ability to make it successful.

- There are also doubts about how much support NextGen currently enjoys inside FAA.

- The need for strong leadership at every level of the organization is critical and, from a number of observations, lacking.

General Electric's Leadership Development Model

Two members of the Academy study team and the Program Manager for FAA's Executive Resources program visited the General Electric (GE) Corporation's John F. Welch Leadership Development Center in Crotonville, New York to learn about GE's approach to leadership development and change management.

GE, among the most well-regarded companies in the world,[56] invests about $1 billion every year on its highly-respected corporate training and education programs, including:

- Entry-level leadership programs which offer recent college graduates development opportunities that combine real-world experience with formal classroom study. Through a series of rotating assignments—typically over a period of two years—young professionals receive accelerated professional development, mentoring, and global networking that cut across GE's businesses.

- Experienced leadership programs position high-potential individuals in collaboration with some of the top innovators in their fields, offering intensive on-the-job development.

- The 53-acre John F. Welch Leadership Center, established in 1956, trains thousands of people from entry-level employees to GE's highest-performing executives.

GE has identified five "Growth Traits" that it seeks in leaders: *external focus, clear thinking, imagination, inclusiveness,* and, *expertise.* These are roughly analogous to FAA's leadership competencies. GE looks for a leader who: creates an <u>external focus</u> that defines success in market/industry terms; is a <u>clear thinker</u> who can simplify strategy into specific actions; makes decisions and communicate priorities; has <u>imagination</u> and courage to take risks on both people and ideas; can energize teams through <u>inclusiveness</u> and connection with people and builds loyalty and commitment; and, develops <u>expertise</u> in a function or domain, using depth as a source of confidence to drive change.

Leader education is a major focus at GE. Its 189 most senior executives have spent an average of 12 months in training and professional development over the course of 15 years, much of it provided at the Crotonville facility. Attendees at senior-level courses work on 'real world' problems (selected by the Chairman) and brief the Chairman on their findings at the end of the session. The last two GE Chairmen have attended 239 of the last 240 training sessions, missing only one because of illness.

The framework GE uses for its leadership development rests on four principles: *philosophy, training, experiential learning*, and *evaluation*.

Philosophy

- Corporate values are continuously communicated from leadership.

- Adherence to values determines how people are rewarded.

- People are encouraged to take "stretch" assignments to develop their leadership capabilities. For example, most senior executives have taken roles in multiple GE businesses.

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[56] Fortune Magazine's ranking of the World's Most Admired Companies ranked GE 3rd in 2008 and 1st in 2007 and 2006.

Training

- Training is a reward and a career enhancer. Top tier courses require an individual to be nominated and are limited to only the top 10 percent+ of the overall population.

- A team-based approach is used for leadership development.

- All courses have a diverse group of students representing various businesses, functions and demographics.

- The skill needs of individual students receive attention during the training.

- The training provides theory, concept, and application.

Experiential Learning

- Top tier courses focus heavily on action learning.

- Students work on real GE business challenges—not simulations—and present their findings to top company leaders.

- Rotational programs at the entry level offer hands-on experience, classroom learning, and cross-functional and cross-business exposure.

Evaluation

- Individual performance assessment is based heavily on GE values and achievement-employees can't get by on performance alone.

- Performance assessments are as rigorous as any budget process.

- Pay increases, incentive compensation, and stock options are all tied to performance.

- Performance evaluations are used to identify participants for higher level training courses.

- A robust succession planning process is in place for every job. Managers identify who will be ready to lead now, who will be ready in 6 months, and who will be ready in 12 months—and what training/experiences these individuals need to get there.

- 360 evaluations are given.

GE's training is keyed to five levels of leadership experience as illustrated below:

Figure 6-3
GE Leadership Stages

Level 1 Emerging Leader	Level 2 New Leader	Level 3 Developing Leader	Level 4 Advanced Leader	Level 5 Executive Leader
• Specialist/individual contributor • Expected to move into a formal leader-ship role, e.g., entry-level professional program members • Typically professional band	• First leadership role • Responsible for a team of direct reports • Typically lead professional band	• Leader with previous leadership experience • Facing new leadership challenges • Typically senior professional band	• Could be responsible for Profit and Loss (P&L) or specific function • Managing others outside own specialty/ geographic area • Manages managers • Typically senior professional or leadership bands	• Responsible for major P&L, cost center, or function • Executive Band, Senior Executive Band, or officer bands

Change Management at GE

To be competitive on a global basis, GE has had to put a lot of emphasis on change management. GE's research into change management found that:

- 100 percent of all changes evaluated as "Successful" had a good technical solution or approach.
- Over 98 percent of all changes evaluated as "Unsuccessful" also had a good technical solution or approach.
- Since the quality of the technical solutions in both successful and unsuccessful changes was very high, the differentiating factor or overall effectiveness of the effort comes down to the degree of cultural acceptance.

To be successful from GE's perspective, change initiatives must be focused on customer needs to ensure that "cultural acceptance", i.e., stakeholder buy-in and support of the effort is achieved. GE also sees leadership as the linking mechanism between the technical (solution) strategy and the engagement (of stakeholders) strategy. This reinforces one of the main points noted in Phase I of this study: for significant organizational change efforts, leadership is the key.

GE's primary corporate model for change management—the Change Acceleration Process—is designed to provide three things:

- A model for change leadership and employee engagement

- Flexible non-linear processes throughout a change process

- A strategy and tools to influence actions and commitment of others through team dialog and action

The model uses a five stage process for managing change: *creating a shared need, shaping a vision, mobilizing commitment, making change last,* and, *monitoring progress.* The anchoring concepts for this process are Leading Change (having a champion who sponsors the change) and Changing Systems and Structures (making sure that the management practices used complement and reinforce change). There are a variety of tools and techniques used to build elements of this model that have been standardized and refined by the Company through the years.

Although this process is a tool for internal use by GE, study team members were told that GE sometimes provides training on this model to other organizations, usually important customers.

Lessons from GE

As with FAA, GE is a widely-dispersed, complex organization that has a fundamental need to manage major changes to its business. Each organization's respective leadership development processes have many similarities. However, there are several aspects of GE's approach to leadership development and change management that offer some suggested approaches to NextGen implementation:

- Complete support of senior leaders is necessary for successful leadership development. The importance of leadership development to GE's organizational culture would be hard to overstate. Senior leaders throughout the company are fully engaged in the development of the subordinate leaders below them.

- Organizational values are thoroughly integrated into the fabric of GE's culture and are critical elements of training and evaluations.

- Change management requires cultural acceptance and top-notch leadership.

Complex Project Management

A new and potentially useful approach for dealing with large-scale, complex systems integration efforts was developed by the Australian Department of Defence[57] when it commissioned an effort to develop competency standards for complex project managers. Building on traditional project management competencies, these new standards attempt to provide a comprehensive benchmark for those responsible for implementing complex programs and projects.

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[57] Ibid.

The standard defined complex projects as "open systems … characterized by recursiveness (a procedure that can repeat itself indefinitely) and non-linear feedback loops, which make them sensitive to small differences in initial conditions and emergent changes. Detailed long-term planning is therefore impossible….traditional project management approaches with their focus on long-term planning, rigid structures, precise work breakdown structure definition, and elaborate control rules is counterproductive—it will drive the complex project towards failure."

The standard characterized complex projects as having:

- a degree of disorder, instability, emergence, non-linearity, uncertainty, irregularity and randomness;
- a dynamic complexity where the parts in a system can react/interact with each other in different ways;
- high uncertainty about what the objectives are or how to implement the objectives;
- a highly pluralist environment across the stakeholders where multiple and divergent views exist;
- an outcomes based strategy, requiring constant renegotiation; and
- a need to not simply adapt to their environment, but evolve with it. They are not 'complex adaptive systems', but rather, 'complex evolving systems'—they change the rules of their development as they evolve over time.

Complex systems are said to follow a random and unpredictable path and the ability (competence) to understand the underlying patterns and proactively deal with them is what distinguishes complex project managers from traditional project managers.

As noted earlier, FAA's leadership program has four Dimensions (Executive Core Qualifications), three to five Competencies associated with each Dimension and Behavioral Anchors/Performance Indicators associated with each Competency. There are three "Profiles" with competency models. The "Executive Success Profile" and "Managerial Success Profile" were designed to shape selection, development, probationary assessment, and performance management at the managerial and executive levels. FAA's "Employee Leadership Profile" was built to support development of non-technical competencies at the employee level. The Complex Project Manager standard is focused exclusively on program and project manager roles. It also takes a different approach regarding these roles on the premise that the 'traditional' approach to program or project management cannot adequately describe what is needed for complex project management.

Using what is described as a systems approach, (*you cannot understand a whole through analyzing its parts)* this new standard considers insights from multiple perspectives and attempts to provide a holistic "understanding of the competencies required for the project management of complexity, and the assessment of an individual against those competencies." This approach, as with FAA's, also breaks down into three levels, and is roughly analogous to the Leadership Development Model but takes a more complex and nuanced view of program and project management capabilities. These multiple perspectives—referred to as "Views"—are broken

down into "Elements of Competency" and within each of these competencies are definitions of specific "Actions in Workplace." The nine Views, which are detailed in Appendix F, are:

- Strategy and Project Management
- Business Planning, Lifecycle Management, Reporting and Performance Measurement
- Change and Journey
- Innovation, Creativity and Working Smarter
- Organizational Architecture
- Systems Thinking and Integration
- Leadership
- Culture and Being Human
- Probity and Governance

Panel Conclusions about Complex Project Management

This new standard for complex project management is not without its critics. How it differs from existing standards, how the approach compares with existing approaches and the content of the standard have been challenged.[58] However, the approach has also generated interest and support in the project management community as evidenced by its inclusion as one of twelve program "streams" in this year's International Program Management Association Conference.[59]

Study team members also spoke with the author of the new standard, Dr. David H. Dombkins,[60] who discussed how the standard evolved, its potential uses and the fundamental premises underlying the training. Dombkins stressed that this approach is based on both fundamental project management principles and practical experiences. He noted that experienced project mangers taking the course have told him that the training helped them to better understand some of their earlier project management experiences. Dombkins also noted that the new standard may be included as part of the U.S. Department of Defense's systems engineering guide for system of systems (SoS). System of systems is defined as "a set or arrangement of systems that results when independent and useful systems are integrated into a larger system that delivers unique capabilities." NextGen could aptly be described as a system of systems.

Based on the definitions provided earlier, NextGen also clearly qualifies as a "complex project." While FAA's Leadership Development Model is a good starting point for developing leadership skills and competencies, if one accepts the premise that underlies the new complex project manager standard—that traditional project management tools and techniques are insufficient to manage the most complex of today's projects– then the current FAA model needs additional

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[58] The Proceedings of 21st IPMA World Congress on Project Management. And Then Came Complex Project Management. S. Jonathan Whitty. Division of Complex & Intelligent Systems, School of IT & Electrical Engineering, University of Queensland, Australia. Harvey Maylor. School of Management, Cranfield University, United Kingdom.
http://espace.library.uq.edu.au/eserv/UQ:13419/And_then_came_Complex_Project_Management.pdf
[59] 22nd IPMA World Congress—Rome (Italy) November 9-11, 2008. http://www.ipmaroma2008.it/index.php
[60] Deputy Chair of the College Of Complex Project Managers and former national president of the Australian Institute of Project Management

methods for training NextGen leaders. The approach taken by the Competency Standard for Complex Project Managers brings elements of leadership into consideration that are not clearly covered in the FAA program but seem to be essential characteristics of what is needed to lead such a transformational effort.

Collaborative Public Management

Although it is not a specific approach to leadership development, collaborative public management focuses on a specific competency—working collaboratively—that is an essential skill in large-scale systems integration efforts. Collaborative public management can be defined as the process of facilitating and operating in multi-organizational arrangements in order to remedy problems that cannot be solved—or solved easily—by single organizations.[61] As stated in one research article: *"…in most cases, the implementation of new programs at the national levels requires U.S. public administrators to be prepared to work a variety of different kinds of Collaborative Public Management actors both within and without government—actors drawn from different organizational cultures, influenced by different sets of incentives, and directed toward different goals"* [62]

The list of organizations and entities that FAA needs to work collaboratively with in order to bring NextGen to fruition is extensive: the aviation community, including airlines, cargo carriers, airports, manufacturers, business and general aviation; other government agencies including DoD and NASA; and, the foreign government entities responsible for their air traffic systems. Cross-sector collaboration (e.g., between government and business) is increasingly seen as an important strategy for dealing with critical and complex problems but the research evidence indicates that it is hardly easy.[63]

Traditional management structure and hierarchies often struggle trying to deal with society's most complex and pressing issues. Research indicates that traditional management hierarchies, which are designed to solve 'routine' problems, often fail when the problems become more interrelated and complex. One article noted that all but one (human capital management) of the 26 programs listed in the Government Accountability Office's high-risk series (which includes NextGen) deals directly with a federal initiative that collided with existing bureaucratic "boundaries", that is, the things organizations are responsible for doing and what powers and functions lay elsewhere.[64]

Given the challenges inherent in any cross-sector collaboration and the complexity of NextGen, having leaders with strong collaboration skills is essential to success. FAA cannot realize the NextGen vision alone, or with a few key partners. It will have to engage and partner with a

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[61] Michael McGuire, "Collaborative Public Management: Assessing What We Know and How We Know It." Bloomington. Public Administration Review (December 2006 • Special Issue).
[62] Structures for Policy Implementation: An Analysis of National Legislation, 1965 – 66 and 1993 – 94. Thad E. Hall and Laurence J. O'Toole. 2000.
[63] McGuire, December 2006.
[64] Donald F. Kettl, "Managing Boundaries in American Administration: The Collaboration Imperative." University of Pennsylvania. Public Administration Review (December 2006 • Special Issue).

complex mix of public and private organizations and entities over an extended period of time to make NextGen a reality.

Identifying the skills that are needed and securing the appropriate training or experienced individuals is a key step. Researchers have attempted to identify and categorize different collaboration competencies including one effort which looked at four important competencies for "boundary spanners" who are key agents who manage within an inter-organizational context by:

- building sustainable relationships;
- managing through influencing and negotiation;
- managing complexity and interdependencies; and,
- managing roles, accountabilities, and motivations.

The skills that make up these competencies have also been considered:

- communicating to create shared meaning,
- understanding,
- empathy,
- conflict resolution,
- networking,
- creativity,
- innovation,
- empowerment, and
- building trust as the "lubricant."

Building trust has been highlighted as particularly important to getting things done since there often are not binding legal agreements linking the parties together in a cross-sector collaboration.

The roles of *sponsors* and *champions* in the collaboration process have also been emphasized. Sponsors are defined as individuals who have considerable prestige, authority, and access to resources they can use on behalf of the collaboration, even if they are not closely involved in the day-to-day collaborative work. Champions are people who focus intently on keeping the collaboration going and use process skills to help the collaboration accomplish its goals. [65]

One study looked at the activities that collaborative public managers engage in[66]: These managers, unlike other public managers, do most of their work outside of the organizational hierarchy. They work in networks of stakeholders. These networks have the following characteristics:

- have advantages in information and creativity;
- are similar to nonprofits in that there is a strong element of voluntary compliance;
- use deliberative processes to reach agreements based on consensus;

[65] John M. Bryson, Barbara C. Crosby, Melissa Middleton Stone, "The Design and Implementation of Cross-Sector Collaborations: Propositions from the Literature." University of Minnesota. Public Administration Review. (December 2006 • Special Issue). See also Appendix G for a listing of 22 Propositions Regarding Cross-Sector Collaborations from this article.
[66] Robert Agranoff, "Inside Collaborative Networks: Ten Lessons for Public Managers."

- are distinguished by public sector knowledge management;
- need resources (i.e., have costs) to do their work; and
- are not replacing public bureaucracies.

A recent article published in the Review of Public Administration Personnel[67] found that the most basic and critical factor of collaboration is *interpersonal understanding*, which only comes through time and experience. The author acknowledged, however, that interpersonal understanding is difficult to assess and reward and that the structure of federal pay systems may actually adversely impact the goal of enhancing collaborative governance.

Collaboration is not a substitute for traditional hierarchy and bureaucracy but in the 21st Century, it is becoming a standard component of and complement to public management. FAA will need all the help it can get in implementing NextGen. Managing those relationships successfully will require extensive efforts on the part of the agency to develop leaders who possess the requisite skills and competencies.

DEVELOPMENT OF THE LEADERSHIP COMPETENCY MODEL

Success and failure share a common thread: leadership, or the lack thereof. The leadership issues that were discussed earlier each contain important elements that would be helpful in implementing NextGen. The same can be said for FAA's own leadership program. The Panel believes that FAA's current approach to leadership development is well grounded in contemporary leadership training principles and fits well into the agency's culture. However, the skills and competencies needed to implement NextGen are somewhat different from those needed by leaders in more traditional leadership roles and blending of aspects of FAA's current program with other approaches is needed.

As noted, FAA's model is comprehensive. Consider the Executive Success Profile provided to those aspiring to become executives to guide them in their leadership development. In addition to the four dimensions, the 16 competencies based on those dimensions and the 103 behavioral anchors based on the competencies, there are hundreds of "on-the-job actions," "workshops and seminars" and "professional readings" available to the hopeful executive. Virtually any subject relating to leadership and management, including all of the elements mentioned in the preceding sections of this report, is included in some form in this program.

A comparison of FAA's competencies and behavioral anchors with the information sources discussed earlier (Results form Phase I of this Study, Results of the Academy's Senior Leader Colloquia, General Electric's Leadership Development Model, Complex Project Manager Program and Collaborative Public Management) finds that FAA's program shares a number of common elements with these sources. Each of FAA's 16 competencies matches up with competencies identified from the other information sources, usually multiple times. The vast majority of the 103 Behavioral Anchors also match up with the elements of the other information sources.

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[67] Heather Getha-Taylor, "Identifying Collaborative Competencies." Review of Public Personnel Administration. (September 15, 2008.)

As noted earlier, these dimensions and competencies are included in the selection, development and evaluation of FAA managers and executives. The Panel does not believe FAA needs to add additional competencies or behavioral anchors as much as it needs to focus them more specifically on the primary responsibilities each NextGen-related leadership position entails. Additionally, the agency should ensure that having determined the proper skill and competency mix it requires from such executives, it applies the standards with rigor to the selection, development and evaluation processes.

The FAA competency/behavioral anchors were compared by the study team with those identified in the cited information sources. Based on the total number of matches as well as the number of sources each competency matched with, the following were found to be the most critical NextGen competencies:

- Competency 10: *Building Alliances*
- Competency 14: *Strategy Formulation*
- Competency 2: *Accountability And Measurement*
- Competency 13: *Vision*
- Competency 12: *Integrity and Honesty*
- Competency 6: *Building Teamwork and Cooperation*
- Competency 9: *Communication*

Building on the FAA competencies and augmenting them with its research findings, the Panel has identified the following leadership competencies as critical to a successful transition to NextGen:

- Accountability and Measurement
- Problem Solving
- Business Acumen
- Customer Focus
- Building Teamwork and Cooperation
- Communication
- Building Alliances
- Interpersonal Relations and Influence
- Integrity and Honesty
- Vision
- Strategy Formulation
- Agility
- Public Sector Savvy
- Complex Project Management

    o Strategy and Project Management
    o Business Planning, Lifecycle Management, Reporting, and Performance Measurement
    o Change and Journey (Leading change/change management)

- o Innovation, Creativity, and Working Smarter
- o Organizational Architecture
- o Systems Thinking and Integration
- o Leadership
- o Culture and Being Human (Understanding cultural and people issues)
- o Probity and Governance (Integrity and exercise of authority)
- Collaborative Public Management

By focusing on the critical NextGen competencies in its current leadership program and taking the steps outlined in the preceding paragraph, the FAA will move closer to providing the NextGen effort with the leadership it needs, at all levels of the organization, to be successful.

