NAS Lifecycle Planning (NLP)

PROJECT LEVEL AGREEMENT (PLA)

**SYSDEV – ATC/Tech Ops Human Factors – Controller Efficiency – Air/Ground Integration**

**Fiscal Year 2013**

**Project Value: $3,679,062**

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Paul Fontaine, Director Date

Office of Advanced Concepts & Technology Development, ANG-C

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Leo Eldredge, Manager (A), Date

NAS Lifecycle Planning, ANG-D2

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Jaime Figueroa, Director, Date

Management Services Office, ANG-A

**REVISION HISTORY**

| **Filename** | **Sections Changed** | **Comments** | **Date** |
| --- | --- | --- | --- |
| FY13\_G1M.02-01\_ATCHF\_initial draft | Multiple | Initial draft to begin coordination | 10/18/12 |
| FY13\_ATCHF\_v5.3.docx | Multiple | Formatting and Edits | 7/19/13 |
| FY13\_ATCHF\_v6.5.docx | Multiple | Additional detail, responding to reviewer comments.  | 7/26/13 |
| FY13\_ATCHF\_v6.7.docx | Multiple | Additional detail, responding to reviewer comments.  | 8/14/13 |
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# 1.0 Quick Look Data Sheet

BLI/BSLI: 1A07A0

CIP #: G01M.02-01

Project ID: 20080021

Value of Project: $3,679,062

PLA/Budget Year: FY2013

Delphi Project #: 1213WA5350

Funding Type/Fund Code: F&E/12582A0130

Program Manager: Rachel Seely

Business Manager: Michelle Whetstine

Effective Period of Agreement: From T-Date until T+24

## 1.1 FY 2013 Milestones

|  |  |  |
| --- | --- | --- |
| **Fiscal Year 2013 Milestones** | **End Date[[1]](#footnote-1)** | **Milestone Level** |
| **01.00.00** Human Factors Guidance for RNAV/RNP Procedure Design | T+12 | 2 |
| **02.00.00** Update: NextGen Controller Strategic Job Analyses and Training Needs Analysis | T+18 | 3 |
| **03.00.00** NextGen Mid-Term Strategic Training Needs Analysis for TechOps | T+12 | 3 |
| **04.00.00** Tech Ops Integrated Work Environment – Advanced TechOps Concept Demonstrations | T+12 | 3 |
| **05.00.00** NextGen Human Performance Hazard Assessment | T+12 | 2 |
| **06.00.00** NextGen Controller Alarms & Alerts: Integration Risks and Alert Management Strategies | T+24 | 3 |
| **07.00.00** HSI Project Integration, Stakeholder Coordination, and EA Alignment | T+12 | 2 |
| **08.00.00** Guidance for HSI Methods in Service Analysis | T+12 | 3 |
| **09.00.00** NextGen Automation and Decision Support Integration Guidance | T+15 | 3 |
| **10.00.00** Human Factors Function in the Acquisition Management System | T+12 | 3 |
| **11.00.00** NextGen En Route/TRACON Controller Common Information Requirements | T+12 | 3 |
| **12.00.00** Program Support | T+12 | 3 |

***NOTE: Achievement of milestones and obligation goals contained herein are contingent upon timely enactment of the FY2013 appropriations.***

## 1.2 FY 2013 Obligation Plan

|  |
| --- |
| **FY 2013PLA Monthly Obligation Plan ($M) for 1213WA5350** |
|  | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | Totals |
| 2013 Plan | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
|  |
| 2014Plan | $0 | $2.0 | $1.45  | $0.23 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $ 3.68 |
|  |
| 2015 Plan | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 |

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| --- |
| **FY 2013PLA Obligation Plan** |
| Vendor | CIP | Delphi Project Number | Proposed Obligation Date (mm/dd/yy) | Cost (How Much $M) |
| American Institutes for Research | G01M.02-01 | 1213WA5350 | 11/15/2013 | $955,000 |
| Fort Hill Group | G01M.02-01 | 1213WA5350 | 12/15/2013 | $1,350,000 |
| Intuitive Design Solutions | G01M.02-01 | 1213WA5350 | 01/15/2014 | $1,074,062 |
| CAMI | G01M.02-01 | 1213WA5350 | 11/15/2013 | $300,000 |

|  |  |
| --- | --- |
| **Delphi Project Number** | **Totals** |
| 1213WA5350 | $3,679,062 |
| **Obligation Plan Total** | **$3,679,062** |

***NOTE: Achievement of milestones and obligation goals contained herein are contingent upon timely enactment of the FY2013appropriations.***

# 2.0 Purpose of Project Level Agreement

To document and define the work agreement between the NAS Lifecycle Planning and the Performing Organization, ANG-C1, is the purpose of this Project Level Agreement (PLA). The leadership of the Solution Set Managers Team and Business Management Team authorized this agreement.