Validation of Leadership Competencies

Ten respondents rated the Leadership competencies. A total of 18 of the 23 competencies listed were rated as either Important or Extremely Important by at least 50 percent of the respondents, and eight of the 18 were also rated Frequently Used or Very Frequently Used by at least 50 percent of the respondents. Four of the competencies rated highly in the first two groups were also rated as Difficult to Learn.

From these results, it appears that the most critical Leadership competencies for NextGen are the following:

- Accountability and Measurement
- Building Teamwork and Collaboration
- Communication
- Interpersonal Relations and Influence
- Agility
- Collaborative Public Management
- Strategic Thinking and Integration

Just as important as the individual competencies are the behavioral anchors identified by this comparison. The behaviors are much more descriptive of the specific qualities found to be important. The Panel believes that FAA should use this information to build a leadership program specifically aimed at building NextGen implementation competencies.

Volume 2 of this report includes the NextGen Leadership Competency Model with validated competencies, knowledge/skill required and behavioral indicators that the above data sources suggest are critical to NextGen success.

FINDINGS

The Panel's review of FAA's leadership competencies and research of other sources yielded the following findings:

1. The most important elements of successful large-scale organizational changes are the responsibilities of leaders.

2. External experts knowledgeable of NextGen and its challenges believe that strong leadership at every level of the FAA organization is critical, and from a number of observations, lacking.

3. FAA's current leadership program is comprehensive in its coverage of leadership competencies and should provide a good platform for designing the appropriate training and professional experience needed by NextGen leaders.

4. GE's Change Management model provides principles that FAA/ATO may wish to explore and model.

5. NextGen can be described as a "complex project," and NextGen leaders may benefit from the principles and concepts contained in the Competency Standard for Complex Project Management.

6. Given the challenges and complexities associated with NextGen, strong collaboration skills are essential to success.

RECOMMENDATIONS

1. **As a first priority, the Panel recommends that ATO work with FAA to tailor existing leadership programs to focus on the critical competencies needed to ensure a successful transition to NextGen**. Leadership was identified as the single most important element of success for large-scale programs like NextGen. The vast array of leadership programs now available to ATO leaders provides a solid foundation for general leadership development, but the National Academy's research showed that some tailoring of these programs is necessary to focus on the specific leadership skills needed for the NextGen transition. The Panel recommends that FAA use the NextGen Leadership Competency Model that is provided with this report (in Volume 2) to enhance its leadership development program to support NextGen. To fully implement the Panel's recommendation, ATO should also use this information to add additional elements to NextGen leadership training and development. This includes:

   - Using aspects of GE's approach to leadership development and change management by: focusing on leadership development as an organizational value to include the complete support of senior leaders; stressing the importance of organizational values and ensuring they are thoroughly integrated into FAA training and performance evaluations, and focusing on change management efforts on cultural acceptance issues

   - Providing training in Collaborative Public Management to NextGen leaders

   - Training leaders on the unique challenges of management and leadership in the government

   - Focusing on the unique leadership challenges of leading a multisector workforce

- Paying particular attention to the elements of complexity that characterize NextGen and the competencies needed to manage complex projects

2. **The Panel recommends that FAA design and deliver a Leadership Systems Integration Laboratory**. In Phase II, the study team learned that FAA's leadership program is designed to build and sustain a common set of competencies which apply to all FAA managers and executives, as well as those who aspire to be leaders. ATO is using these programs in recruitment, performance appraisal, and training processes as mandated by FAA.

   FAA is to be commended for the comprehensive and thorough work it has done in establishing a leadership program, but based on the study team's research, the FAA program may not be adequate to prepare ATO leaders for the unique and demanding change management and systems integration efforts that lie ahead. While developing these competencies cannot be accomplished quickly, the Panel believes that ATO's leaders could benefit from a more structured, "hands-on" approach to developing and honing the skills that will facilitate NextGen systems integration.

3. **The Panel recommends that ATO design and deliver a Technical Leadership Development Program.** As the study team continued to conduct interviews and engage subject matter experts in Phase II, a key finding emerged regarding the leadership skills needed to successfully transition to NextGen. Colloquia participants, as well as individuals from academia and private industry, highlighted the importance of strong *technical* leadership skills. Specifically, they commented that ATO will need leaders with strong technical backgrounds to supervise and manage new and evolving NextGen programs. ATO's challenge is to be able to identify candidates for leadership positions that possess both the strong technical grounding as well as the managerial expertise needed to make NextGen a success. Often, senior level employees are strong in one of these areas, but seldom do they have equal skill levels in both**.**

   The study team's research found confirmation in academia that senior employees need to be prepared for transition to broader managerial responsibilities. As an example, the University of Wisconsin has designed a program called the Technical Leadership Certificate.[68] This program is tailored to meet the needs of technical professionals who are transitioning from technically focused disciplines into managerial and leadership roles. The Technical Leadership Certificate is specifically designed to provide the body of knowledge that the technical leader needs to be effective in his or her organization. The program covers a broad array of topics from business strategy to process improvement—and from change management to financial metrics—to deliver the depth of knowledge needed to be successful in today's global economy.

   Similar to the University of Wisconsin, the study team learned that the School of Systems and Enterprises at the Stevens Institute of Technology is designing a solutions engagement workshop for IBM which will provide senior engineers hands-on development to become better technical leaders. ATO already has an established relationship with the Stevens

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[68] http://exed.wisc.edu/tlcertificate/default.asp

Institute and should expand its partnership with the school to design a program to develop its technical leaders.

4. **The Panel recommends that ATO recruit from external sources to identify executives to partner with ATO Executives.** The Panel's research showed that ATO managers could benefit from having the fresh perspectives of external leaders who have had experience in managing large-scale systems integration efforts or other programs of similar scope and complexity as NextGen. Colloquia participants related success stories in which they described the blending of external expertise with institutional knowledge of internal leaders.

5. **The Panel recommends that FAA implement a form of Supervisory Pay to attract strong supervisors.** FAA's Core Compensation System uses 12 broad pay bands in lieu of the General Schedule system of 15 grades and 10 steps. The two top bands (L and M) were added to the original bands (A-K) to accommodate the perceived need for additional coverage of managerial and specialty positions. This change has created a situation in which senior technical staff who move through the pay bands and receive annual increases can reach salary levels that match or, even exceed, those of their managers. This situation may actually serve as a "disincentive" for technical experts to move into supervisory positions. To mitigate this potential circumstance, some agencies that use pay banding as a key element of their alternative systems provide some type of pay differentials to compensate managers for the additional responsibilities associated with supervision. While there are some existing flexibilities in the Core Compensation System that provide incentives for supervision, these may not be adequate.

CHAPTER 7
ADDITIONAL IMPLEMENTATION CHALLENGES

OVERVIEW

The Panel believes that ATO is in the difficult position of addressing its workforce challenges in an organizational environment that seems ill-suited to successfully managing its long-term workforce planning efforts. Perceptions of lack of clarity around the NextGen vision, tense labor-management relations, and an overly complex governance structure are all areas of concern. Any one of these factors could threaten ATO's success, but together, they may be predictors of failure. The Panel acknowledges that ATO has initiated several efforts to address some of these issues and applauds the steps taken by ATO after issuance of the Panel's Phase I *Preliminary Findings and Observations*. However, a follow-up assessment will be essential to evaluate the outcome of these efforts and to ensure success. ATO's efforts include:

- **Communications**: Working in collaboration with the VP for Communications, the Senior VP for NextGen and Operations Planning has initiated several efforts to improve employees' understanding of NextGen. A new video highlighting the benefits and progress of NextGen has been released and is available on the FAA website. ATO has also created a new NextGen website, and a series of "Lunch and Learn" sessions was recently conducted to provide more information about NextGen. Finally, a NextGen orientation for new employees was developed to educate the workforce on the challenges of the current system and the importance of the NextGen transition.

- **Acquisition Workforce Council:** ATO has reestablished its Acquisition Workforce Council, which existed in ATO's predecessor organization, ARA. The Council is charged with ensuring that ATO hires and trains the right personnel to manage a projected $5.6 billion investment over the next five years, and in the years beyond.

- **Governance:** ATO has commissioned a separate study to assess the NextGen governance structure. While the specific objectives of the study were not shared, the National Academy study team was informed by the vendor conducting the study that the review will encompass NextGen documentation and ATO's systems integration plan.

- **Culture**: ATO recently conducted a market survey to identify potential vendors to conduct an assessment of its culture. The purpose of this long-term assessment would be to help ATO leaders understand the desired behaviors that will complement the recent realignment and any anticipated obstacles along the way. A key part of this assessment will include executive coaching provided by external sources to help ATO leaders model the corporate executive leadership and decision making processes that are needed from senior managers.

RECOMMENDATIONS

In addition to the recommendations provided in Chapters 2 through 6, the Panel makes the following additional recommendations to address NextGen implementation challenges:

NextGen Plans

The NextGen Implementation Plan lays out FAA's plan to transition from today's National Airspace System to NextGen. However, this Plan does not yet include the appropriate level of detail to satisfy Congress, GAO, and stakeholders that NextGen planning is progressing adequately. In its most recent report on NextGen progress,[69] GAO noted that aviation industry stakeholders think that NextGen planning documents lack the information industry needs to implement NextGen by 2025. ATO's Director of NextGen Integration and Implementation informed the Academy study team that ATO has implemented a planning process and detailed plans will be published in January 2009; however, these plans are still being drafted.

While complex efforts like NextGen require flexibility in the planning process to accommodate changes in the environment and technology, once critical decisions are made regarding what NextGen programs will be developed and implemented, **the Panel recommends that ATO make it a priority to develop and communicate detailed plans for integrating and implementing these programs with timelines, milestones and funding requirements. That is not to say that these plans will never change, but they are needed to guide the NextGen transition.**

Accountability and Metrics

Experts who understand the challenges of large-scale efforts like NextGen consistently pointed to performance accountability as a critical element of success. The NextGen Implementation Plan is the mechanism by which FAA holds itself accountable for its NextGen commitments, but this plan does not include detailed milestones and metrics. ATO reported that a proposed NextGen Portfolio Work Plan will respond to this concern for each of the seven NextGen solution sets (operational capability and supporting policy) by providing timelines, milestones, deliverables, and planned funding for each key capability. Additionally, ATO plans to implement a portfolio management process that will identify and track commitments in accordance with established timelines and metrics. This effort is still under development and is not fully implemented.

In light of the concerns raised by Congress and other stakeholders, the Panel recommends that ATO develop and implement a comprehensive accountability system that integrates all of the critical NextGen solution sets with timelines, metrics, and resource requirements.

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[69] Ibid, September 2008.

Labor-Management Relations

FAA's workforce is highly unionized, and ATO's ability to successfully transition to NextGen will require that the agency successfully engage the unions that represent its employees. The labor-management environment at FAA has been strained for years. While this problem has resisted solution in the past, to ensure NextGen success, FAA's leaders will need to find ways to break through the obstacles that have impeded successful relations with its unions and create a new set of guiding principles for managing these relationships.

The Panel recommends that FAA and ATO develop and implement a strategy to engage the unions on NextGen.

NextGen Systems Integration

The Panel is concerned that ATO service units that have a role in the NextGen transition may not have clear, straightforward business processes that support integration of NextGen programs. Rather, the business processes in place may be more supportive of ATO's operational mission than its long-term NextGen vision.

The Panel recommends that ATO evaluate the business processes embedded in the service unit operations to determine whether they are optimally designed to support NextGen. The Panel further recommends that ATO review the findings of the Activity Value Analysis conducted by Booz-Allen & Hamilton in 2004 to identify systems and processes that can be improved to better support NextGen.

Identifying R&D Partners

Colloquia participants cautioned that NextGen cannot succeed by doing "business as usual." ATO needs to examine its relationships with established partners and, if necessary, seek new and more diverse expertise in R&D. Continuing to rely on one or two providers for this critical work may not serve ATO well in the future.

The Panel recommends that ATO evaluate the approach used to identify research and development partners, with a view toward increasing competitiveness and infusing the organization with fresh perspectives.

HR Operations

Currently, ATO's staffing services are provided by the FAA Assistant Administrator for Human Resources, while some workforce management advisory services are provided by ATO staff reporting to the VP for Strategy and Performance. Feedback from senior ATO managers and others revealed concerns about the availability of adequate HR services to support NextGen. FAA's HR staff has also expressed concerns about the increasing number of supporting HR staff in general, but a specific concern was raised about the processes used by ATO's HR staff.

Overall, there seems to be a lack of understanding of the roles and responsibilities of FAA's HR staff in relation to the ATO staff that may adversely affect ATO's ability to acquire and retain the workforce it needs for NextGen. The Panel believes that more integrated approach to HR services is needed to focus on marketing, recruiting, and staffing positions for NextGen.

The Panel recommends that FAA and ATO evaluate the structure and content of their human resources (HR) operations and services to ensure that both are optimally designed to support NextGen.

PANEL AND STAFF

PANEL

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J. Victor Lebacqz—Founder, VICC Associates; Former Associate Administrator for Aeronautics Research, National Aeronautics and Space Administration (NASA); Deputy Associate Administrator of Aeronautics and Space Technology (NASA); Prior positions with NASA Ames Research Center: Associate Center Director; Deputy Director, Ames Aerospace Directorate; Program Director, Division Chief, Branch Chief, NASA Aviation System Capacity; Lecturer, Stanford University.

Nancy G. Leveson—Nancy Leveson is Professor of Aeronautics and Astronautics and also Professor of Engineering Systems at MIT. She is an elected member of the National Academy of Engineering (NAE). Prof. Leveson conducts research on the topics of system safety, software safety, software and system engineering, and human-computer interaction. In 1999, she received the ACM Allen Newell Award for outstanding computer science research and in 1995 the AIAA Information Systems Award for "developing the field of software safety and for promoting responsible software and system engineering practices where life and property are at stake." In 2005 she received the ACM Sigsoft Outstanding Research Award. She has published over 200

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[*] *Academy Fellow*

research papers and is author of a book, "Safeware: System Safety and Computers" published by Addison-Wesley. She consults extensively in many industries on the ways to prevent accidents.

Robert Tobias*—Director and Distinguished Adjunct Professor, Institute for the Study of Public Policy Implementation, American University; Member, IRS Oversight Board. Former positions with National Treasury Employees Union: National President; Executive Vice President; General Counsel. Former Member, Commercial Activities Panel.

STAFF

J. William Gadsby,* *Vice President for Academy Studies*—Former Director, Management Studies Program, National Academy of Public Administration. Former positions with U.S. General Accounting Office: Senior Executive Service; Director, Government Business Operations Issues; Director, Federal Management Issues; Director, Intergovernmental and Management Issues. Former Assistant Director, Financial Management Branch, U.S. Office of Management and Budget.

Alethea Long-Green, *Program Area Director*—HR Director for Academy Studies, National Academy of Public Administration; Director of Human Capital Planning and Management, U.S. Department of Commerce; Director of Human Resources, Chief of the Workforce Effectiveness Division, U.S. Patent and Trademark Office; President, Strategic Technical Resources, Inc.; Vice President, Tech International, Inc.; Consultant with various contractors to the Department of Defense.

Darlene F. Haywood, *Project Director*—Former Human Resources Consultant, Department of Homeland Security; Former positions with the Department of Commerce: Chief, Strategic Workforce Management Group, International Trade Administration; Commerce Demonstration Project Manager; Commerce Classification Program Manager. Ms. Haywood has more than 34 years as a Federal human resources management professional.

Myra Howze Shiplett, *Former Project Director*—President, RandolphMorgan Consulting; Former head of the Academy's Center for Human Resources Management; former career executive at the Administrative Office of the U.S. Courts, the Federal Housing Finance Board, the Department of State, the Office of Personnel Management and the Federal Trade Commission.

Leslie Overmyer-Day, *Senior Analyst*—Industrial/Organizational Psychologist. Former Director and consultant with the Ambit Group, nine years in private practice supporting federal clients in DoD and civilian agencies. Additional experience conducting organizational studies and training development for a variety of federal clients. Areas of concentration include skill inventories, predictors of turnover, and training needs analysis.

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* *Academy Fellow*

Patricia Cornwell Johnson, *Senior Advisor*—Former Senior Executive Service; Director, Office of Human Resources, U.S. Equal Opportunity Commission. Positions with Washington Metropolitan Area Transit Authority (WMATA); Labor Relations Counsel, McDonald's Corporation; Regional Field Attorney, National Labor Relations Board.

Joanna Lange, *Senior Advisor*—Former Senior Associate with GRA Inc. Ms. Lange's human resources consulting emphasis areas include strategic human capital planning, workforce analysis, workforce planning, recruitment, succession, and restructure analysis and planning. Ms. Lange has over 25 years of Federal Service as a Human Resources (HR) practitioner.

Ed Stephenson, *Senior Advisor*—Human capital management senior advisor on previous Academy studies including the National Aeronautics and Space Administration; guest lecturer on human capital management for the University of Maryland's Institute for Global Chinese Affairs; more than 35 years experience with management and human capital issues at the U.S. Government Accountability Office and the District of Columbia Control Board.

Joseph Thompson, *Senior Advisor*—President, Aequus, Inc., a management consulting firm. Former Under Secretary for Benefits, U.S. Department of Veterans Affairs. Director, VA Regional Office, NY. Chairman, Federal Executive Board, NY.

Dawn Fratrin, *Senior Analyst*—MPA, Maxwell School of Syracuse University. Former Evaluator, Office of Inspector General, Department of Interior; Program Analyst, Department of Health and Human Services; Peace Corps Volunteer, Malawi, Africa.

Christine Sterling, *Senior Research Analyst*—Project staff member on past Academy studies including: The 21st Century Federal Manager Series; Broadband Pay Experience in the Public Sector; The Transforming Power of Information Technology: Making the Federal Government an Employer of Choice for IT Employees; and NASA Human Capital Flexibilities for the 21st Century Workforce.

Patricia Esslinger, *Groupware Facilitator*—Previous assignments in various Federal human resources management specialties and held supervisory and management positions in both operations and policy development.

Julia Mensah, *Research Associate*—Project staff member on past Academy studies including: NASA: Balancing a Multisector Workforce to Achieve a Healthy Organization and The Corporation for National and Community Service: Building a Foundation for the Future.

Ednilson Quintanilla, *Research Associate*—Former Supervisor's Analyst, Santa Cruz County Board of Supervisors, County of Santa Cruz, CA; Alternate County Planning Commissioner, County of Santa Cruz, CA; Alternate County Transportation Commissioner, County of Santa Cruz, CA; Chair of the Board of Directors, Central Coast Energy Services, CA; Chair of the Board of Directors, Women's Crisis Support, Santa Cruz, CA.