## 2.1 Scope of Project Level Agreement

This PLA provides the milestones, deliverables, obligation plan, and spend plan for the FY2013 ATC/Tech Ops Human Factors – Controller Efficiency – Air/Ground Integration project. The agreement is effective upon signing until the latest milestone date listed in Sections 1.1 and 5.0 of this document (unless amended). Follow on work may be accomplished via an amended or new PLA. The amended or new PLA milestones and deliverables may be effective for a multi-year period, if appropriate.

## 2.2 Project Level Agreement Linkage to NSIP

This PLA is a part of the NLP Segment Implementation Plan (NSIP). The outcomes of this project, ATC/Tech Ops Human Factors – Efficiency – Air/Ground Integration, are linked to the NSIP for Segment Bravo in NSIP 5.0 Section 8.1.2.2 "Increasing capacity and efficiency using RNAV/RNP" (OI 108209).

# 3.0 Project Scope

Information regarding the scope of this PLA is contained in the following section. This section includes the problem being mitigated by this program, the current gaps/shortfalls within today’s as-is NAS that will be covered by this program, a description of the project, the description of the solution the project provides, and an overview of how the project fits into the NAS Enterprise Architecture.

## 3.1 Problem Description

Delay reduction, through increases in capacity and efficiency of the NAS, is the largest component ($77 Billion in estimated savings) of the business case for NextGen. Yet, while humans are intended to be integrated components of this future system, no single program looks at the *contributions* of humans in achieving these goals.

Though elements of the Human Factors discipline are applied during concept development and again at the interface level during individual tool implementation, no comprehensive program of work assesses the ***required human performance*** to achieve NextGen capacity and efficiency targets. We have yet to define how, and to what extent, all NAS actors can contribute to reducing delays. We begin to form the foundation for defining these human performance metrics, measuring impacts of tool integration, and modeling the exact contributions of humans to NAS efficiency in this program.

This portfolio of work creates a mechanism where human performance is assessed at multiple stages of development, across multiple systems, and through the evolution of individual NAS actors. By systematically linking existing Advanced Concepts Development (ANG-C1) work and Computer Human Interface (CHI) work done at the PMO level, these efforts collectively establish an end-to-end Human Systems Integration effort.

Risks to NextGen through strategic assessment of human performance hazards, training needs, and job analysis are first identified in this end-to-end solution. Next, specific activities identify ways to improve human performance. Finally, this portfolio of work provides the product delivery mechanisms through stakeholder and consumer engagement, AMS integration, and implementation support. The stakeholder and consumer community has informed both the need and the solution description. These consumers include the PMO, Safety and Technical Training Office, Systems Engineering, and the NextGen Implementation Harmonization Division.

The Human Factors Division NextGen team performed the following activities to define the end-to-end solution:

1. Conducted internal discussions to identify strategic planning requirements based on NextGen objectives.
2. Met with NAS EA roadmap leads to orchestrate alignment between specific program activities and delivery of HSI products via the HSI roadmap.
3. Conducted working meetings with PMO, the Concept Development Group, and Systems Engineering, to identify gaps in agency use of HSI best practices throughout the system lifecycle.
4. Established ongoing discussions with NextGen Systems Engineering and Implementation Harmonization Division to explore and define the specific needs for system implementation support.
5. In coordination with AJI, identified requirements to address strategic training needs and job analysis for controllers, maintainers, and traffic management personnel.
6. Identified need for cross-cutting human performance hazard assessment, tracking, and requirements definition through ongoing collaboration with NextGen Safety.
7. Coordinated with En Route and Terminal PMO HF leads to identify cross-cutting risks to NextGen in the areas of automation implementation, and alarms and alerts management for controllers.
8. Identified opportunities to further leverage this work to inform the evolution of NextGen and improve human performance and NAS efficiency.

The above identification of needs resulted in a portfolio of milestones which includes strategic job and training needs analysis, human performance hazards assessments, cross-cutting work to provide automation implementation guidance, and controller alarms & alerts management strategies. Section 3.3, below, details each milestone and associated products. Section 3.4 identifies the relationship of each milestone to the next, and how they collectively support FAA NextGen needs.