INDIVIDUALS AND ORGANIZATIONS INTERVIEWED
OR CONTACTED
(Titles and locations listed are as of the time of the Academy's contact)

FEDERAL AVIATION ADMINISTRATION

David Cook, Office of Corporate Learning, Office of the Assistant Administrator for Human Resources
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Kerry Lange, Manager, Executive Resources Staff
Tony Mello, Director, Safety Investigations
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Darlene Olson, Director Human Capital Management

Air Traffic Organization
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Victoria Cox, Vice President, NextGen and Operations Planning
Rick Day, Vice President for En Route and Oceanic Services
Richard Jehlen, Director, Planning & Procedures
Bruce Johnson, Vice President, Terminal Services
Eugene D. Juba, Senior Vice President for Finance
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Cynthia Rooney, Director, Leadership and Professional Development
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Patricia Watts, Director, FAA Centers of Excellence
Pamela Whitley, Acting Manager, NextGen Solution Integration Group
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DebbWilson, Director of Acquistition Policy and Contracting
Steve Zaidman, Vice President, Technical Operations Services

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Adam Greco, Air Traffic Domain Director
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Jennifer Morris, Manager, Capacity Analysis Group
Earl Stein, Manager, Human Factors Team
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Charles Leader, Director, JPDO
Robert Pearce, Deputy Director, JPDO

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Gerald L. Dillingham, Director, Civil Aviation Issues, Physical Infrastructure Team
Susan A. Fleming, Director, Physical Infrastructure Team
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Chris Pehrson, Staff Liason to JPDO, Department of the Air Force
Jeffrey C. Phillips, NASA Johnson Space Center Management Forums Manager
Terri Robinson, Human Resources Manager, National Aeronautics and Space Administration
Phyllis F. Scheinberg, Chief Financial Officer/Assistant Secretary for Budget and Programs
U.S. Department of Transportation
Tiffany Schuffert, Administrative Support Assistant, Workforce Management and Development
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Jaiwon Shin, Deputy Associate Administrator for Aeronautics Research Mission Directorate,
NASA
Richard Spires, Deputy Commissioner, Internal Revenue Service
James Stofan, Deputy Assistant Administrator- Education Programs Integration, National
Aeronautics and Space Administration

Paul R. Thompson, Chief, Executive Resources Group, Office of Personnel Management
Pete Verga, Principal Deputy Assistant Secretary for Defense (Homeland Defense), U.S. Department of Defense

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Mark Terranova, Associate Director, University of Maryland Baltimore County
Amy Torani, Program Manager—Customer Education, General Electric Corporate Training, Crotonville
Dinesh Verma, Dean of the School of Systems and Enterprises, Stevens Institute of Technology

UNION REPRESENTATIVES

William Chouinard Jr., President, American Federation of State County and Municipal Employees (AFSCME) Local 2953
Susan Grundmann, General Counsel, National Federation of Federal Employees (NFFE), Washington, DC
Cassie Kerner, Special Assistant to the President, National Federation of Federal Employees (NFFE), Washington, DC
Ann Robinson, National Organizer, American Federation of Government Employees (AFGE)

COLLOQUIA PARTICIPANTS

Joseph Del Balzo, President and CEO of JDA Aviation Technology Solutions. He previously served as Acting Administrator and Deputy Administrator of the U.S. Federal Aviation Administration (FAA). He also served as FAA's Executive Director of System Operations. He led the definition of requirements for new technology, installing, operating and maintaining all air traffic control systems and facilities, operating the nation's air traffic control system, and developing and overseeing safety regulations for all aircraft, airline, and airmen in the U.S. system.

Roy Bridges, Director, Space and Science Services for Northrop Grumman Technical Services. Former Director of NASA's Langley Research Center and John F. Kennedy Space Center. As director of the Langley Research Center, he was responsible for many aeronautical and space research programs for NASA. As director of the Kennedy Space Center, Bridges was responsible for managing NASA's only site for processing and launch of the Space Shuttle vehicle; processing the payloads flown on both the Shuttle and expendable launch vehicles; and overseeing expendable vehicle launches carrying NASA payloads. Bridges is also a former NASA Astronaut and retired U.S. Air Force Major General.

John Cavolowsky, Deputy Program Director, Airspace Systems Program at NASA HQ. He has supported the Joint Planning and Development Office in development of the Integrated National Plan for the Next Generation Air Transportation System 2025. Cavolowsky is an experienced research and development project and program manager for aviation operations systems and aerothermodynamics, having held various R&D and management roles since joining the NASA Ames Research Center at Moffett Field, California in 1989.

Jack Clemons, Formerly Senior Vice President of Lockheed Martin Transportation and Security Solutions in Rockville, Maryland. He worked on the NASA Apollo and Skylab programs for the TRW Systems Group in Houston, Texas, and on the NASA Space Shuttle program for IBM in Houston. Mr. Clemons joined Lockheed Martin's Air Traffic Management Company in 1992 as functional manager of software development and was Director of en Route Programs, Vice President for Air Traffic Control Engineering, and then Senior Vice President of Engineering, Technology and Operations. He retired from Lockheed Martin in 2005 in order to write and consult.

Julian Earls, Executive-in-Residence, Nance College of Business Administration, Cleveland State University. He retired in December as director of the NASA Glenn Research Center, after a career with the agency that begun in 1965. Dr. Earls has written 28 publications for technical and educational journals. Last October, Cleveland State awarded him its most prestigious non-academic recognition, The President's Medal.

Frank Frisbie, Vice President of Strategic Planning at Apptis, Inc. He is a former senior executive with the Department of Defense and the Federal Aviation Administration (FAA) and more recently Vice President and Senior Client Executive for Civil Aviation with Northrop Grumman Information Technology. He joined the FAA in 1958, where he held a variety of

positions. In his last two FAA posts, he was directly responsible for research, development, system engineering, acquisition, deployment, and maintenance of all 20,000 air traffic control facilities in the United States.

Jim Jennings, Deputy Program Manager/COO, Space Gateway Support, LLC). Mr. Jennings served as Associate Administrator, Institutions and Management, NASA Headquarter, Washington, D C. In this position he managed the functional areas of Human Capital Management, Infrastructure Management, and Headquarter Operations, Diversity and EEO, Security and Program Protection, Institutional Planning, Procurement, Small Business Office, NASA Shared Services Center and Chief Health and Medical Officer.

Mr. Jennings is a former Deputy Director of the Kennedy Space Center (KSC). In this capacity he was responsible for assisting the Director in determining and implementing Center policy and in managing and executing Center missions as well as lead center and program responsibilities. Previously, as KSC's Deputy Comptroller, Jennings was responsible for the process of preparation, defense, and execution of the KSC budget. Jennings' 35-year NASA career has included management and analyst positions at the Marshall Space Flight Center and NASA Headquarters.

Stephen Kalish, Partner, Deep Water Point (DWP), LLC. DWP is an independent new business consultancy. Mr. Kalish is former Civil Group President, a $1.3 B business, at the Computer Science Corporation (CSC), the principal IT services provider to all federal civil agencies, and especially to the FAA in the development and maintenance of the nation's air traffic control and air management systems. He joined CSC in 1986 as manager of systems engineering for a $1 billion program with NASA's Goddard Space Flight Center. In this capacity he supported flight missions and data systems, managed the systems development methodology and chaired the Central Engineering Board. Additionally, he served as Vice President, Strategic Development, redefining the division's strategic plan, new business guidebook and proposal development system. Prior to being promoted to Group President, he was Vice President of CSC's Transportation Solutions Division.

Donna Mclean, Chairman of the Board of Directors of the National Railroad Passenger Corporation (Amtrak). A former official at the U.S. Department of Transportation, she is owner of Donna McLean Associates, LLC, a Washington, D.C.-based consulting firm specializing in transportation policy. Prior to forming Donna McLean Associates, McLean was Assistant Secretary for Budget and Programs and Chief Financial Officer of the U.S. Department of Transportation (DOT). She had also served at the DOT as the Assistant Administrator for Financial Services at the Federal Aviation Administration beginning in 1999. From 1993 to 1999, McLean was a professional staff member of the Aviation Subcommittee of the House Transportation and Infrastructure Committee in the U.S. House of Representatives.

Martin Pozesky, President and CEO of MTP Associates. Since 1994, he has provided technical, management, and strategic consulting services in air traffic control programs encompassing telecommunications, surveillance, automation, weather, navigation, and landing, and avionics systems. Before forming MTP Associates, Mr. Pozesky worked for the Federal Aviation Administration, where he retired as Associate Administrator of Systems Engineering and Development. He led U.S. efforts to apply GPS satellite technology to aviation and air traffic

control and has led global initiatives in air traffic management, aviation systems engineering, planning, program formulation, program management, and systems integration for more than 20 years.

Sandy Samuel, Vice President, Aviation Solutions, at Lockheed Martin Transportation and Security Solutions (LMTSS) in Rockville, Maryland. In this position, she is responsible for all domestic and international air traffic management business, including the En Route Automation Modernization (ERAM) program, the FAA's $1.4B modernization effort for the en route environment.

Christopher Scolese, Associate Administrator, NASA. Formerly, Scolese was NASA Chief Engineer where he was responsible for the overall review and technical readiness of all NASA programs. During his tenure at Goddard, which began in 1987, he held key leadership positions including, Deputy Director of the Goddard Space Flight Center, EOS Program Manager and the Deputy Director of Flight Programs and Projects for Earth Science at the Goddard Space Flight Center. He also served as Deputy Associate Administrator in the Office of Space Science at NASA Headquarters.

Agam Sinha, Senior Vice President of The MITRE Corporation and General Manager of the Center for Advanced Aviation System Development (CAASD). He also directs the Federal Aviation Administration's Federally Funded Research and Development Center (FFRDC). CAASD supports the Federal Aviation Administration (FAA), Transportation Security Administration (TSA), and international civil aviation authorities in addressing operational and technical challenges to meet aviation's capacity, efficiency, safety and security needs. Dr. Sinha has over 30 years of experience in aviation and weather systems.

Richard Spires, Deputy Commissioner for Operations Support for the Internal Revenue Service (IRS) with overall responsibility for the Information Technology (IT), Human Capital, Finance, Shared Services and Security functions of the agency. Prior to September 2007, Mr. Spires served as the IRS' Chief Information Officer (CIO), with responsibility for maintaining IRS's 400+ IT systems that administer more than 200 million United States taxpayer records, as well as executive over IRS's Business Systems Modernization (BSM) program, one of the largest and most complex IT modernization efforts undertaken to date. Prior to his Federal service, Mr. Spires held the position of President and Chief Operating Officer at Mantas, Inc., a leading software vendor that provides business intelligence solutions to the financial services, as well as a number of managerial and technical positions at SRA International.

Banavar Sridhar, NASA Senior Scientist for Air Transportation Systems. Sridhar's research interests are in the application of modeling and optimization techniques to aerospace systems. Dr. Sridhar received the 2004 Institute of Electrical and Electronics Engineers, Inc (IEEE) Control System Technology Award for his contributions to the development of modeling and simulation techniques for multi-vehicle traffic networks and advanced air traffic system. He led the development of traffic flow management software, Future ATM Concepts Evaluation Tool (FACET), which received the NASA Software of the Year Award in 2006. He is a Fellow of the IEEE and the American Institute of Aeronautics and Astronautics (AIAA)

David Watrous, President of RTCA, Inc. Prior to joining RTCA, he had a long career in the United States Air Force, the majority of which centered on system acquisition and program management. Dave retired from the USAF in 1987 with the rank of Brigadier General. In that capacity he was director for intelligence, Headquarters U.S. Pacific Command, Camp H.M. Smith, Hawaii.

Woodrow Whitlow, Director of the NASA Glenn Research Center. In this capacity he is Responsible for planning, organizing and directing the activities required to accomplish the missions assigned to the center, which specializes in spaceflight systems, propulsion, power, communications, microgravity science and human research. Formerly he served as the Deputy Director of the NASA John F. Kennedy Space Center. There his duties included assisting the director in determining and implementing center policy and in managing and implementing the center's missions and agency program responsibilities in the areas of processing, launch, and recovery of launch vehicles; processing of spacecraft; and acquisition of launch services.

Richard Wlezien, Professor and Chair, Mechanical Engineering Department, Tufts University. Professor Wlezien teaches courses in fluid dynamics and thermal sciences. Research interests include control of noise generation mechanisms, active control of fluid flow, biological fluid dynamics, experiments in fluid dynamics for undergraduate education, and biologically inspired flight. Wlezien is former Director of the Fundamental Aeronautics Program, Aeronautics Research Mission Directorate, NASA.

COMPETENCY MODEL VALIDATION SURVEY

FAA/Air Traffic Organization Acquisition Workforce Competency Model Validation

1. Leadership Competency Model How IMPORTANT is this competency to the NextGen transition?	Extremely Important	Important	Marginally Important	Somewhat Unimportant	Not At All Important	Response Count
Accountability and Measurement	60.0% (6)	40.0% (4)	0.0% (0)	0.0% (0)	0.0% (0)	10
Problem Solving	40.0% (4)	60.0% (6)	0.0% (0)	0.0% (0)	0.0% (0)	10
Business Acumen	30.0% (3)	50.0% (5)	20.0% (2)	0.0% (0)	0.0% (0)	10
Customer Focus	40.0% (4)	50.0% (5)	0.0% (0)	10.0% (1)	0.0% (0)	10
Building Teamwork and Cooperation	50.0% (5)	50.0% (5)	0.0% (0)	0.0% (0)	0.0% (0)	10
Communications	40.0% (4)	60.0% (6)	0.0% (0)	0.0% (0)	0.0% (0)	10
Building Alliances	60.0% (6)	40.0% (4)	0.0% (0)	0.0% (0)	0.0% (0)	10
Interpersonal Relations and Influence	20.0% (2)	80.0% (8)	0.0% (0)	0.0% (0)	0.0% (0)	10
Integrity and Honesty	50.0% (5)	40.0% (4)	10.0% (1)	0.0% (0)	0.0% (0)	10
Vision	70.0% (7)	20.0% (2)	10.0% (1)	0.0% (0)	0.0% (0)	10
Strategy Formulation	70.0% (7)	30.0% (3)	0.0% (0)	0.0% (0)	0.0% (0)	10
Agility	0.0% (0)	90.0% (9)	10.0% (1)	0.0% (0)	0.0% (0)	10
Public Sector Savvy	10.0% (1)	60.0% (6)	30.0% (3)	0.0% (0)	0.0% (0)	10
Strategy and Project Management	40.0% (4)	50.0% (5)	10.0% (1)	0.0% (0)	0.0% (0)	10
Business Planning, Lifecycle Management, Reporting and Performance Measurement	20.0% (2)	40.0% (4)	40.0% (4)	0.0% (0)	0.0% (0)	10
Change and Journey	20.0% (2)	60.0% (6)	10.0% (1)	10.0% (1)	0.0% (0)	10
Innovation, Creativity and Working Smarter	10.0% (1)	60.0% (6)	20.0% (2)	10.0% (1)	0.0% (0)	10
Organizational Architecture	0.0% (0)	60.0% (6)	40.0% (4)	0.0% (0)	0.0% (0)	10
Systems Thinking and Integration	50.0% (5)	50.0% (5)	0.0% (0)	0.0% (0)	0.0% (0)	10
Leadership	70.0% (7)	30.0% (3)	0.0% (0)	0.0% (0)	0.0% (0)	10
Culture and Being Human	10.0% (1)	60.0% (6)	20.0% (2)	10.0% (1)	0.0% (0)	10

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	Very Frequently	Frequently	Occasionally	Rarely	Never	Response Count
Probity and Governance	0.0% (0)	40.0% (4)	50.0% (5)	10.0% (1)	0.0% (0)	10
Collaborative Public Management	10.0% (1)	70.0% (7)	20.0% (2)	0.0% (0)	0.0% (0)	10
					answered question	10
					skipped question	0

2. Leadership Competency Model How FREQUENTLY will this competency be used?

	Very Frequently	Frequently	Occasionally	Rarely	Never	Response Count
Accountability and Measurement	40.0% (4)	50.0% (5)	10.0% (1)	0.0% (0)	0.0% (0)	10
Problem Solving	40.0% (4)	50.0% (5)	10.0% (1)	0.0% (0)	0.0% (0)	10
Business Acumen	20.0% (2)	40.0% (4)	40.0% (4)	0.0% (0)	0.0% (0)	10
Customer Focus	20.0% (2)	60.0% (6)	10.0% (1)	10.0% (1)	0.0% (0)	10
Building Teamwork and Cooperation	70.0% (7)	20.0% (2)	10.0% (1)	0.0% (0)	0.0% (0)	10
Communications	60.0% (6)	30.0% (3)	10.0% (1)	0.0% (0)	0.0% (0)	10
Building Alliances	50.0% (5)	50.0% (5)	0.0% (0)	0.0% (0)	0.0% (0)	10
Interpersonal Relations and Influence	60.0% (6)	40.0% (4)	0.0% (0)	0.0% (0)	0.0% (0)	10
Integrity and Honesty	50.0% (5)	50.0% (5)	0.0% (0)	0.0% (0)	0.0% (0)	10
Vision	50.0% (5)	30.0% (3)	20.0% (2)	0.0% (0)	0.0% (0)	10
Strategy Formulation	20.0% (2)	40.0% (4)	40.0% (4)	0.0% (0)	0.0% (0)	10
Agility	20.0% (2)	50.0% (5)	30.0% (3)	0.0% (0)	0.0% (0)	10
Public Sector Savvy	0.0% (0)	40.0% (4)	50.0% (5)	10.0% (1)	0.0% (0)	10
Strategy and Project Management	20.0% (2)	60.0% (6)	20.0% (2)	0.0% (0)	0.0% (0)	10
Business Planning, Lifecycle Management, Reporting and Performance Measurement	10.0% (1)	40.0% (4)	40.0% (4)	10.0% (1)	0.0% (0)	10
Change and Journey	10.0% (1)	40.0% (4)	40.0% (4)	10.0% (1)	0.0% (0)	10
Innovation, Creativity and Working Smarter	20.0% (2)	50.0% (5)	10.0% (1)	20.0% (2)	0.0% (0)	10
Organizational Architecture	10.0% (1)	20.0% (2)	60.0% (6)	10.0% (1)	0.0% (0)	10
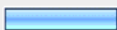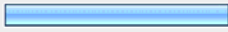
Systems Thinking and Integration	40.0% (4)	40.0% (4)	20.0% (2)	0.0% (0)	0.0% (0)	10
Leadership	60.0% (6)	40.0% (4)	0.0% (0)	0.0% (0)	0.0% (0)	10
Culture and Being Human	40.0% (4)	20.0% (2)	30.0% (3)	10.0% (1)	0.0% (0)	10
Probity and Governance	0.0% (0)	20.0% (2)	70.0% (7)	10.0% (1)	0.0% (0)	10
Collaborative Public Management	0.0% (0)	50.0% (5)	50.0% (5)	0.0% (0)	0.0% (0)	10
					answered question	10
					skipped question	0

3. Leadership Competency Model How DIFFICULT is it to learn or develop this competency?

	Very Difficult	Difficult	Somewhat Difficult	Easy	Very Easy	Response Count
Accountability and Measurement	0.0% (0)	30.0% (3)	40.0% (4)	30.0% (3)	0.0% (0)	10
Problem Solving	20.0% (2)	40.0% (4)	30.0% (3)	10.0% (1)	0.0% (0)	10
Business Acumen	10.0% (1)	30.0% (3)	50.0% (5)	10.0% (1)	0.0% (0)	10
Customer Focus	0.0% (0)	30.0% (3)	50.0% (5)	10.0% (1)	10.0% (1)	10
Building Teamwork and Cooperation	30.0% (3)	40.0% (4)	20.0% (2)	10.0% (1)	0.0% (0)	10
Communications	10.0% (1)	30.0% (3)	50.0% (5)	10.0% (1)	0.0% (0)	10
Building Alliances	30.0% (3)	30.0% (3)	30.0% (3)	10.0% (1)	0.0% (0)	10
Interpersonal Relations and Influence	30.0% (3)	40.0% (4)	20.0% (2)	0.0% (0)	10.0% (1)	10
Integrity and Honesty	20.0% (2)	10.0% (1)	50.0% (5)	0.0% (0)	20.0% (2)	10
Vision	30.0% (3)	40.0% (4)	20.0% (2)	10.0% (1)	0.0% (0)	10
Strategy Formulation	30.0% (3)	30.0% (3)	40.0% (4)	0.0% (0)	0.0% (0)	10
Agility	10.0% (1)	60.0% (6)	20.0% (2)	0.0% (0)	10.0% (1)	10
Public Sector Savvy	0.0% (0)	20.0% (2)	70.0% (7)	10.0% (1)	0.0% (0)	10
Strategy and Project Management	0.0% (0)	70.0% (7)	0.0% (0)	30.0% (3)	0.0% (0)	10
Business Planning, Lifecycle Management, Reporting and Performance Measurement	0.0% (0)	50.0% (5)	20.0% (2)	20.0% (2)	10.0% (1)	10
Change and Journey	30.0% (3)	40.0% (4)	30.0% (3)	0.0% (0)	0.0% (0)	10