The fact that the HSI Roadmap is the only reflection in the Enterprise Architecture that people are a critical node in the NAS illustrates the need for a comprehensive Human Factors program. Additionally, a preliminary mapping of NextGen technologies shows that the various Operational Improvements that cite a need for automation or decision support tools that will be used by air navigation service providers to achieve the new capability will result in at least 12 tools added to the TRACON workstation, 12 new tools added to the tower, and 10 tools to be added to the en route workstation.

This is a very large change to working conditions and the integration of these tools will result in chaos if each program independently develops them. The introduction of this large amount of technology points to not only system performance risk, but the potential for safety risk since the potential for human error in each of these increases as the workstation becomes more complex. Some of the automation purports to simplify and contract the role of the controller, but without a concerted effort to strategically implement specific features and tools, there is no assurance that technology will serve the people in the NAS to achieve the NextGen objectives.

To address these integration risks, specific activities in this portfolio systematically assess:

1. the number and type of automation and decision support tools being implemented simultaneously at any one workstation,
2. the specific tool interactions which may pose human performance risks,
3. and mitigations required such as system functional requirements and/or guidance material to be provided to the PMO.

This approach will serve to capture and mitigate current risks while developing a long-term mitigation strategy which eventually informs an agency-wide automation philosophy. The PMO will be provided with implementation guidance, as development of this automation philosophy is not currently feasible. This guidance serves to inform automation and decision-support implementations such that controllers, traffic managers, and maintainers can reasonably expect consistent system behavior and information presentation.

## 3.2 Performance Gap/Mission Shortfall

This program is cross-cutting and applies across all solution sets. The mission shortfall is that most of the capabilities in NextGen hinge upon the actions of air traffic service providers using new decision support tools or automation to achieve the operational improvement. The effectiveness of each of these solutions is contingent upon the proper human engineering of the new capability. This human engineering is not just the visible interface, but the characteristics of the tool and how the tool is used in the context of the work.

A documented limitation of the human component of the system to handle additional traffic is the true performance gap in NextGen. The current human-system capacity limit is at about 125% to 130% of the 2004 traffic level at busy en route arrival sectors. Due to human limitations many TRACON sectors are currently at capacity. The advanced technology being proposed in NextGen has the potential to increase efficiency, but only if human-in-the-loop system performance is properly engineered. The purpose of this program is to assure that NextGen technology achieves its promised objective from the human performance standpoint. The expected future state of the NAS in NextGen with respect to controller efficiency and air ground integration is such that there will be an effective and well integrated set of tools for each controller that enables the controller to manage the level of traffic required by the concept with an acceptable level of safety risk due to human error. The controller should be able to maintain safe operations by reliance on back-up modes of operations under degraded conditions when systems fail or do not perform adequately. The controller needs to effectively communicate and work with pilots and other controllers, as well as other actors in the NAS, to transfer various levels of separation authority without ambiguity or uncertainty regarding responsibility for separation. The controller must deliver the services to the pilot in a manner that supports the pilot’s preference, complies with strategic plans for the flow of traffic in the NAS, and is able to minimize the impact on the environment.

The current NAS is characterized by controller workstations that have limited integration and are a collection of independently developed tools. The controller acts as the system integrator and selectively uses features of the workstation that support his mode of operation. Many tools, such as URET, are not used for their intended purpose and provide limited improvements to capacity or capability. Some prior development efforts resulted in tools that were not effective or induced an unacceptable level of workload (e.g., p-FAST).

## 3.3 Project Description

This project is designed to balance three concurrent objectives.

1. Establish and exercise HSI best practices for the purposes of reducing programmatic risk, human performance risk, and overall system lifecycle cost
2. Respond to the needs of both stakeholders and consumers
3. Support NextGen Objectives of Safety, Capacity, and Efficiency

To accomplish these, the following milestones and activities are planned:

01.00.00 Human Factors Guidance for RNAV/RNP Procedure Design – NextGen is unable to fully realize the efficiency benefits of PBN since certain RNAV/RNP procedures have not been accepted by the operational community. This is due to excessive fixes, numerous altitude bands, and other factors inherent in the procedure design. Pilots and controllers do not use, or have significant difficulty complying with, these demanding procedures due to the limitations of their aircraft equipment, time demands for completion of task sequences, and the excessive workload required to adequately perform the procedure. To identify and mitigate specific factors through better procedure design, the Fort Hill Group will address the impact of known non-conformance human performance causal factors such as controller communication, automation interaction, and procedure design as they affect controller and pilot acceptance and performance across RNAV/RNP-dependent Operational Improvements. The Human Factors Division will provide outputs of this effort to AJV and ATO Ops for consideration during procedure design and to the PMO for system design considerations where required. These will include Human Factors considerations in procedure design, cross-cutting functional requirements, controller information requirements, and operational scenarios that will support the testing of non-conformance causal factors across RNAV/RNP-dependent OIs during development and implementation.