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Innovation, Creativity and Working Smarter	10.0% (1)	**60.0% (6)**	10.0% (1)	20.0% (2)	0.0% (0)	10
Organizational Architecture	10.0% (1)	30.0% (3)	**50.0% (5)**	0.0% (0)	10.0% (1)	10
Systems Thinking and Integration	30.0% (3)	**60.0% (6)**	0.0% (0)	10.0% (1)	0.0% (0)	10
Leadership	40.0% (4)	**50.0% (5)**	10.0% (1)	0.0% (0)	0.0% (0)	10
Culture and Being Human	40.0% (4)	10.0% (1)	**50.0% (5)**	0.0% (0)	0.0% (0)	10
Probity and Governance	0.0% (0)	20.0% (2)	**70.0% (7)**	0.0% (0)	10.0% (1)	10
Collaborative Public Management	20.0% (2)	30.0% (3)	**40.0% (4)**	10.0% (1)	0.0% (0)	10
					answered question	10
					skipped question	0

4. Please choose one of the following occupational families (in which you have knowledge or expertise) to review.

		Response Percent	Response Count
Business/Financial Management		20.0%	2
Contracting		0.0%	0
Program/Project Management		**40.0%**	4
Research		10.0%	1
Systems Engineering		30.0%	3
		answered question	10
		skipped question	0

5. Occupational Family: Program/Project Management How IMPORTANT is this competency to the NextGen transition?						
	Extremely Important	Important	Marginally Important	Somewhat Unimportant	Not At All Important	Response Count
Strategic Alignment	40.0% (2)	**60.0% (3)**	0.0% (0)	0.0% (0)	0.0% (0)	5
Organizational Awareness	0.0% (0)	**80.0% (4)**	20.0% (1)	0.0% (0)	0.0% (0)	5
Program/Project Planning	40.0% (2)	**60.0% (3)**	0.0% (0)	0.0% (0)	0.0% (0)	5
Capital Planning and Investment Assessment	20.0% (1)	20.0% (1)	**60.0% (3)**	0.0% (0)	0.0% (0)	5
Program/Project Management	**80.0% (4)**	20.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	5
Stakeholder Management	20.0% (1)	**60.0% (3)**	20.0% (1)	0.0% (0)	0.0% (0)	5
Requirements Analysis	40.0% (2)	**60.0% (3)**	0.0% (0)	0.0% (0)	0.0% (0)	5
Risk Management	**100.0% (5)**	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	5
Technical Expertise	0.0% (0)	**80.0% (4)**	20.0% (1)	0.0% (0)	0.0% (0)	5
Systems Thinking and Integration	**60.0% (3)**	40.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	5
Systems Engineering Management	20.0% (1)	**80.0% (4)**	0.0% (0)	0.0% (0)	0.0% (0)	5
System Safety	**40.0% (2)**	**40.0% (2)**	20.0% (1)	0.0% (0)	0.0% (0)	5
Test and Evaluation Management	**60.0% (3)**	40.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	5
Life Cycle Logistics Strategy Development, Development of Supportability Requirements, and Performance Based Logistics	20.0% (1)	**40.0% (2)**	**40.0% (2)**	0.0% (0)	0.0% (0)	5
Acquisition Planning	20.0% (1)	**80.0% (4)**	0.0% (0)	0.0% (0)	0.0% (0)	5
Market Analysis	0.0% (0)	**40.0% (2)**	**40.0% (2)**	20.0% (1)	0.0% (0)	5
Source Identification and Selection	0.0% (0)	40.0% (2)	**60.0% (3)**	0.0% (0)	0.0% (0)	5
Contract Administration	0.0% (0)	**60.0% (3)**	40.0% (2)	0.0% (0)	0.0% (0)	5
Contractor Performance Management	20.0% (1)	**80.0% (4)**	0.0% (0)	0.0% (0)	0.0% (0)	5
Cost Estimating	40.0% (2)	**60.0% (3)**	0.0% (0)	0.0% (0)	0.0% (0)	5
Financial Planning	0.0% (0)	**60.0% (3)**	40.0% (2)	0.0% (0)	0.0% (0)	5
Formulation of Financial Programs and Budget	20.0% (1)	**40.0% (2)**	**40.0% (2)**	0.0% (0)	0.0% (0)	5

Benefit-Cost Analysis	20.0% (1)	**60.0% (3)**	20.0% (1)	0.0% (0)	0.0% (0)	5
Budget Execution	40.0% (2)	**60.0% (3)**	0.0% (0)	0.0% (0)	0.0% (0)	5
Earned Value Management (EVM)	20.0% (1)	**60.0% (3)**	0.0% (0)	20.0% (1)	0.0% (0)	5
Integrity and Honesty	**60.0% (3)**	40.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	5
Team Building	**60.0% (3)**	40.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	5
Accountability	**80.0% (4)**	20.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	5
Agility	20.0% (1)	20.0% (1)	**60.0% (3)**	0.0% (0)	0.0% (0)	5
Influencing/Negotiating	20.0% (1)	**60.0% (3)**	20.0% (1)	0.0% (0)	0.0% (0)	5
Decision-Making	**60.0% (3)**	40.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	5
Creativity/Innovation	20.0% (1)	**40.0% (2)**	**40.0% (2)**	0.0% (0)	0.0% (0)	5
Information Technology Architecture	0.0% (0)	40.0% (2)	**60.0% (3)**	0.0% (0)	0.0% (0)	5
Configuration Management	20.0% (1)	**60.0% (3)**	20.0% (1)	0.0% (0)	0.0% (0)	5
Systems Integration	20.0% (1)	**80.0% (4)**	0.0% (0)	0.0% (0)	0.0% (0)	5
Information Systems/Network Security	20.0% (1)	**60.0% (3)**	20.0% (1)	0.0% (0)	0.0% (0)	5
Information Technology Performance Assessment	20.0% (1)	**40.0% (2)**	**40.0% (2)**	0.0% (0)	0.0% (0)	5
Infrastructure Design	0.0% (0)	**60.0% (3)**	40.0% (2)	0.0% (0)	0.0% (0)	5
Systems Life Cycle	20.0% (1)	**60.0% (3)**	20.0% (1)	0.0% (0)	0.0% (0)	5
Data Management	20.0% (1)	**60.0% (3)**	20.0% (1)	0.0% (0)	0.0% (0)	5
					answered question	5
					skipped question	5

6. Occupational Family: Program/Project Management How FREQUENTLY will this competency be used?						
	Very Frequently	Frequently	Occasionally	Rarely	Never	Response Count
Strategic Alignment	0.0% (0)	60.0% (3)	40.0% (2)	0.0% (0)	0.0% (0)	5
Organizational Awareness	20.0% (1)	60.0% (3)	20.0% (1)	0.0% (0)	0.0% (0)	5
Program/Project Planning	60.0% (3)	40.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	5
Capital Planning and Investment Assessment	20.0% (1)	20.0% (1)	60.0% (3)	0.0% (0)	0.0% (0)	5
Program/Project Management	100.0% (5)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	5
Stakeholder Management	0.0% (0)	60.0% (3)	40.0% (2)	0.0% (0)	0.0% (0)	5
Requirements Analysis	60.0% (3)	40.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	5
Risk Management	100.0% (5)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	5
Technical Expertise	40.0% (2)	40.0% (2)	20.0% (1)	0.0% (0)	0.0% (0)	5
Systems Thinking and Integration	60.0% (3)	40.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	5
Systems Engineering Management	40.0% (2)	60.0% (3)	0.0% (0)	0.0% (0)	0.0% (0)	5
System Safety	20.0% (1)	60.0% (3)	20.0% (1)	0.0% (0)	0.0% (0)	5
Test and Evaluation Management	20.0% (1)	60.0% (3)	20.0% (1)	0.0% (0)	0.0% (0)	5
Life Cycle Logistics Strategy Development,Development of Supportability Requirements, and Performance-Based Logistics	0.0% (0)	40.0% (2)	60.0% (3)	0.0% (0)	0.0% (0)	5
Acquisition Planning	20.0% (1)	40.0% (2)	40.0% (2)	0.0% (0)	0.0% (0)	5
Market Analysis	0.0% (0)	40.0% (2)	40.0% (2)	20.0% (1)	0.0% (0)	5
Source Identification and Selection	0.0% (0)	20.0% (1)	60.0% (3)	20.0% (1)	0.0% (0)	5
Contract Administration	20.0% (1)	60.0% (3)	0.0% (0)	20.0% (1)	0.0% (0)	5
Contractor Performance Management	60.0% (3)	40.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	5
Cost Estimating	0.0% (0)	80.0% (4)	20.0% (1)	0.0% (0)	0.0% (0)	5
Financial Planning	0.0% (0)	20.0% (1)	60.0% (3)	20.0% (1)	0.0% (0)	5
Formulation of Financial Programs and Budget	0.0% (0)	60.0% (3)	20.0% (1)	20.0% (1)	0.0% (0)	5

Benefit-Cost Analysis	0.0% (0)	**80.0% (4)**	20.0% (1)	0.0% (0)	0.0% (0)	5
Budget Execution	**80.0% (4)**	20.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	5
Earned Value Management (EVM)	**40.0% (2)**	**40.0% (2)**	0.0% (0)	20.0% (1)	0.0% (0)	5
Integrity and Honesty	**60.0% (3)**	40.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	5
Team Building	**100.0% (5)**	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	5
Accountability	**100.0% (5)**	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	5
Agility	20.0% (1)	**60.0% (3)**	20.0% (1)	0.0% (0)	0.0% (0)	5
Influencing/Negotiating	20.0% (1)	**80.0% (4)**	0.0% (0)	0.0% (0)	0.0% (0)	5
Decision-Making	**60.0% (3)**	40.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	5
Creativity/Innovation	20.0% (1)	20.0% (1)	**60.0% (3)**	0.0% (0)	0.0% (0)	5
Information Technology Architecture	0.0% (0)	40.0% (2)	**60.0% (3)**	0.0% (0)	0.0% (0)	5
Configuration Management	**40.0% (2)**	**40.0% (2)**	20.0% (1)	0.0% (0)	0.0% (0)	5
Systems Integration	**60.0% (3)**	40.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	5
Information Systems/Network Security	20.0% (1)	**40.0% (2)**	**40.0% (2)**	0.0% (0)	0.0% (0)	5
Information Technology Performance Assessment	0.0% (0)	40.0% (2)	**60.0% (3)**	0.0% (0)	0.0% (0)	5
Infrastructure Design	20.0% (1)	20.0% (1)	**60.0% (3)**	0.0% (0)	0.0% (0)	5
Systems Life Cycle	0.0% (0)	40.0% (2)	**60.0% (3)**	0.0% (0)	0.0% (0)	5
Data Management	20.0% (1)	**80.0% (4)**	0.0% (0)	0.0% (0)	0.0% (0)	5
					answered question	5
					skipped question	5

7. Occupational Family: Program/Project Management How DIFFICULT is it to learn or develop this competency?						
	Very Difficult	Difficult	Somewhat Difficult	Easy	Very Easy	Response Count
Strategic Alignment	20.0% (1)	**40.0% (2)**	20.0% (1)	20.0% (1)	0.0% (0)	5
Organizational Awareness	0.0% (0)	**60.0% (3)**	20.0% (1)	20.0% (1)	0.0% (0)	5
Program/Project Planning	20.0% (1)	**40.0% (2)**	20.0% (1)	20.0% (1)	0.0% (0)	5
Capital Planning and Investment Assessment	0.0% (0)	**60.0% (3)**	20.0% (1)	20.0% (1)	0.0% (0)	5
Program/Project Management	20.0% (1)	**40.0% (2)**	20.0% (1)	20.0% (1)	0.0% (0)	5
Stakeholder Management	20.0% (1)	**60.0% (3)**	20.0% (1)	0.0% (0)	0.0% (0)	5
Requirements Analysis	0.0% (0)	**60.0% (3)**	40.0% (2)	0.0% (0)	0.0% (0)	5
Risk Management	**40.0% (2)**	20.0% (1)	**40.0% (2)**	0.0% (0)	0.0% (0)	5
Technical Expertise	20.0% (1)	**40.0% (2)**	**40.0% (2)**	0.0% (0)	0.0% (0)	5
Systems Thinking and Integration	20.0% (1)	**40.0% (2)**	**40.0% (2)**	0.0% (0)	0.0% (0)	5
Systems Engineering Management	20.0% (1)	**60.0% (3)**	20.0% (1)	0.0% (0)	0.0% (0)	5
System Safety	20.0% (1)	**60.0% (3)**	20.0% (1)	0.0% (0)	0.0% (0)	5
Test and Evaluation Management	20.0% (1)	20.0% (1)	**60.0% (3)**	0.0% (0)	0.0% (0)	5
Life Cycle Logistics Strategy Development, Development of Supportability Requirements, and Performance- Based Logistics	0.0% (0)	40.0% (2)	**60.0% (3)**	0.0% (0)	0.0% (0)	5
Acquisition Planning	0.0% (0)	20.0% (1)	**60.0% (3)**	20.0% (1)	0.0% (0)	5
Market Analysis	0.0% (0)	20.0% (1)	**60.0% (3)**	0.0% (0)	20.0% (1)	5
Source Identification and Selection	0.0% (0)	0.0% (0)	**80.0% (4)**	0.0% (0)	20.0% (1)	5
Contract Administration	0.0% (0)	20.0% (1)	**60.0% (3)**	0.0% (0)	20.0% (1)	5
Contractor Performance Management	20.0% (1)	**40.0% (2)**	**40.0% (2)**	0.0% (0)	0.0% (0)	5
Cost Estimating	0.0% (0)	40.0% (2)	**60.0% (3)**	0.0% (0)	0.0% (0)	5
Financial Planning	0.0% (0)	20.0% (1)	**60.0% (3)**	20.0% (1)	0.0% (0)	5
Formulation of Financial Programs and Budget	0.0% (0)	40.0% (2)	**60.0% (3)**	0.0% (0)	0.0% (0)	5

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Benefit-Cost Analysis	0.0% (0)	**80.0% (4)**	20.0% (1)	0.0% (0)	0.0% (0)	5
Budget Execution	20.0% (1)	**40.0% (2)**	20.0% (1)	20.0% (1)	0.0% (0)	5
Earned Value Management (EVM)	20.0% (1)	20.0% (1)	**40.0% (2)**	20.0% (1)	0.0% (0)	5
Integrity and Honesty	20.0% (1)	**40.0% (2)**	**40.0% (2)**	0.0% (0)	0.0% (0)	5
Team Building	**40.0% (2)**	**40.0% (2)**	20.0% (1)	0.0% (0)	0.0% (0)	5
Accountability	20.0% (1)	**40.0% (2)**	20.0% (1)	20.0% (1)	0.0% (0)	5
Agility	**60.0% (3)**	20.0% (1)	20.0% (1)	0.0% (0)	0.0% (0)	5
Influencing/Negotiating	**60.0% (3)**	40.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	5
Decision-Making	40.0% (2)	**60.0% (3)**	0.0% (0)	0.0% (0)	0.0% (0)	5
Creativity/Innovation	20.0% (1)	**60.0% (3)**	20.0% (1)	0.0% (0)	0.0% (0)	5
Information Technology Architecture	0.0% (0)	40.0% (2)	**60.0% (3)**	0.0% (0)	0.0% (0)	5
Configuration Management	20.0% (1)	0.0% (0)	**80.0% (4)**	0.0% (0)	0.0% (0)	5
Systems Integration	20.0% (1)	**80.0% (4)**	0.0% (0)	0.0% (0)	0.0% (0)	5
Information Systems/Network Security	0.0% (0)	**60.0% (3)**	40.0% (2)	0.0% (0)	0.0% (0)	5
Information Technology Performance Assessment	0.0% (0)	40.0% (2)	**60.0% (3)**	0.0% (0)	0.0% (0)	5
Infrastructure Design	20.0% (1)	**40.0% (2)**	20.0% (1)	20.0% (1)	0.0% (0)	5
Systems Life Cycle	0.0% (0)	**80.0% (4)**	20.0% (1)	0.0% (0)	0.0% (0)	5
Data Management	20.0% (1)	0.0% (0)	**80.0% (4)**	0.0% (0)	0.0% (0)	5
					answered question	5
					skipped question	5

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8. Would you like to review competencies for another job family?

		Response Percent	Response Count
Business/Financial Mangement		0.0%	0
Contracting		0.0%	0
Research		0.0%	0
Systems Engineering		0.0%	0
No thanks, Program/Project Management is my main area of expertise		100.0%	5
	answered question		5
	skipped question		5

9. Occupational Family: Business/Financial Management How IMPORTANT is this competency to the NextGen transition?

	Extremely Important	Important	Marginally Important	Somewhat Unimportant	Not At All Important	Response Count
Basic Budgeting and Accounting	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	2
Financial Budget & Data Analysis	100.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	2
Financial Management	100.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	2
Project Management	100.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	2
Performance Management	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	2
Federal Budgeting	0.0% (0)	100.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	2
Agency Budgeting	0.0% (0)	100.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	2
Grants Management	0.0% (0)	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	2
Financial Systems Functionality	0.0% (0)	100.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	2
Software Capability	0.0% (0)	100.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	2
Strategic Planning	0.0% (0)	100.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	2
Management Processes	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	2
Organizational Forecasting	0.0% (0)	100.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	2
Risk Analysis and Internal Controls	0.0% (0)	100.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	2

Management Control Concepts and Principles	0.0% (0)	100.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	2
Security Controls	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	2
Auditing	0.0% (0)	100.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	2
Reconciliation and Financial Reporting	0.0% (0)	100.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	2
Productivity Improvement Systems and Business Reengineering Processes	0.0% (0)	100.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	2
					answered question	2
					skipped question	8

10. Occupational Family: Business/Financial Management How FREQUENTLY will this competency be used?

	Very Frequently	Frequently	Occasionally	Rarely	Never	Response Count
Basic Budgeting and Accounting	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	2
Financial Budget & Data Analysis	0.0% (0)	100.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	2
Financial Management	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	2
Project Management	100.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	2
Performance Management	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	2
Federal Budgeting	0.0% (0)	0.0% (0)	100.0% (2)	0.0% (0)	0.0% (0)	2
Agency Budgeting	0.0% (0)	0.0% (0)	100.0% (2)	0.0% (0)	0.0% (0)	2
Grants Management	0.0% (0)	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	2
Financial Systems Functionality	0.0% (0)	0.0% (0)	100.0% (2)	0.0% (0)	0.0% (0)	2
Software Capability	0.0% (0)	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	2
Strategic Planning	0.0% (0)	100.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	2
Management Processes	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	2
Organizational Forecasting	0.0% (0)	0.0% (0)	100.0% (2)	0.0% (0)	0.0% (0)	2
Risk Analysis and Internal Controls	0.0% (0)	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	2
Management Control Concepts and Principles	0.0% (0)	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	2

	Very Difficult	Difficult	Somewhat Difficult	Easy	Very Easy	Response Count
Security Controls	0.0% (0)	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	2
Auditing	0.0% (0)	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	2
Reconciliation and Financial Reporting	0.0% (0)	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	2
Productivity Improvement Systems and Business Reengineering Processes	0.0% (0)	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	2
					answered question	2
					skipped question	8

11. Occupational Family: Business/Financial Management How DIFFICULT is it to learn or develop this competency?

	Very Difficult	Difficult	Somewhat Difficult	Easy	Very Easy	Response Count
Basic Budgeting and Accounting	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (2)	0.0% (0)	2
Financial Budget & Data Analysis	0.0% (0)	0.0% (0)	50.0% (1)	50.0% (1)	0.0% (0)	2
Financial Management	0.0% (0)	0.0% (0)	50.0% (1)	50.0% (1)	0.0% (0)	2
Project Management	0.0% (0)	0.0% (0)	100.0% (2)	0.0% (0)	0.0% (0)	2
Performance Management	0.0% (0)	0.0% (0)	100.0% (2)	0.0% (0)	0.0% (0)	2
Federal Budgeting	0.0% (0)	50.0% (1)	0.0% (0)	50.0% (1)	0.0% (0)	2
Agency Budgeting	0.0% (0)	0.0% (0)	50.0% (1)	50.0% (1)	0.0% (0)	2
Grants Management	0.0% (0)	50.0% (1)	0.0% (0)	50.0% (1)	0.0% (0)	2
Financial Systems Functionality	0.0% (0)	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	2
Software Capability	0.0% (0)	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	2
Strategic Planning	0.0% (0)	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	2
Management Processes	0.0% (0)	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	2
Organizational Forecasting	0.0% (0)	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	2
Risk Analysis and Internal Controls	0.0% (0)	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	2
Management Control Concepts and Principles	0.0% (0)	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	2
Security Controls	0.0% (0)	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	2
Auditing	0.0% (0)	0.0% (0)	100.0% (2)	0.0% (0)	0.0% (0)	2