02.00.00 & 03.00.00 Strategic Job and Training Needs Analysis –NextGen has not changed the role of controllers or delegated safety critical tasks to automation, though NextGen has introduced some new methods and techniques for traffic management. Additionally, Decision Support Tools (DSTs) perform some non-safety critical tasks. These techniques and potential movement of information integration tasks to DSTs necessitates a revision of the mid-term controller job description. These changes are referred to as “NextGen drivers” and each necessitates a strategic look at the controller’s job tasks and future training needs.

American Institutes for Research (AIR) will update the 2011 Mid-Term Controller Job Descriptions and Strategic Training Needs Analysis to maintain the relevance, utility, and accuracy of this strategic perspective and respond to updated NSIP increments. These updates will take the form of reports provided to the office of Safety and Technical training to inform strategic curriculum development and evaluate workforce considerations such as required Knowledge, Skills, Abilities, and Other (KSAOs) attributes. Additionally, AIR will develop the initial strategic job and training needs analysis for the Technical Operations community. Specific outputs include:

* A list of NextGen technology, automation, and procedures (i.e., Drivers) that capture the OIs and that are proposed to impact TechOps in the Mid-Term.
* Impact of the NextGen Drivers on TechOps.
* Job descriptions that explain what the TechOps jobs will look like in the Mid-Term.
* Training products including estimates of the new training that will be required, and the resources required, to support the new training for TechOps personnel.

These products are required to be provided to the Safety and Technical Training office to ensure that TechOps personnel are prepared to successfully support the technologies, automation and procedures that will be in place by the Mid-Term.

04.00.00 TechOps Integrated Work Environment – As NextGen moves the NAS toward a service environment, supported by an internet/data center model for information exchange, the role of the TechOps community is changing. The TechOps community is responsible for maintaining the NAS using a multitude of systems that have been independently developed over many years. New maintenance concepts are being introduced that could fundamentally change the way systems are monitored and repaired. However, before these changes can be systematically implemented, it is necessary to develop a singular, cohesive Concept of Operations (CONOPS) for the TechOps community.

The TechOps community has requested the Human Factors Division to assist with developing this CONOPS from a Human Factors perspective as well as developing specific narratives for individual concepts. These individual concepts will be matured through a series of concept demonstrations delivered to the TechOps community.

05.00.00 Human Performance Hazard Assessment – The current methods of human performance hazard assessment leave gaps in the FAA’s ability to proactively identify system-level human performance hazards which may impact safety. The current methods are better at capturing information after the fact and are often equipment focused. This effort presents a proactive approach with methods that focus on the human contribution to system performance and the human performance risks inherent in implementing new procedures, tasks, and systems.

While the NAS is one of the safest in the world, the challenge is to maintain this safety or possibly even improve upon it while implementing many new systems. To achieve this, the Fort Hill Group will conduct human performance safety hazard assessments of NextGen changes to identify potential safety hazards and to develop targeted mitigation strategies in the form of functional, system, research, and training requirements. This potential safety hazards and associated requirements will be provided to NextGen Safety for tracking and mitigation.

06.00.00 Controller Alarms and Alerts Management - As NextGen will bring many new tools and systems with their individual alarms, alerts, and status indicators, it will be necessary for the PMO to consider how these are integrated, prioritized, and displayed to controllers. This project will provide guidance on this prioritization and strategies for controller alert management such that consistency may be obtained across En Route, TRACON, and Tower domains. This guidance will be provided to the PMO for consideration when defining individual system requirements.

To achieve this consistency and efficiently produce this guidance, IDS will leverage ATC Tower alerts standards work performed in 2013 to baseline NAS legacy alarms and alerts. This will form the basis of a catalog of NextGen alarms and alerts which will be expanded through SME interviews, ongoing human performance hazards analysis, and existing CONOPS. IDS will then develop a formal NextGen alarms and alerts taxonomy and prioritization schema for use in drafting an initial NextGen Alarms and Alerts Implementation Guidebook.