Reconciliation and Financial Reporting	0.0% (0)	0.0% (0)	100.0% (2)	0.0% (0)	0.0% (0)	2
Productivity Improvement Systems and Business Reengineering Processes	0.0% (0)	50.0% (1)	50.0% (1)	0.0% (0)	0.0% (0)	2
					answered question	2
					skipped question	8

12. Would you like to review competencies for another job family?

		Response Percent	Response Count
Contracting		0.0%	0
Program/Project Management		0.0%	0
Research		0.0%	0
Systems Engineering		0.0%	0
No thanks, Business/Financial Management is my main area of expertise		100.0%	2
		answered question	2
		skipped question	8

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13. Occupational Family: Contracting How IMPORTANT is this competency to the NextGen transition?						
	Extremely Important	Important	Marginally Important	Somewhat Unimportant	Not At All Important	Response Count
Acquisition Strategy Development	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Market Research	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Understanding Sourcing	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Defining Government Requirements in Commercial/Non-Commercial Terms	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Solicitation of Offers	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Defining Contractual/Business Relationships	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Detailed Bid Evaluation Skills	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Proposal Analysis and Evaluation	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Negotiation	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Award Resolution	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Requirements/Contract Management	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Performance Management	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Financial Management	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Resolution of Contract Termination and/or Closeout	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
					answered question	0
					skipped question	10

14. Occupational Family: Contracting How FREQUENTLY will this competency be used?						
	Very Frequently	Frequently	Occasionally	Rarely	Never	Response Count
Acquisition Strategy Development	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Market Research	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Understanding Sourcing	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Defining Government Requirements in Commercial/Non-Commercial Terms	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Solicitation of Offers	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Defining Contractual/Business Relationships	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Detailed Bid Evaluation Skills	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Proposal Analysis and Evaluation	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Negotiation	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Award Resolution	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Requirements/Contract Management	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Performance Management	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Financial Management	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Resolution of Contract Termination and/or Closeout	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
					answered question	0
					skipped question	10

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15. Occupational Family: Contracting How DIFFICULT is it to learn or develop this competency?						
	Very Difficult	Difficult	Somewhat Difficult	Easy	Very Easy	Response Count
Acquisition Strategy Development	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Market Research	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Understanding Sourcing	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Defining Government Requirements in Commercial/Non-Commercial Terms	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Solicitation of Offers	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Defining Contractual/Business Relationships	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Detailed Bid Evaluation Skills	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Proposal Analysis and Evaluation	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Negotiation	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Award Resolution	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Requirements/Contract Management	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Performance Management	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Financial Management	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
Resolution of Contract Termination and/or Closeout	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0
					answered question	0
					skipped question	10

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16. Would you like to review competencies for another job family?		Response Percent	Response Count
Business/Financial Management		0.0%	0
Program/Project Management		0.0%	0
Research		0.0%	0
Systems Engineering		0.0%	0
No thanks, Contracting is my main area of expertise		0.0%	0
	answered question		0
	skipped question		10

17. Occupational Family: Research How IMPORTANT is this competency to the NextGen transition?	Extremely Important	Important	Marginally Important	Somewhat Unimportant	Not At All Important	Response Count
Software development	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1
Prototype modeling	0.0% (0)	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	1
Systems security	0.0% (0)	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	1
Networks	0.0% (0)	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	1
Human factors engineering	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1
Human factors physical and psychological process	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1
Hardware and software human interface design	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1
Statistical analysis	0.0% (0)	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	1
Network analysis	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1
Risk management	0.0% (0)	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	1
Multi-disciplinary analysis	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1
	answered question					1
	skipped question					9

18. Occupational Family: Research How FREQUENTLY will this competency be used?	Very Frequently	Frequently	Occasionally	Rarely	Never	Response Count
Software development	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1
Prototype modeling	0.0% (0)	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	1
Systems security	0.0% (0)	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	1
Networks	0.0% (0)	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	1
Human factors engineering	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1
Human factors physical and psychological process	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1
Hardware and software human interface design	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1
Statistical analysis	0.0% (0)	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	1
Network analysis	0.0% (0)	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	1
Risk management	0.0% (0)	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	1
Multi-disciplinary analysis	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1
					answered question	1
					skipped question	9

19. Occupational Family: Research How DIFFICULT is it to learn or develop this competency?						
	Very Difficult	Difficult	Somewhat Difficult	Easy	Very Easy	Response Count
Software development	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1
Prototype modeling	0.0% (0)	0.0% (0)	100.0% (1)	0.0% (0)	0.0% (0)	1
Systems security	0.0% (0)	0.0% (0)	100.0% (1)	0.0% (0)	0.0% (0)	1
Networks	0.0% (0)	0.0% (0)	100.0% (1)	0.0% (0)	0.0% (0)	1
Human factors engineering	0.0% (0)	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	1
Human factors physical and psychological process	0.0% (0)	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	1
Hardware and software human interface design	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1
Statistical analysis	0.0% (0)	0.0% (0)	100.0% (1)	0.0% (0)	0.0% (0)	1
Network analysis	0.0% (0)	0.0% (0)	100.0% (1)	0.0% (0)	0.0% (0)	1
Risk management	0.0% (0)	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	1
Multi-disciplinary analysis	0.0% (0)	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	1
					answered question	1
					skipped question	9

20. Would you like to review competencies for another job family?			
		Response Percent	Response Count
Business/Financial Management		0.0%	0
Contracting		0.0%	0
Program/Project Management		100.0%	1
Systems Engineering		0.0%	0
No thanks, Research is my main area of expertise		0.0%	0
		answered question	1
		skipped question	9

21. Occupational Family: Systems Engineering How IMPORTANT is this competency to the NextGen transition?						
	Extremely Important	Important	Marginally Important	Somewhat Unimportant	Not At All Important	Response Count
Systems concepts	100.0% (3)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	3
"System of system" capability issues	100.0% (3)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	3
Enterprise & technology environment	33.3% (1)	66.7% (2)	0.0% (0)	0.0% (0)	0.0% (0)	3
Determine and manage stakeholder requirements	100.0% (3)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	3
System Design: Architectural design	33.3% (1)	33.3% (1)	33.3% (1)	0.0% (0)	0.0% (0)	3
System Design: Concept generation	66.7% (2)	0.0% (0)	33.3% (1)	0.0% (0)	0.0% (0)	3
System Design: Design for …	33.3% (1)	33.3% (1)	33.3% (1)	0.0% (0)	0.0% (0)	3
System Design: Functional analysis	66.7% (2)	33.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	3
System Design: Interface management	33.3% (1)	66.7% (2)	0.0% (0)	0.0% (0)	0.0% (0)	3
System Design: Maintaining design integrity	33.3% (1)	66.7% (2)	0.0% (0)	0.0% (0)	0.0% (0)	3
System Design: Modeling and simulation	33.3% (1)	66.7% (2)	0.0% (0)	0.0% (0)	0.0% (0)	3
System Design: Select preferred solution	33.3% (1)	66.7% (2)	0.0% (0)	0.0% (0)	0.0% (0)	3
System Design: System robustness	33.3% (1)	66.7% (2)	0.0% (0)	0.0% (0)	0.0% (0)	3
System Design: Human factors engineering	66.7% (2)	33.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	3
Integration and verification	66.7% (2)	33.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	3
Validation	66.7% (2)	33.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	3
Transition to operation	100.0% (3)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	3
Civil Engineering	0.0% (0)	0.0% (0)	66.7% (2)	33.3% (1)	0.0% (0)	3
Electrical Engineering	0.0% (0)	0.0% (0)	66.7% (2)	33.3% (1)	0.0% (0)	3
Electronics Engineering	33.3% (1)	0.0% (0)	33.3% (1)	33.3% (1)	0.0% (0)	3
Computer Engineering	33.3% (1)	33.3% (1)	33.3% (1)	0.0% (0)	0.0% (0)	3
Concurrent engineering	33.3% (1)	33.3% (1)	33.3% (1)	0.0% (0)	0.0% (0)	3

	Very Frequently	Frequently	Occasionally	Rarely	Never	Response Count
Enterprise integration	66.7% (2)	33.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	3
Integration of fields of specialization	66.7% (2)	33.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	3
Lifecycle process definition	0.0% (0)	100.0% (3)	0.0% (0)	0.0% (0)	0.0% (0)	3
Planning, monitoring and controlling	100.0% (3)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	3
Precursor analysis	0.0% (0)	66.7% (2)	33.3% (1)	0.0% (0)	0.0% (0)	3
Probabilistic risk assessment	0.0% (0)	66.7% (2)	33.3% (1)	0.0% (0)	0.0% (0)	3
System safety	100.0% (3)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	3
Trend analysis	0.0% (0)	100.0% (3)	0.0% (0)	0.0% (0)	0.0% (0)	3
					answered question	3
					skipped question	7

22. Occupational Family: Systems Engineering How FREQUENTLY will this competency be used?

	Very Frequently	Frequently	Occasionally	Rarely	Never	Response Count
Systems concepts	100.0% (3)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	3
"System of system" capability issues	100.0% (3)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	3
Enterprise & technology environment	0.0% (0)	66.7% (2)	33.3% (1)	0.0% (0)	0.0% (0)	3
Determine and manage stakeholder requirements	100.0% (3)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	3
System Design: Architectural design	0.0% (0)	66.7% (2)	33.3% (1)	0.0% (0)	0.0% (0)	3
System Design: Concept generation	33.3% (1)	33.3% (1)	33.3% (1)	0.0% (0)	0.0% (0)	3
System Design: Design for …	0.0% (0)	33.3% (1)	66.7% (2)	0.0% (0)	0.0% (0)	3
System Design: Functional analysis	33.3% (1)	0.0% (0)	66.7% (2)	0.0% (0)	0.0% (0)	3
System Design: Interface management	33.3% (1)	66.7% (2)	0.0% (0)	0.0% (0)	0.0% (0)	3
System Design: Maintaining design integrity	33.3% (1)	66.7% (2)	0.0% (0)	0.0% (0)	0.0% (0)	3
System Design: Modeling and simulation	33.3% (1)	33.3% (1)	33.3% (1)	0.0% (0)	0.0% (0)	3

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System Design: Select preferred solution	0.0% (0)	**66.7% (2)**	33.3% (1)	0.0% (0)	0.0% (0)	3
System Design: System robustness	0.0% (0)	**100.0% (3)**	0.0% (0)	0.0% (0)	0.0% (0)	3
System Design: Human factors engineering	**66.7% (2)**	33.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	3
Integration and verification	**66.7% (2)**	33.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	3
Validation	**66.7% (2)**	33.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	3
Transition to operation	33.3% (1)	**66.7% (2)**	0.0% (0)	0.0% (0)	0.0% (0)	3
Civil Engineering	0.0% (0)	0.0% (0)	**66.7% (2)**	33.3% (1)	0.0% (0)	3
Electrical Engineering	0.0% (0)	0.0% (0)	**66.7% (2)**	33.3% (1)	0.0% (0)	3
Electronics Engineering	**33.3% (1)**	0.0% (0)	**33.3% (1)**	**33.3% (1)**	0.0% (0)	3
Computer Engineering	33.3% (1)	0.0% (0)	**66.7% (2)**	0.0% (0)	0.0% (0)	3
Concurrent engineering	33.3% (1)	0.0% (0)	**66.7% (2)**	0.0% (0)	0.0% (0)	3
Enterprise integration	**66.7% (2)**	33.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	3
Integration of fields of specialization	**66.7% (2)**	33.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	3
Lifecycle process definition	0.0% (0)	**100.0% (3)**	0.0% (0)	0.0% (0)	0.0% (0)	3
Planning, monitoring and controlling	**66.7% (2)**	33.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	3
Precursor analysis	0.0% (0)	33.3% (1)	**66.7% (2)**	0.0% (0)	0.0% (0)	3
Probabilistic risk assessment	33.3% (1)	**66.7% (2)**	0.0% (0)	0.0% (0)	0.0% (0)	3
System safety	**66.7% (2)**	33.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	3
Trend analysis	33.3% (1)	**66.7% (2)**	0.0% (0)	0.0% (0)	0.0% (0)	3
					answered question	3
					skipped question	7

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23. Occupational Family: Systems Engineering How DIFFICULT is it to learn or develop this competency?						
	Very Difficult	Difficult	Somewhat Difficult	Easy	Very Easy	Response Count
Systems concepts	66.7% (2)	33.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	3
"System of system" capability issues	100.0% (3)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	3
Enterprise & technology environment	33.3% (1)	66.7% (2)	0.0% (0)	0.0% (0)	0.0% (0)	3
Determine and manage stakeholder requirements	33.3% (1)	66.7% (2)	0.0% (0)	0.0% (0)	0.0% (0)	3
System Design: Architectural design	0.0% (0)	66.7% (2)	33.3% (1)	0.0% (0)	0.0% (0)	3
System Design: Concept generation	33.3% (1)	33.3% (1)	33.3% (1)	0.0% (0)	0.0% (0)	3
System Design: Design for …	0.0% (0)	66.7% (2)	33.3% (1)	0.0% (0)	0.0% (0)	3
System Design: Functional analysis	0.0% (0)	66.7% (2)	33.3% (1)	0.0% (0)	0.0% (0)	3
System Design: Interface management	0.0% (0)	66.7% (2)	33.3% (1)	0.0% (0)	0.0% (0)	3
System Design: Maintaining design integrity	33.3% (1)	33.3% (1)	33.3% (1)	0.0% (0)	0.0% (0)	3
System Design: Modeling and simulation	66.7% (2)	33.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	3
System Design: Select preferred solution	33.3% (1)	33.3% (1)	33.3% (1)	0.0% (0)	0.0% (0)	3
System Design: System robustness	0.0% (0)	100.0% (3)	0.0% (0)	0.0% (0)	0.0% (0)	3
System Design: Human factors engineering	66.7% (2)	33.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	3
Integration and verification	33.3% (1)	33.3% (1)	33.3% (1)	0.0% (0)	0.0% (0)	3
Validation	33.3% (1)	33.3% (1)	33.3% (1)	0.0% (0)	0.0% (0)	3
Transition to operation	33.3% (1)	66.7% (2)	0.0% (0)	0.0% (0)	0.0% (0)	3
Civil Engineering	0.0% (0)	0.0% (0)	100.0% (3)	0.0% (0)	0.0% (0)	3
Electrical Engineering	0.0% (0)	0.0% (0)	100.0% (3)	0.0% (0)	0.0% (0)	3
Electronics Engineering	0.0% (0)	33.3% (1)	66.7% (2)	0.0% (0)	0.0% (0)	3
Computer Engineering	33.3% (1)	33.3% (1)	33.3% (1)	0.0% (0)	0.0% (0)	3
Concurrent engineering	33.3% (1)	33.3% (1)	33.3% (1)	0.0% (0)	0.0% (0)	3

Enterprise integration	**66.7% (2)**	0.0% (0)	33.3% (1)	0.0% (0)	0.0% (0)	3
Integration of fields of specialization	33.3% (1)	**66.7% (2)**	0.0% (0)	0.0% (0)	0.0% (0)	3
Lifecycle process definition	0.0% (0)	33.3% (1)	**66.7% (2)**	0.0% (0)	0.0% (0)	3
Planning, monitoring and controlling	0.0% (0)	0.0% (0)	**100.0% (3)**	0.0% (0)	0.0% (0)	3
Precursor analysis	0.0% (0)	33.3% (1)	**66.7% (2)**	0.0% (0)	0.0% (0)	3
Probabilistic risk assessment	0.0% (0)	**66.7% (2)**	33.3% (1)	0.0% (0)	0.0% (0)	3
System safety	33.3% (1)	**66.7% (2)**	0.0% (0)	0.0% (0)	0.0% (0)	3
Trend analysis	33.3% (1)	0.0% (0)	**66.7% (2)**	0.0% (0)	0.0% (0)	3
					answered question	3
					skipped question	7

24. Would you like to review competencies for another job family?		
	Response Percent	Response Count
Business/Financial Management	0.0%	0
Contracting	0.0%	0
Program/Project Management	0.0%	0
Research	0.0%	0
No thanks, Systems Engineering is my main area of expertise	100.0%	3
	answered question	3
	skipped question	7

25. General Competency Model How IMPORTANT is this competency to the NextGen transition?						
	Extremely Important	Important	Marginally Important	Somewhat Unimportant	Not At All Important	Response Count
Oral Communication	60.0% (6)	40.0% (4)	0.0% (0)	0.0% (0)	0.0% (0)	10
Written Communication	50.0% (5)	50.0% (5)	0.0% (0)	0.0% (0)	0.0% (0)	10
Teamwork	90.0% (9)	10.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	10
Collaboration	90.0% (9)	10.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	10
Interpersonal Skills	50.0% (5)	40.0% (4)	10.0% (1)	0.0% (0)	0.0% (0)	10
Customer Service	40.0% (4)	60.0% (6)	0.0% (0)	0.0% (0)	0.0% (0)	10
Effective Management of Customer Expectations	50.0% (5)	50.0% (5)	0.0% (0)	0.0% (0)	0.0% (0)	10
Influencing/Negotiating	50.0% (5)	30.0% (3)	20.0% (2)	0.0% (0)	0.0% (0)	10
Creative Thinking	40.0% (4)	40.0% (4)	20.0% (2)	0.0% (0)	0.0% (0)	10
Decision-Making	70.0% (7)	30.0% (3)	0.0% (0)	0.0% (0)	0.0% (0)	10
Integrated Thinking	80.0% (8)	20.0% (2)	0.0% (0)	0.0% (0)	0.0% (0)	10
Problem Solving	60.0% (6)	20.0% (2)	20.0% (2)	0.0% (0)	0.0% (0)	10
Flexibility	40.0% (4)	50.0% (5)	10.0% (1)	0.0% (0)	0.0% (0)	10
					answered question	10
					skipped question	0

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26. General Competency Model How FREQUENTLY will this competency be used?	Very Frequently	Frequently	Occasionally	Rarely	Never	Response Count
Oral Communication	90.0% (9)	10.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	10
Written Communication	20.0% (2)	80.0% (8)	0.0% (0)	0.0% (0)	0.0% (0)	10
Teamwork	90.0% (9)	10.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	10
Collaboration	60.0% (6)	40.0% (4)	0.0% (0)	0.0% (0)	0.0% (0)	10
Interpersonal Skills	90.0% (9)	10.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	10
Customer Service	20.0% (2)	70.0% (7)	10.0% (1)	0.0% (0)	0.0% (0)	10
Effective Management of Customer Expectations	10.0% (1)	80.0% (8)	10.0% (1)	0.0% (0)	0.0% (0)	10
Influencing/Negotiating	50.0% (5)	30.0% (3)	20.0% (2)	0.0% (0)	0.0% (0)	10
Creative Thinking	30.0% (3)	60.0% (6)	10.0% (1)	0.0% (0)	0.0% (0)	10
Decision-Making	50.0% (5)	50.0% (5)	0.0% (0)	0.0% (0)	0.0% (0)	10
Integrated Thinking	60.0% (6)	40.0% (4)	0.0% (0)	0.0% (0)	0.0% (0)	10
Problem Solving	50.0% (5)	50.0% (5)	0.0% (0)	0.0% (0)	0.0% (0)	10
Flexibility	40.0% (4)	50.0% (5)	10.0% (1)	0.0% (0)	0.0% (0)	10
					answered question	10
					skipped question	0

27. General Competency Model How DIFFICULT is it to learn or develop this competency?	Very Difficult	Difficult	Somewhat Difficult	Easy	Very Easy	Response Count
Oral Communication	30.0% (3)	30.0% (3)	20.0% (2)	20.0% (2)	0.0% (0)	10
Written Communication	0.0% (0)	70.0% (7)	20.0% (2)	10.0% (1)	0.0% (0)	10
Teamwork	40.0% (4)	20.0% (2)	20.0% (2)	20.0% (2)	0.0% (0)	10
Collaboration	30.0% (3)	30.0% (3)	20.0% (2)	20.0% (2)	0.0% (0)	10
Interpersonal Skills	40.0% (4)	20.0% (2)	20.0% (2)	20.0% (2)	0.0% (0)	10
Customer Service	0.0% (0)	40.0% (4)	40.0% (4)	20.0% (2)	0.0% (0)	10
Effective Management of Customer Expectations	40.0% (4)	20.0% (2)	20.0% (2)	20.0% (2)	0.0% (0)	10
Influencing/Negotiating	40.0% (4)	30.0% (3)	30.0% (3)	0.0% (0)	0.0% (0)	10
Creative Thinking	30.0% (3)	30.0% (3)	40.0% (4)	0.0% (0)	0.0% (0)	10
Decision-Making	30.0% (3)	50.0% (5)	20.0% (2)	0.0% (0)	0.0% (0)	10
Integrated Thinking	30.0% (3)	60.0% (6)	10.0% (1)	0.0% (0)	0.0% (0)	10
Problem Solving	20.0% (2)	70.0% (7)	10.0% (1)	0.0% (0)	0.0% (0)	10
Flexibility	30.0% (3)	30.0% (3)	40.0% (4)	0.0% (0)	0.0% (0)	10
					answered question	10
					skipped question	0

SUMMARY OF VALIDATION RESULTS

Table 1 presents the validation results for the Program/Project Management competencies.

Table 1
Validation of Program/Project Management Competencies

Importance : Extremely Important (EI) Important (I)	Frequency: Very Frequently (VF) Frequently (F)	Difficulty to Learn: Very Difficult (VD) Difficult (D)
- Strategic Alignment (60%-I) - Organizational Awareness (80%-I) - Program/Project Planning Processes (60%-I) - Program/Project Management Processes (80%-EI) - Stakeholder Management (60%-I) - Requirements Analysis (60%-I) - Risk Management (100%-I) - Technical Expertise (80%-I) - Systems Thinking and Integration (60%-EI) - Systems Engineering Management (80%-I) - Test and Evaluation Management (60%—EI) - Acquisition Planning (80%-I) - Systems Integration (80%-I) - Contract Administration (60%-I) - Contractor Performance Management (80%-I) - Cost Estimating (60%-I) - Financial Planning (60%-I) - Budget Execution (60%-I) - Integrity and Honesty (60%-EI) - Team Building (60%-I) - Accountability (80%-EI) - Decision-Making (60%-EI)	- Strategic Alignment (80%-F) - Organizational Awareness (60%-F) - Program Project Planning (60%-VF) - Program/Project Management Processes (100%-VF) - Stakeholder Management (60%-F) - Requirements Analysis (60%-VF) - Risk Management (100%-VF) - Systems Thinking and Integration (60%-VF) - Systems Engineering Management (60%-F) - Systems Safety (60%-F) - Test and Evaluation Management (60%-F) - Contract Administration (60%-F) - Contractor Performance Management (60%-VF) - Cost Estimating (80%-F) - Formulation of Financial Programs and Budget (60%-F) - Benefit-Cost Analysis (80%-F) - Budget Execution (80%-VF) - Integrity and Honesty (60%-VF) - Team Building (100%-VF) - Accountability (100%-VF) - Agility (60%-F) - Influencing/Negotiating (80%-F) - Decision-Making (60%-F) - Systems Integration (60%-VF) - Data Management (80%-F)	- Organizational Awareness (60%-D) - Capital Planning and Investment Assessment (60%-D) - Stakeholder Management (60%-D) - Requirements Analysis (60%-D) - Systems Engineering Management (60%-D) - System Safety (60%-D) - Benefit-Cost Analysis (80%-D) - Agility (60%-VD) - Influencing/Negotiating (60%-VD) - Risk Management (60%-D)

Table 2 presents the validation results for the Systems Engineering competencies.

Table 2
Validation of Systems Engineering Competencies

Importance : Extremely Important (EI) Important (I)	Frequency: Very Frequently (VF) Frequently (F)	Difficulty to Learn: Very Difficult (VD) Difficult (D)
• Systems Concepts (100%-EI) • System of Systems Capability Issues (100%-EI) • Managing Stakeholder Requirements (100%-EI) • System Design: Concept Generation (100%-EI) • System Design: Functional Analysis (100%-EI) • System Design: Human Factors Engineering (100%-EI) • System Design: Modeling and Simulation (100%-I) • Integration and Verification (100%-EI) • Validation (100%-EI) • Transition to Operation (100%-EI) • Integration of Fields of Specialization (100%-EI) • Lifecycle Process Definition (100%-I) • Planning, Monitoring, and Controlling (100%-EI) • System Safety (100%-EI) • Trend Analysis (100%-I)	• Systems Concepts (100%-VF) • System of Systems Capability Issues (100%-VF) • Managing Stakeholder Requirements (100%-VF) • Enterprise and Technology Environment (100%-F) • System Design: System Robustness (100%-F) • System Design: Human Factors Engineering (100%-VF) • Integration and Verification (100%-VF) • Validation (100%-VF) • Integration of Fields of Specialization (100%-VF) • Planning, Monitoring, and Controlling (100%-VF) • System Safety (50%-VF)	• Systems Concepts (100%-VD) • System of Systems Capability Issues (100%-VD) • Enterprise and Technology Environment (100%-D) • Managing Stakeholder Requirements (100%-D) • System Design: System Robustness (100%-D) • System Design: Human Factors Engineering (100%-VD)

Validation results for the Business/Financial Management competencies are presented in Table 3.

Table 3
Validation of Business/ Financial Management Competencies

Importance: Extremely Important (EI) Important (I)	Frequency of Use: Very Frequently (VF) Frequently (F)	Difficulty to Learn: Very Difficult (VD) Difficult (D)
• Financial Budget & Data Analysis (100%-EI) • Financial Management (100%-EI) • Project Management (100%-EI) • Federal Budgeting (100%- I) • Agency Budgeting (100%- I) • Financial Systems Functionality (100%-I) • Software Capability (100%- I) • Strategic Planning (100%- I) • Organizational Forecasting (100%- I) • Risk Analysis and Internal Controls (100%- I) • Management Control Concepts and Principles (100%- I) • Auditing (100%- I) • Reconciliation and Financial Reporting (100%- I) • Productivity Improvement Systems and Business Reengineering Processes (100%- I)	• Financial Budget & Data Analysis (100%-F) • Project Management (100%- VF) • Strategic Planning (100%- F)	• Federal Budgeting (50%-D) • Grants Management (50%-D) • Financial Systems Functionality (50%-D) • Software Capability (50%-D) • Strategic Planning (50%-D) • Management Processes (50%-D) • Organizational Forecasting (50%-D) • Risk Analysis and Internal Controls (50%-D) • Management Control Concepts and Principles (50%-D) • Security Controls (50%-D) • Productivity Improvement Systems and Business Reengineering Processes (50%-D)

The results of the validation of Research competencies are presented in Table 4 below.

Table 4
Validation of Research Competencies

Importance: Extremely Important (EI) Important (I)	Frequency: Very Frequently VF) Frequently (F)	Difficulty to Learn: Very Difficult (VD) Difficult (D)
• Software Development (100%-EI) • Prototype Modeling (100%- I) • Systems Security (100%- I) • Networks(100%- I) • Human Factors Engineering (100%- EI) • Human Factors Physical and Psychological Process (100%-EI) • Hardware and Software Human Interface Design (100%- EI) • Statistical Analysis (100%- I) • Network Analysis (100%- EI) • Risk Management (100%- I) • Multi-disciplinary Analysis (100%-EI)	• Software Development (100%- VF) • Prototype Modeling (100%- F) • Systems Security (100%-F) • Networks(100%- F) • Human Factors Engineering (100%- VF) • Human Factors Physical and Psychological Process (100%- VF) • Hardware and Software Human Interface Design (100%- VF) • Statistical Analysis (100%- F) • Network Analysis (100%-F) • Risk Management (100%-F) • Multi-disciplinary Analysis (100%-VF)	• Software Development (100%- VD) • Human Factors Engineering (100%- D) • Human Factors Physical and Psychological Process (100%- D) • Hardware and Software Human Interface Design (100%- VD) • Risk Management (100%- D) • Multi-disciplinary Analysis (100%-D)

The results of the validation of General competencies are presented in Table 5 below.

Table 5
Validation of General Competencies

Importance: Extremely Important (EI) Important (I)	Frequency: Very Frequently (VF) Frequently (F)	Difficulty to Learn: Very Difficult (VD) Difficult (D)
• Oral Communication (50%-EI) • Written Communication (62.5%-I) • Teamwork (87.5%-EI) • Collaboration (87.5%-EI) • Customer Service (62.5%-I) • Interpersonal Skills (50%-I) • Decision-Making (62.5%-EI) • Integrated Thinking (75%-EI) • Flexibility (62.5%-I) • Creative Thinking (50%-I) • Effective Management of Customer Expectations (50%-EI)	• Oral Communication (87.5%-VF) • Written Communication (87.5%-F) • Teamwork (87.5%-VF) • Collaboration (50%-VF) • Interpersonal Skills (87.5%-VF) • Customer Service (75%-F) • Effective Management of Customer Expectations (75%-F) • Creative Thinking (62.5%-F) • Decision-Making (50%-VF) • Integrated Thinking (50%-VF) • Problem Solving (50%-VF) • Flexibility (50%-F)	• Written Communication (75%-D) • Effective Management of Customer Expectations (50%-VD) • Integrated Thinking (50%-D) • Problem Solving (62.5%-D)

Table 6 below displays the validation results for the leadership competencies.

Table 6
Validation of Leadership Competencies

Importance: Extremely Important (EI) Important (I)	Frequency of Use: Very Frequently (VF) Frequently (F)	Difficulty to Learn: Very Difficult (VD) Difficult (D)
• Accountability and Measurement (60%-EI) • Building Teamwork and Cooperation (50%-EI) • Problem Solving (60%-I) • Building Alliances (60%-EI) • Communication (60%-I) • Building Alliances (60%-EI) • Interpersonal Relations and Influence (90%-I) • Vision (70%-EI) • Strategy Formulation (70%-EI) • Agility (90%-I) • Public Sector Savvy (60%-I) • Change and Journey (60%-I) • Innovation, Creativity, and Working Smarter (60%-I) • Organizational Architecture (60%-I) • Culture and Being Human (60%-I) • Collaborative Public Management (70%-I) • Systems Thinking and Integration (50%-VI) • Leadership-as a subset of Complex Project Management (70%-EI) • Integrity and Honesty (50%-EI)	• Leadership –as a subset of Complex Project Management (VF-60%) • Customer Focus (60%-F) • Building Teamwork and Cooperation (70%-VF) • Communication (70%-VF) • Interpersonal Relations and Influence (60%-VF) • Strategy and Project Management (60%-F) • Integrity and Honesty (50%-VF) • Accountability and Measurement (50%-F) • Problem Solving (50%-F) • Agility (50%-F) • Collaborative Public Management (50%-F)	• Agility (60%-D) • Strategy and Project Management (70%-D) • Innovation, Creativity, and Working Smarter (60%-D) • Systems Thinking and Integration (60%-D) • Leadership-as a subset of Complex Project Management (50%-D)

COMPLEX PROJECT MANAGER COMPETENCY STANDARD

The definition of the individual Views and the Elements of Competency are as follows:

View 1—Strategy and Project Management specifies the competencies required to understand the context of the complex project, and to develop and implement a project strategy and system to deliver the client's emergent outcomes. It takes into account the project's context, the level of complexity and uncertainty of the project, the maturity of the client and contractors, the market, and compliance, to deliver the client's outcomes which are fit for purpose and provide value for money.

Elements of Competency
   1.1 Establish the vision and mission statements, and define outcomes
   1.2 Establish the environmental scanning system
   1.3 Select the strategy
   1.4 Establish the strategic project set
   1.5 Project/program implementation

View 2—Business Planning, Lifecycle Management, Reporting and Performance Measurement specifies the competencies required to develop and implement the project business planning, reporting, and performance measurement systems. The business plan defines the program at an overview level with a high-level view of the project schedule and the overall project budget. The business plan also identifies and defines the operational goals and objectives of the project and establishes the reporting framework to be used and the performance management methodology that forms part of that reporting methodology. Additionally, the business planning process identifies the lifecycle management process to be followed and provides the planning basis for the establishment of the project's gate review framework.

Elements of Competency
   2.1 Design and establish the business planning, lifecycle management, reporting and performance measurement systems
   2.2 Ongoing leadership and management of the business planning, gate review, lifecycle management, reporting and performance measurement systems
   2.3 Ongoing management of the strategic business plan and budget to maintain achievement of strategic outcomes
   2.4 Establish project exit criteria
   2.5 Procurement

View 3—Change and Journey specifies the competencies required to develop and implement the ongoing change and journey management system to support implementation of the emergent strategy. As complex projects are dynamic and emerging systems, dealing with ongoing change becomes routine. Most complex projects embark on a journey towards a vision. Complex project managers have to plan and constantly adapt their strategy and implementation plan along the journey. Communication and stakeholder management are central to: alignment of stakeholders;

creating motivation; driving continuous improvement; problem avoidance and resolution; the creation and development of the project culture; and political management.

Elements of Competency
　　3.1 Define culture of the project environment including key values and their hierarchy
　　3.2 Classify the program and sub projects by size, risk and complexity
　　3.3 Classify the maturity levels of the client (customer), contractors and key stakeholders, personality profiles, and leadership style(s)
　　3.4 Determine the scale of change required in project environment and the rate of change that is needed
　　3.5 Classify the level of impact, uncertainty, risk areas, and resistance to change
　　3.6 Develop the change and journey management strategy to fit with the project culture and leadership style
　　3.7 Establish the change and journey management system
　　3.8 Establish the stakeholder management strategy and plan
　　3.9 Establish the communication strategy and plan
　　3.10 Pilot projects—symbolism and the management of meaning
　　3.11 Double loop learning

View 4—Innovation, Creativity and Working Smarter specifies the competencies required to design, develop, lead and manage a project organization that delivers innovation, creativity and continuous improvement in projects that are complex and non linear/recursive in their nature.

Elements of Competency
　　4.1 Driving innovation
　　4.2 Identifying key innovative opportunities
　　4.3 Evaluating innovative opportunities
　　4.4 Driving continuous improvement
　　4.5 Benchmarking/best of breed
　　4.6 Design management

View 5—Organizational Architecture specifies the competencies required to design, establish and manage the organizational architecture for complex projects.

Elements of Competency
　　5.1 Designing the project organization
　　5.2 Establishing and managing the project organization
　　5.3 Developing project maturity
　　5.4 Strategic human resources management

View 6—Systems Thinking and Integration specifies the competencies required to use systems thinking in the project management of complexity. Systems thinking is a methodology to effectively deal with the ever increasing complexity and rate of change in our world. Project managers need the capability to deal with the project as a whole and the project in context, rather than the project in isolation to its environment. Systems thinking provides project managers with a powerful methodology to increase project performance and reduce/resolve key project risks.

Systems thinking is not a single approach, but encompasses a range of methodologies and possible tools. Most projects operate within larger systems, and are themselves systems. Internationally, project performance measures are moving away from inputs/outputs to be based on project outcomes. These changes, along with increasing environmental uncertainty are driving project managers to not only deal with the project as a system but just as importantly to treat the project as part of a much larger system. In many projects, it is the failure to deal with external forces which has driven project failure.

Elements of Competency
6.1 Classify systems by type
6.2 Apply systems thinking using a contingency approach
6.3 Integrate appropriate systems thinking philosophy in designing the project organizational architecture
6.4 Design the organizational architecture to fit with chaos and uncertainty
6.5 Implement systems thinking
6.6 Planning for chaos and / or high uncertainty
6.7 Planning for a project which exhibits characteristics of complexity and chaos

View 7—Leadership specifies the competencies required to lead complex projects. Leadership is a key variable in organizational architecture, and greatly impacts the project culture, philosophy, and the ability of the project to develop an emergent strategy and to deliver a successful outcome.

Elements of Competency
7.1 Understanding
7.2 Sculpturing
7.3 Mobilizing
7.4 Inspiring
7.5 Situational Leadership

View 8—Culture and Being Human specifies the competencies required to understand culture, cognition, personality, and human lifecycle, and to use them in the design and operation of the project organization and its systems. Being human refers to the physiological realities of being human and its impact on how we think, make decisions, and hold memory and values. It also includes issues such as our personality and aging.

Elements of Competency
8.1 Understand and integrate international cultural differences
8.2 The cultural values (national, organizational, and sub cultures) are used to understand people and are key inputs/drivers in designing the project organizational architecture and change/journey
8.3 Understand the project's people and stakeholders to use in systems/process design
8.4 Personality profiling to understand people and to design the project organizational architecture and change/journey
8.5 Understand human lifecycle stages to understand people

View 9—Probity and Governance specifies the competencies required to deliver probity and governance in complex projects.

Elements of Competency
    9.1 Establish probity and governance statutory and organizational requirements
    9.2 Define project specific probity and governance requirements
    9.3 Design probity and governance systems
    9.4 Manage ongoing probity and governance

As noted, each of the Elements of Competence is followed by a number of Actions in Workplace/Behavioral Anchors (there are 374 total) that are classified into four levels:

> **D** *(Development)*—The project manager applies the competency under direct supervision.
> **P** *(Practitioner)*—The project manager applies the competency without the need for direct supervision, but within the bounds of standardized processes, procedures and systems.
> **C** *(Competent)*—The project manager applies the competency without the need for direct supervision, provides direct supervision of the competency for others, and mentors development of the competency in others.
> **L** *(Leader)*—The project manager provides professional leadership in the competency. They lead in the design of processes, procedures and systems, and have the ability to use the competency flexibly and creatively.

This Standard also looks at five different levels of project management expertise—Project Manager, Traditional Senior Project Manager, Program Manager, Member of the College of Complex Project Managers and Fellow of the College of Complex Project Managers.

Example of a View, Element of Competency and Action(s) in Workplace
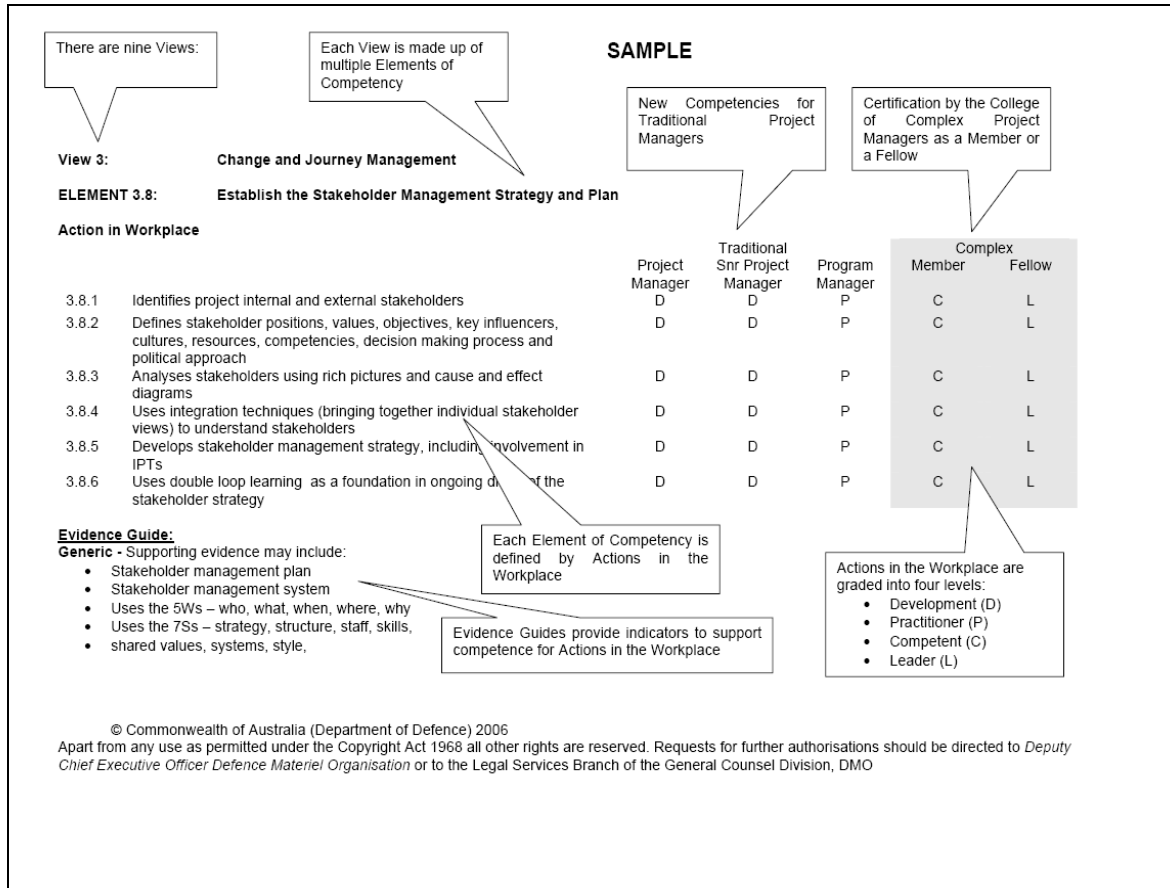
A final section in the Complex Project Manager Standard specifies the personal attributes that distinguish outstanding individuals:

10.1 Wisdom
10.2 Action and Outcome Oriented
10.3 Creates and Leads Innovative Teams
10.4 Focused and Courageous
10.5 Ability to Influence

These special attributes are classified into four levels:

> **Experiential Learning (EL)**—The project manager is using the behaviors experientially in developing the special attributes.
> **Normative (N)**—The project manager is recognized as using the attribute as a normal behavior.
> **Mentor (M)**—The project manager mentors others in their use of the special attribute.
> **Symbol (S)**—The project manager is regarded as providing a symbol for the special attribute through their behaviors and leads the development of the behaviors in their project teams.

Example of Personal Attributes

ELEMENT 10.1:   Wisdom

Attributes

		Project Manager	Traditional Snr Project Manager	Program Manager	Complex Member	Fellow
10.1.1	Has a robust self-esteem	EL	EL	N	M	S
10.1.2	Is a learning person – seeks opportunities to grow and change	EL	EL	N	M	S
10.1.3	Is a thinking person and reflective practitioner	EL	EL	N	M	S
10.1.4	Is not overly defensive -is able to keep their cool, conceal frustration - is willing to admit own mistakes	EL	EL	N	M	S
10.1.5	Recognises that the client may not always be right in their judgement, but they are always the client	EL	EL	N	M	S
10.1.6	Knows how to take time out	EL	EL	N	M	S
10.1.7	Manages their own time	EL	EL	N	M	S
10.1.8	Demonstrates critical inquiry	EL	EL	N	M	S
10.1.9	Constantly questions everything that they are doing -is alert for the first hint of error	EL	EL	N	M	S
10.1.10	Is adept at networking, seeks and is open to diverse perspectives and takes counsel	EL	EL	N	M	S
10.1.11	Mentors key individuals	EL	EL	N	M	S
10.1.12	Mentors potential future complex project managers	EL	EL	N	M	S

Evidence Guide (assessed by Fellows of the College):

- Listens to others and seeks feedback and respects their views on how he/she affects them. Uses feedback to modify own behaviour
- Has a wide behavioural repertoire, makes own behavioural choices with knowledge of a range of alternatives and their situational consequences
- Puts in the effort necessary for thinking
- Trusts their judgement in matters of importance
- Reserves time for themself, unscheduled time to just sit back, relax, and mull over issues
- Takes a step back from the battlefield, review doubts about their strategy, and role plays nagging interpersonal issues
- Budgets their time with the focus on strategy
- Does not fill their calendar, allows contemplation time
- Steers clear of unnecessary detail
- Delegates: has many balls in the air and cannot watch them all
- Has a sense of wonder

22 PROPOSITIONS REGARDING CROSS-SECTOR COLLABORATIONS

Proposition 1: Like all interorganizational relationships, cross-sector collaborations are more likely to form in turbulent environments. In particular, the formation and sustainability of cross-sector collaborations are affected by driving and constraining forces in the competitive and institutional environments.

Proposition 2: Public policy makers are most likely to try cross-sector collaboration when they believe the separate efforts of different sectors to address a public problem have failed or are likely to fail, and the actual or potential failures cannot be fixed by the sectors acting alone.

Proposition 3: Cross-sector collaborations are more likely to succeed when one or more linking mechanisms, such as powerful sponsors, general agreement on the problem, or existing networks, are in place at the time of their initial formation.

Proposition 4: The form and content of a collaboration's initial agreements, as well as the processes used to formulate them, affect the outcomes of the collaboration's work.

Proposition 5: Cross-sector collaborations are more likely to succeed when they have committed sponsors and effective champions at many levels who provide formal and informal leadership.

Proposition 6: Cross-sector collaborations are more likely to succeed when they establish—with both internal and external stakeholders—the legitimacy of collaboration as a form of organizing, as a separate entity, and as a source of trusted interaction among members.

Proposition 7: Cross-sector collaborations are more likely to succeed when trust-building activities (such as nurturing cross-sectoral and cross-cultural understanding) are continuous.

Proposition 8: Because conflict is common in partnerships, cross-sector collaborations are more likely to succeed when partners use resources and tactics to equalize power and manage conflict effectively.

Proposition 9: Cross-sector collaborations are more likely to succeed when they combine deliberate and emergent planning; deliberate planning is emphasized more in mandated collaborations and emergent planning is emphasized more in non-mandated collaborations.

Proposition 10: Cross-sector collaborations are more likely to succeed when their planning makes use of stakeholder analyses, emphasizes responsiveness to key stakeholders, uses the process to build trust and the capacity to manage conflict, and builds on distinctive competencies of the collaborators.

Proposition 11: Collaborative structure is influenced by environmental factors such as system stability and the collaboration's strategic purpose.

Proposition 12: Collaborative structure is likely to change over time because of ambiguity of membership and complexity in local environments.

Proposition 13: Collaboration structure and the nature of the tasks performed at the client level are likely to influence a collaboration's overall effectiveness.

Proposition 14: Formal and informal governing mechanisms are likely to influence collaboration effectiveness.

Proposition 15: Collaborations involving system level planning activities are likely to involve the most negotiation, followed by collaborations focused on administrative-level partnerships and service delivery partnerships.

Proposition 16: Cross-sector collaborations are more likely to succeed when they build in resources and tactics for dealing with power imbalances and shocks.

Proposition 17: Competing institutional logics are likely within cross-sector collaborations and may significantly influence the extent to which collaborations can agree on essential elements of process, structure, governance, and desired outcomes.

Proposition 18: Cross-sector collaborations are most likely to create public value when they build on individuals' and organizations' self-interests and each sector's characteristic strengths while finding ways to minimize, overcome, or compensate for each sector's characteristic weaknesses.

Proposition 19: Cross-sector collaborations are most likely to create public value when they produce positive first-, second-, and third-order effects.

Proposition 20: Cross-sector collaborations are most likely to create public value when they are resilient and engage in regular reassessments.

Proposition 21: Cross-sector collaborations are more likely to be successful when they have an accountability system that tracks inputs, processes, and outcomes; use a variety of methods for gathering, interpreting, and using data; and use a results management system that is built on strong relationships with key political and professional constituencies.

Proposition 22: The normal expectation ought to be that success will be very difficult to achieve in cross-sector collaborations.

LEADERSHIP COMPETENCIES FROM FIVE DIFFERENT PERSPECTIVES

The following discussion compares the relationship between FAA's identified leadership competencies (and their behavioral anchors) with the results from Phase I of this study as well as the four areas mentioned previously: Colloquia Results, General Electric's Model, Complex Project Manager Standard and Collaborative Public Management. Key elements in each of these areas are listed with the FAA's leadership competencies and behavioral anchors (BA) that seem most appropriate.

1. Phase I Findings

The literature review conducted in the first phase of this study identified the elements of success that characterize large-scale systems integration projects. This research identified four key considerations for successful change as well nine elements of success common to such efforts.

Phase I Research Results—Essential Considerations

Successful large-scale technology transitions critical success factors include:

- o *Leadership*
    - No specific competencies are identified here because this includes virtually all of the competencies and their related behavioral indicators
- o *Strategic thinking*
    - **Competency 14: *Strategy Formulation***
        - **BA**—Balances a long-term view of mission and purpose with short-term requirements
        - **BA**—Determines objectives and sets priorities
        - **BA**—Identifies immediate and longer range objectives
        - **BA**—Analyzes implications of different strategic options and determines appropriate course of action
        - **BA**—Addresses trends and future changes affecting FAA
- o *Careful planning*
    - **Competency 14: *Strategy Formulation***
        - **BA**— Translates strategy into concrete action plans that integrate multiple elements and programs
- o *Basic characteristics of public sector organizations*
    - FAA's list of competencies and behavioral anchors does not have a comparable quality

b. Phase I Research Results—Elements of Success

The Academy staff found that there are important differences regarding organization and culture in public sector agencies that need to be considered when undertaking any major systems implementation project. Among the key elements of success identified by the Academy's staff are:

- o *Good ongoing communication*—throughout the project
  - **Competency 10:** *Building Alliances*
    - **BA**—Communicates openly and honestly
    - **BA**—Fosters open communication and exchange of ideas and knowledge throughout the organization
    - **BA**—Tailors communication style to fit different groups and circumstances
- o *User involvement*—early and continuing
  - **Competency 3:** *Problem Solving*
    - **BA**—Engages stakeholders in making critical decisions
- o *Management support*—including engaging all stakeholders
  - **Competency 13:** *Vision*
    - **BA**—Builds a shared vision with others across the organization
    - **BA**—Communicates organizational direction and priorities clearly
- o *Solid requirements*—well defined and as stable as possible
  - **Competency 13:** *Vision*
    - **BA**—Communicates organizational direction and priorities clearly
    - **BA**—Engages others in translating vision into action
- o *Good portfolio/program/ project management*—throughout the project
  - **Competency 1:** *Managing Organizational Performance*
    - **BA**—Sets key individual and organizational performance objectives
    - **BA**—Effectively addresses individual and organizational performance issues
    - **BA-** Adjusts the way work is performed to meet changing conditions and demands
    - **BA**—Takes corrective actions to ensure that critical programs meet budget and schedule requirements
    - **BA**—Instills a sense of pace and urgency into the organization and seeks to maintain momentum
- o *Good planning*—realistic milestones, timeframes, and costs
  - **Competency 14:** *Strategy Formulation*
    - **BA**—Analyzes implications of different strategic options and determines appropriate course of action
    - **BA**—Translates strategy into concrete action plans that integrate multiple elements and programs
- o *Incremental approach*—achieve successes and make adjustments

- **Competency 1:** *Managing Organizational Performance*
  - **BA**—Adjusts the way work is performed to meet changing conditions and demands
  - **BA**—Takes corrective actions to ensure that critical programs meet budget and schedule requirements
- **Competency 15:** *Agility*
  - **BA**—Changes viewpoints, behavior and work methods in response to new information
  - **BA**—Recovers quickly from setbacks
  - **BA**—Learns from experience (failures and successes)
- *Organizational alignment*—ensure the organization is aligned properly
  - **Competency 3:** *Problem Solving*
    - **BA**—Addresses organizational barriers that impede success
- *Respond to failure quickly—*Communicate the bad news early and learn from the mistakes
  - **Competency 2:** *Accountability And Measurement*
    - **BA**—Assesses organizational successes and failures and applies lessons learned
  - **Competency 12:** *Integrity And Honesty*
    - **BA**—Acknowledges personal failures as well as accomplishments
  - **Competency 15:** *Agility*
    - **BA**—Learns from experience (failures and successes)

2. Colloquia

Colloquia participants generated seven important themes concerning what it takes to successfully implement NextGen. They also ranked FAA's leadership competencies according to their perceived importance in implementing NextGen.

a. Colloquia Results—Themes

- *Defining NextGen*
  - **Competency 13:** *Vision*
    - **BA**—Builds a shared vision with others across the organization
    - **BA**—Communicates organizational direction and priorities clearly
    - **BA**—Articulates the connection between the efforts of employees and the mission of the agency
- *Describing Success*
  - **Competency 2:** *Accountability And Measurement*
    - **BA**—Establishes systems to monitor progress and identify problem areas

- **BA**—Reaches agreement with other executives on common goals and mutual accountability
- **BA**—Assesses organizational successes and failures and applies lessons learned

o *Committing to the Program*

- **Competency 12:** *Integrity And Honesty*
  - **BA**—Leads with consistency, dignity, compassion and integrity
  - **BA**—Demonstrates and fosters high standards and ethical behavior
  - **BA**—Fulfills commitments
  - **BA**—Stands behind decisions
  - **BA**—Presents viewpoints with courage and conviction
  - **BA**—Models commitment to public service and the mission of FAA

o *Metrics and Accountability*

- **Competency 1:** *Managing Organizational Performance*
  - **BA**—Sets key individual and organizational performance objectives
  - **BA**—Effectively addresses individual and organizational performance issues
  - **BA**—Takes corrective actions to ensure that critical programs meet budget and schedule requirements
- **Competency 2:** *Accountability And Measurement*
  - **BA**—Takes responsibility for achievement of established performance objectives
  - **BA**—Establishes accountability for achieving objectives
  - **BA**—Establishes systems to monitor progress and identify problem areas
  - **BA**—Assesses organizational successes and failures and applies lessons learned

o *Funding Issues*

- **Competency 4:** *Business Acumen*
  - **BA**—Justifies resource requirements to internal and external stakeholders (e.g., cost-effectiveness and return on investment)
  - **BA**—Allocates and manages human, financial, and material resources effectively
  - **BA**—Makes appropriate resource tradeoffs to achieve FAA long-term objectives
  - **BA**—Tracks costs of doing business

o *Culture*

- **Competency 13:** *Vision*
  - **BA**—Pursues opportunities to move the organization toward the vision

- **BA**—Articulates the connection between the efforts of employees and the mission of the agency
- **BA**—Engages others in translating vision into action

o *Communications*

- **Competency 9:** *Communications*
  - **BA**—Communicates openly and honestly
  - **BA**—Fosters open communication and exchange of ideas and knowledge throughout the organization

b. Colloquia Results—Relative Importance of FAA Competencies to Implementing NextGen

1. Integrity and Honesty
2. Building Teamwork and Cooperation
3. Vision
4. Communication
5. Strategy Formulation
6. Accountability and Measurement
7. Managing Organizational Performance
8. Building Alliances

3. General Electric

GE has identified five "Growth Traits" that it seeks in leaders: *external focus, clear thinking, imagination, inclusiveness,* and, *expertise* which are roughly analogous to FAA's leadership competencies.

o Creating an external focus that defines success in market/industry terms

- **Competency 2:** *Accountability and Measurement*
  - **BA**—Reaches agreement with other executives on common goals and mutual accountability

- **Competency 3:** *Problem Solving*
  - **BA**—Engages stakeholders in making critical decisions

- **Competency 4:** *Business Acumen*
  - **BA**—Works collaboratively to fund the right priorities from an FAA-wide viewpoint

- **Competency 5:** *Customer Focus*
  - **BA**—Leverages customer knowledge and insight
  - **BA**—Shares information and ideas with customers

- **BA**—Establishes customer-oriented performance metrics
- **BA**—Plans for and adapts to changing customer relationships
- **BA**—Understands the needs, drivers, and constraints of stakeholders
- **BA**—Understands market and economic factors affecting FAA and the aerospace industry

- **Competency 6:** *Building Teamwork and Cooperation*
  - **BA**—Works effectively across functions and cultures

- **Competency 10:** *Building Alliances*
  - **BA**—Represents FAA and organizational positions effectively
  - **BA**—Represents FAA positions effectively to stakeholders
  - **BA**—Builds and maintains external stakeholder trust and confidence
  - **BA**—Understands the organization's impact on stakeholders
  - **BA**—Fosters networks, alliances, and other business relationships
  - **BA**—Fosters networks, alliances, and other business relationships
  - **BA**—Develops common ground among a wide range of stakeholders (e.g., other operational units, labor, industry, public, international, or other government entities)
  - **BA**—Finds and develops common ground among a wide range of stakeholders (e.g., labor, industry, public, international, other government entities)

o Being a <u>clear thinker</u> who can simplify strategy into specific actions, makes decisions and communicate priorities; and,
- **Competency 3:** *Problem Solving*
  - **BA**—Provides clear direction but gives space for initiative and creativity
  - **BA**—Makes tough decisions

- **Competency 9:** *Communications*
  - **BA**—Communicates openly and honestly
  - **BA**—Listens effectively and communicates understanding
  - **BA**—Effectively interprets intent, influence, and non-verbal elements of communications
  - **BA**—Tailors communication style to fit different groups and circumstances
  - **BA**—Fosters open communication and exchange of ideas and knowledge throughout the organization
  - **BA**—Presents financial and operational data clearly and persuasively

- **BA**—Facilitates lateral communication

o Having <u>imagination</u> and courage to take risks on both people and ideas
  - **Competency 14:** *Strategy Formulation*
    - **BA**—Balances a long-term view of mission and purpose with short-term requirements
    - **BA**—Identifies immediate and longer range objectives
    - **BA**—Determines objectives and sets priorities
    - **BA**—Plans for changing trends that can affect operations
    - **BA**—Develops and implements realistic business plans to achieve strategic goals and objectives
    - **BA**—Analyzes implications of different strategic options and determines appropriate course of action
    - **BA**—Develops strategies to implement organizational change
    - **BA**—Addresses trends and future changes affecting FAA
    - **BA**—Translates strategy into concrete action plans that integrate multiple elements and programs

  - **Competency 16:** *Innovation*
    - **BA**—Models creative thinking and innovation
    - **BA**—Acts as a catalyst for organizational change
    - **BA**—Challenges the status quo (e.g., seeks better efficiency, effectiveness
    - **BA**—Champions implementation of new systems, technology, and processes to improve quality and productivity
    - **BA**—Anticipates barriers and resistance to change and looks for solutions
    - **BA**—Builds organizational readiness for change
    - **BA**—Supports and rewards individuals who take responsible risks
    - **BA**—Enables implementation of new ideas and innovative approaches

o Energizing teams through <u>inclusiveness</u> and connection with people and building loyalty and commitment
  - **Competency 6:** *Building Teamwork and Cooperation*
    - **BA**—Creates an environment in which people thrive and accomplish their best
    - **BA**—Uses teamwork effectively to achieve business results
    - **BA**—Capitalizes on the diversity of talent to enhance team performance
    - **BA**—Encourages differing opinions to be expressed and respected

- **BA**—Coaches teams toward goal achievement
- **BA**—Provides clear direction but gives space for initiative and creativity
- **BA**—Equips teams with resources to accomplish objectives
- **BA**—Anticipates barriers and resistance to change and looks for solutions
- **BA**—Works effectively across functions and cultures

- **Competency 7:** *Building the Model Equal Employment Opportunity Program*
  - **BA**—Demonstrates leadership and commitment to FAA's model EEO Program
  - **BA**—Creates an environment in which people thrive and accomplish their best
  - **BA**—Ensures equal opportunity for all employees or applicants through compliance with applicable EEO laws and regulations
  - **BA**—Recognizes and rewards high performance
  - **BA**—Prevents and eliminates discrimination, harassment and retaliation
  - **BA**—Encourages people to take pride in their work
  - **BA**—Manages people effectively
  - **BA**—Allocates mission personnel, as appropriate, to participate in activities such as community out-reach and recruitment programs
  - **BA**—Prevents or eliminates discrimination and harassment
  - **BA**—Understands and responds to the differing needs of people

- **Competency 8:** *Developing Talent*
  - **BA**—Provides feedback to employees to support their development
  - **BA**—Coaches, mentors, and guides development of employees
  - **BA**—Focuses training and development investments on defined business priorities
  - **BA**—Plans for the development and deployment of talent in the organization
  - **BA**—Uses duty assignments to provide developmental opportunities (e.g., details, OJT)
  - **BA**—Supports development of corporate talent in other parts of the agency
  - **BA**—Considers the future talent needs of the unit or organization and implements appropriate workforce planning
  - **BA**—Leverages assignments to provide developmental opportunities (e.g., details)

o Developing <u>expertise</u> in a function or domain, using depth as a source of confidence to drive change

- FAA's list of competencies and behavioral anchors does not have a comparable quality.

4. Complex Project Manager

Implementation of complex projects is a dynamic system and to a large degree unknowable. Detailed long-term planning is therefore impossible.

Complex projects are open systems and are characterized by recursiveness and non-linear feedback loops, which make them sensitive to small differences in initial conditions and emergent changes.

Applying traditional project management approaches with their focus on long-term planning, rigid structures, precise work breakdown structure definition, and elaborate control rules is counterproductive—it will drive the complex project towards failure.

The specific path followed by the behavior of complex systems is random and therefore unpredictable, there are underlying patterns. The ability (competence) to understand them and proactively deal with them is what distinguishes complex project managers from traditional project managers.

- **Competency 13:** *Vision*
  - **BA**—Anticipates political, economic, international, technological, and industry changes that will impact mission
- **Competency 14:** *Strategy Formulation*
  - **BA**—Balances a long-term view of mission and purpose with short-term requirements
- **Competency 15:** *Agility*
  - **BA**—Changes viewpoints, behavior and work methods in response to new information
  - **BA**—Copes with complex or ambiguous situations
  - **BA**—Recovers quickly from setbacks
  - **BA**—Learns from experience (failures and successes)

5. Collaborative Public Management

- o Building sustainable relationships
  - **Competency 10:** *Building Alliances*
    - **BA**—Fosters networks, alliances, and other business relationships

- **BA**—Finds and develops common ground among a wide range of stakeholders (e.g., labor, industry, public, international, other government entities)
- **BA**—Builds and maintains external stakeholder trust and confidence

o Managing through influencing and negotiation
- **Competency 11:** *Interpersonal Relations And Influence*
  - **BA**—Collaborates with others to achieve results
  - **BA**—Helps build consensus
  - **BA**—Consistently treats others with respect
  - **BA**—Builds rapport with other executives

o Managing complexity and interdependencies
- **Competency 3:** *Problem Solving*
  - **BA**—Analyzes and addresses the interaction of complex variables
  - **BA**—Recognizes organizational and political interests
  - **BA**—Helps resolve problems external to the organization that affect overall FAA performance

o Managing roles, accountabilities, and motivations
- **Competency 2:** *Accountability And Measurement*
  - **BA**—Establishes systems to monitor progress and identify problem areas
  - **BA**—Establishes accountability for achieving objectives
- **Competency 3:** *Problem Solving*
  - **BA**—Recognizes organizational and political interests
  - **BA**—Engages stakeholders in making critical decisions
- **Competency 5:** *Customer Focus*
  - **BA**—Leverages customer knowledge and insight
  - **BA**—Shares information and ideas with customers
  - **BA**—Establishes customer-oriented performance metrics
  - **BA**—Understands the needs, drivers, and constraints of stakeholders
  - **BA**—Understands market and economic factors affecting FAA and the aerospace industry
- **Competency 6:** *Building Teamwork and Cooperation*
  - **BA**—Anticipates barriers and resistance to change and looks for solutions
  - **BA**—Works effectively across functions and cultures

- **Competency 7:** *Building the Model Equal Employment Opportunity Program*
-    **BA**—Understands and responds to the differing needs of people
- **Competency 10:** *Building Alliances*
  - **BA**—Fosters networks, alliances, and other business relationships
  - **BA**—Finds and develops common ground among a wide range of stakeholders (e.g., labor, industry, public, international, other government entities)

SUMMARY OF EXISTING HUMAN CAPITAL FLEXIBILITIES

Governmentwide Flexibilities

Data examined by the study team revealed that over the past five years, ATO's attrition has been largely due to retirements. During that period, the average attrition rate was about 6.5 percent, but retirements accounted for approximately 76 percent of this attrition. Therefore, ATO needs to address its skills requirements by creating a pipeline from the entry-level through the full performance level and beyond. From the many recruiting and hiring flexibilities available, the study team identified the following tools that may be helpful to ATO in addressing both aspects of the ATO workforce challenge.[70]

Flexible Hiring

There are a number of high-impact hiring flexibilities already available to ATO, and several of them should be helpful in acquiring talent now and building a pipeline of future talent. Some of these flexibilities are described below, along with a discussion of how they are used in FAA, where that information is available.

- **Excepted Appointing Authorities**: Excepted service hiring authorities are available to agencies to fill special jobs or to fill any job in unusual or special circumstances under Schedules A, B, or C. [71] These excepted service authorities enable agencies to hire when it is not feasible or not practical to use traditional competitive hiring procedures, and their use can streamline hiring authorities. Agencies may use any excepted service authority under Schedule A or Schedule B when it is applicable. Only OPM can authorize Schedule C appointments for jobs that have confidential or policy-determining nature. Below are some Excepted Service Appointing Authorities that may be particularly useful to ATO.

  - Intergovernmental Personnel Act (IPA) Mobility Act: The goal of the IPA mobility program is to facilitate the movement of employees, for short periods of time, when this movement serves a sound public purpose. Mobility assignments may be used to achieve objectives such as:[72]
    - strengthening the management capabilities of federal agencies, state, local and Indian tribal governments, and other eligible organizations
    - assisting in the transfer and use of new technologies and approaches to solving governmental problems
    - facilitating an effective means of involving state and local officials in developing and implementing federal policies and programs

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[70] www.opm.gov/Strategic_Manaagement_of_Human_Capital/fhfrc.

[71] Schedule A appointing authorities are used for jobs for which it is impractical to use standard qualification requirements and to rate applicants using traditional competitive procedures. Schedule B appointing authorities are typically used for student appointments, and Schedule C appointees have a confidential or policy-impacting relationship with their supervisor or the agency head.

[72] 5 CFR part 334.

o providing program and developmental experience which will enhance the assignee's performance in his or her regular job

ATO's work in support of the transition to NextGen readily lends itself to the use of IPA assignments. From interviews conducted in Phase I, the study team learned that some managers are using IPA assignments as a way to quickly acquire talent from other federal agencies. ***To maximize the potential benefits of this tool, ATO should consider expanding its use of IPA assignments to acquire skills quickly from institutions of higher education and other eligible organizations.***

- Federal Career Intern Program (**FCIP**): The Federal Career Intern Program is designed to help agencies recruit exceptional individuals into a variety of occupations at the GS-5, 7, and 9 grade levels. As an alternative to the competitive examining process, the FCIP provides streamlined hiring procedures with relatively few eligibility and procedural requirements. This program provides a 2-year internship that involves formal training and developmental assignments as established by the agency. Upon successful completion of the program, interns may be eligible for non-competitive placement in permanent positions. The FCIP can be used for entry-level positions that lend themselves to internal formal training/developmental programs, leading to full-performance level work. This program, unlike the Student Career Experience Program, is not restricted to students, and appointments can be made at any time during the year. In a recent report *Attracting the Next Generation: A Look at Federal Entry-Level New Hires*,[73] the Merit Systems Protection Board (MSPB) noted that the use of the FCIP has skyrocketed since its inception. By FY 2005, FCIP appointments accounted for over 60 percent of the MSPB study's new hires at the GS-5 and GS-7 levels because the program streamlines recruitment and assessment practices, allows for faster hiring decisions, and provides agencies the ability to tailor their recruitment procedures to meet mission requirements. More recently, OPM reported that hires under FCIP increased 147 percent from 2004 to 2007, from about 6,800 to almost 17,000.

ATO could tailor the FCIP to develop a targeted recruitment program focused on the acquisition workforce. Under program guidelines, ATO would have the flexibility to determine the types of formal training and developmental opportunities to provide for specific positions in the acquisition workforce.

- **Presidential Management Fellows**: The Presidential Management Fellows (PMF) Program was established to attract to the federal service outstanding graduate students from a variety of academic disciplines and career paths who have a clear interest in, and commitment to, excellence in the leadership and management of public policies and programs. By drawing graduate students from diverse social and cultural backgrounds, the PMF Program is designed to provide a continuing source of trained individuals to meet the future challenges of public service. The PMF Program is centrally managed by OPM, which has the responsibility for assessing applicants with recent graduate degrees to identify candidates with strong analytic, leadership, and writing skills. ***ATO managers could use the PMF program to augment current staffing and as investments in succession planning.***

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[73] *Attracting the Next Generation: A Look at Federal Entry-Level Hew Hires*, January 2008.

Flexible Benefits and Work Arrangements

- **Student Loan Repayment Program**: This program can be extremely attractive to entry-level employees. Under this program, agencies may repay federally insured student loans as a recruitment or retention incentive for appointees or current employees. Agencies may make payments to the loan holder up to a maximum of $10,000 in a calendar year and a total of not more than $60,000 for any one employee.

  FAA does not yet have an approved Student Loan Repayment Program. ***However, this tool could be an attractive benefit to assist ATO in recruiting and retaining employees in STEM occupations.***

- **Tuition Reimbursement**: To encourage employees to pursue education, an agency may establish a tuition reimbursement program and reimburse employees for some or all of the cost of tuition for successfully completed courses. In the absence of an agency tuition reimbursement program, a manager may use an agency training form to approve training and specify what expenses the agencies will pay. Alternatively, agencies may share training and education costs with employees to support training and education that benefits both the agency and the employee.

  FAA should use the Tuition Reimbursement Program to attract and retain both entry-level and skilled employees.

FAA's Unique Flexibilities

In addition to the governmentwide flexibilities available to ATO, the study team identified those flexibilities in the FAA's own unique HR system that may be most beneficial to ATO. The team found that while FAA's HR system provides a wide range of flexibilities that could be beneficial to ATO for both recruitment and retention, there is a perception among managers that some of these tools are not available for use.

Hiring Flexibilities

FAA has a single appointing authority that allows maximum flexibility to hire students, veterans, persons with disabilities, temporary and permanent employees. The agency uses its own direct hire authority as well as other special appointing authorities.

On-the-Spot Hiring authority is the agency's unique Direct Hire Authority. It allows selecting officials to fill specific positions or hire specific candidates without using competitive procedures. This special hiring authority is applicable to (1) hard-to-fill positions and (2) positions filled by use of special appointing authorities.

- **Hard-to-fill positions** are positions for which there is documented evidence that there is an insufficient number of well-qualified eligible candidates responding to an announcement or where there is an established history of insufficient numbers of applicants even after repeated advertising efforts. FAA has established specific criteria

for designating positions as "hard-to-fill" for purposes of On-the-Spot hiring.[74] The criteria are:

- Inadequate number of well-qualified applicants from competitive and non-competitive sources for vacant positions
- Repeated advertising efforts of appropriate geographic scope through a variety of recruitment sources with minimal results
- Documented history of an inadequate number of well-qualified applicants for vacant positions
- Unacceptable ratio of acceptance to offers

From discussions with ATO managers and others within the academic community, the study team learned that some of the acquisition occupations may in fact meet the above criteria for designation as "hard-to-fill." For example, interviewees expressed concern that ATO would not be able to recruit a sufficient number of high-quality systems engineers, and they expressed concern about whether there is an adequate supply of qualified systems engineers in the general labor market. In light of the importance of systems engineering skills to the NextGen transition, ***ATO should work with FAA's HR staff to immediately take steps to exempt this occupational family from competitive procedures so that qualified applicants can be hired swiftly as the need arises. Moreover, ATO should review the full scope of positions in the acquisition occupational families to identify others that may appropriately be designated as "hard-to-fill."***

- **Temporary Appointments**: When specific needs arise for which permanent employees are not the solution, ATO could make wider use of temporary appointments. Under Personnel Reform, FAA has the authority to make temporary appointments up to 5 years if competitive procedures or special appointment authorities are used. In addition, the head of a line of business can extend these appointments based on organizational need.

- **Special Appointing Authorities** seem to be more widely used for the operational workforce. FAA has established its own student intern program modeled after the Student Career Experience Program—Federal Aviation Administration Student Intern Program (FASIP). Additionally, there are several other hiring flexibilities to employ students. However, the extent to which these tools are used to support hiring needs in the acquisition workforce is not clear. The study team learned that only three students were hired over the past year using the FASIP, and in general, ATO managers believe this program is underutilized as a source of new hires. Special internship programs providing more direct hiring authority for key positions in the five occupational families might serve ATO well as it strives to build the workforce of the future.

  Currently, FAA has a special appointing authority for entry-level engineers which allows for the non-competitive appointment of entry-level engineers at the FG-5, 7, or 9 level. Additionally, the study team learned that a special intern program is being designed for the Contracting occupational family. ***To support the transition to NextGen, ATO should work***

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[74] FAA HR Operating Instruction: On-the-Spot Hiring, dated February 20, 2005, and revised April 15, 2007.

with FAA's HR staff to design a unique Acquisition Career Intern Program covering the full scope of acquisition occupations.

Expert Level Positions are authorized under FAA's Personnel Reform authority, under limited circumstances. Expert positions can be established in the following categories: Professional, Technical, Engineering, and Specialized. ATO has hired seven employees at the L band, which is considered comparable to an Expert under 5 U.S.C. 3109. *Use of this flexibility may be useful to ATO in situations where employees with unique skills and experience are available.*

Pay Flexibilities

FAA's Core Compensation Plan, implemented in April 2000, and authorized by the personnel reform legislation, provided some important pay flexibilities that were designed to help the agency retain talented employees. A brief description of some of these pay flexibilities follows:

- **Recruitment, Retention, and Relocation Incentives**: Like the rest of the Government, FAA can use Recruitment Relocation, and Retention Incentives to recruit and retain employees with critical skills. Under FAA policies, approval authority for all three of these tools is delegated to the heads of the service units—up to a certain level. For example, they can approve recruitment incentives up to 25 percent of basic pay; but those amounting to 25-50 percent must be approved by the FAA Associate Administrator for Human Resources. For the years 2005 to 2008, ATO has made limited use of recruitment, relocation, and retention bonuses for the acquisition workforce. A total of four recruitment incentives (one each year since 2005); three relocation incentives (one each year since 2006); and nine retention incentives (two in 2007 and seven thus far in 2008) have been paid since 2005. Increased use of these incentives would likely improve ATO's ability to hire and retain employees in critical positions in the acquisition workforce. Additionally, FAA should consider delegating full authority to ATO Vice Presidents, with appropriate accountability, to determine the appropriate incentive for key occupations in the acquisition workforce. HR should serve in an advisory, not an approval role, and if practicable, ATO managers should given the authority they need to make decisions that increase their ability to hire in support of NextGen programs.

- **Flexible Promotion Increase**: This tool allows managers to provide base pay increases of up to 15 percent upon promotion, but limits increases, by organization, to an average of 8-10 percent in a fiscal year.

- **Reassignment Increase**: This tool provides for base pay increases in a reassignment situation ranging from 1– 7 percent of the employee's base rate of pay and should average 4– 5 percent for the organization during each fiscal year. No more than 10–20 percent of employees in a line of business may receive reassignment increases in any fiscal year.

- **Reassignment Bonus**: A reassignment bonus is a one-time payment of 1–7 percent of an employee's base rate of pay. Employees may not receive both a reassignment bonus and a

reassignment increase for the same action. Granting a reassignment bonus is at the sole discretion of the appropriate management officials in the service unit.

- **In-Position Increase**: In-position increases to an employee's base rate of pay may range from 1–7 percent and should average 4–5 percent for the organization as a whole during each fiscal year.

- **Expert Level Position**: The FAA's Core Compensation Plan authorizes the establishment of Expert level positions in very limited situations. In the Professional, Technical, Engineering, and Specialized job categories, Expert positions can be established one pay band higher than the highest level available for the job category of the positions. It appears that ATO is utilizing the reassignment increase and the in-position increase more frequently than the reassignment bonus and the flexible promotion. From 2005 to the present, a total of 626 reassignment increases have been awarded, and 202 in-position increases. However, as previously noted, Expert level appointments are used infrequently. ***ATO managers should consider using Expert appointments to acquire the quality systems engineers, software engineers, and other highly technical experts needed for NextGen programs.***

HIGH IMPACT FLEXIBILITIES MAPPED TO CAREER PATTERN SCENARIOS[75]

Flexibility or Authority	HR Flexibilities and Authorities Handbook*	Student	New Professional	Mid-Career	Retiree	Highly Mobile	Revolving	Term	Mission-Focused	Experienced Professional	Requires Flexibilities
Pay											
Recruitment or Relocation Incentives[1]	E-1&2		H	H	M	H	H		H	H	
Superior Quals & Special Needs Pay-Setting Auth.	E-4		M	H	H	H	H	H	H	H	
Maximum Payable Rate Rule[2]	E-5				H		M		H	H	
Dual Comp Waivers	E-6				H						
Hiring											
Temporary Appointment	A-3						M				
Term Appointment	A-3		H				H	H			
Excepted Appointing Authorities[3]	A-4	H	H	H						M	
Veterans Appointing Authorities	A-4	H	M	M		M			H	M	
Appointment of Experts and Consultants	A-4			H	H	M	H		H		
Direct-Hire Authority	A-4		M	M				M	H		
Reinstatement Eligibility	A-4				H	H	H	M			
Intergov'tal Personnel Act (IPA) Mobility Program	J-3			M		H	H	H			
Work Arrangements											
Flexible Work Schedules and Leave Policies	C-1&3	H	H	H	H	H	H	H	H	H	H
Part-Time and/or Job Sharing	A-4	H		M	H						H
Telework	C-2	H	H	H	H	H	H	H	H	H	H
Benefits											
Flexible Spending Accounts	D-7		M	M		M	M	M	M	M	M
Student Loan Repayment Program	E-11	M	H			M			H		
Tuition Reimbursement	J-1	H	H						M	M	
Childcare and Eldercare Benefits	C-6		M	H	M					M	H
Thrift Savings Plan (TSP) Matching	D-5		H	H	H	H	H	H	H	H	H
Part-Time/Term Benefits	Many	H			H				H		H

* For more information, turn to the indicated section of Part II in the HR Flexibilities and Authorities Handbook.

"H" indicates the flexibility is **H**ighly effective in attracting candidates from the given scenario; "M" indicates **M**oderately effective.

[1] Relocation is only for current employees. Recruitment is only for those who are not current employees.

[2] Rule uses rate earned in a previous Federal civilian position.

[3] For Student: FCIP, PMF, STEP, SCEP. For New Professional: FCIP, PMF, SCEP. For Mid-Career SPMF. For Exp'd Prof: SPMF.

FCIP - Federal Career Intern Program

PMF - Presidential Management Fellow

STEP - Student Temporary Employment Program

SCEP - Student Career Experience Program

SPMF - Senior Presidential Management Fellow

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[75] *Career Patterns: A 21st Century Approach to Attracting Talent.* U.S. Office of Personnel Management, June 2006.

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