07.00.00 HSI Project Integration, Stakeholder Coordination, and EA Alignment – The Human Factors Division must continuously engage stakeholders to make sure its Human Factors research effectively supports NextGen. This means carefully documenting the research needs and determining exactly when the research must be completed to inform critical program milestones and decisions. Once this information is known, the multi-year plan (or roadmap) for project execution, and the alignment of these projects with NextGen programs, must be documented in a format that allows shared understanding of this information.

To accomplish this, the Fort Hill Group will meet with NextGen Roadmap Leads, the Human Factors Division, and other NextGen Stakeholders and HSI product consumers to develop the HSI roadmap. This roadmap will align all HSI activities to specific program elements on other NAS EA roadmaps such as automation, air/ground integration, and DataComm. This ensures that HSI products such as risk assessments, functional requirements, or implementation guidance are available for review and consideration at key programmatic milestones.

Additionally, the HSI Roadmap and its associated artifacts will outline the “as is” and “to be” roles and responsibilities of the actors in the NAS (air traffic controllers, pilots, dispatchers, traffic managers, etc.), their interactions with NextGen technologies, linkage to required changes to staffing, personnel selection, training, and required research and development activities in the human factors area that are needed to realize the NextGen vision.

This process allows for identification of research shortfalls with NextGen stakeholders and provides complete alignment between the Human Factors Division activities and the NAS Enterprise Architecture. This process proceeds throughout the year and results in the annual release of a new HSI roadmap that communicates these changes to all stakeholders.

08.00.00 Guidance for HSI Methods in Service Analysis – There is a gap in programs’ agency level plans with regards to a consistent approach to Human System Integration.  Programs require guidance to support the vertical integration of human systems at the program-level with the vision and goals at the agency-level as captured in the FAA Strategic Plan.  Guidance is also needed for the vertical integration of human systems in concepts (developed by programs during Concept & Requirements Definition) with target operational capabilities of the NAS (defined in the NAS ConOps). The products include HSI Plans and templates that programs can use to align vertically with agency-level plans.

09.00.00 NextGen Automation and Decision Support Integration Guidance – The Human Factors Division has identified integration gaps in the implementation of specific automation and DSTs. Through discussions with the PMO, ANG-C1 has identified specific automation configurations and usage scenarios that present human performance risks. This occurs during simultaneous usage of multiple automation and decision support tools which may be using different algorithms and/or data sources. The Human Factors Division is best positioned to analyze this cross-cutting issue due to its enterprise perspective of the NAS. Integration of automation and DSTs spans multiple tools and the En Route, TRACON, and tower domains. No single program can resolve this on its own.

This issue of how automation and DSTs are integrated requires careful examination of automation implementations and subsequent determination of appropriate automation and DST behaviors. This will reduce the necessity for controllers to mentally integrate potentially disparate information or systems presenting potentially conflicting alarms and resolution advisories.

To address this, IDS will perform an initial catalog of NextGen decision support tools and proposed automation systems and identify instances of simultaneous automation usage and associated risks due to trust and conflicting information. IDS will analyze automation limitations and how overall system resiliency is affected by increased use of automation and decision support. This work will result in understanding of automation degraded modes, system resiliency under increased automation, recovery procedures for adverse events, and a simulation plan designed to test the validity of findings and recommendations. The results will be provided to the PMO and Safety and Technical Training Group. Additionally, this work will inform future concept development.

10.00.00 Human Factors in the Acquisition Management System - This year, the Ideas to In-Service framework for shepherding NextGen initiatives from concept to implementation was incorporated into the Acquisition Management System. As a result, human factors engineering guidance is out of date and programs lack guidance for how to apply this specialized discipline required in lifecycle acquisition management. This investment provides solutions for compliance with the updates to Acquisition Management System (AMS) Policy and with Section 4.7 for human factors by Next Generation Air Transportation System (NextGen) Programs and other programs that use AMS. The results of this investment include: 1) integration of human factors guidance into systems engineering and other FAA process guidance, 2) strengthening compliance with human factors AMS policy, and 3) an expansion of needed human factors coordination across the agency.

11.00.00 Controller Common Information Requirements – Significant cost savings can be achieved by strategic implementation of common En Route and TRACON tasks and tools. These savings are achieved through consolidated training, consolidated design, and enabling a more flexible workforce.

To achieve this, the Civil Aerospace Medical Institute will evaluate common controller information requirements between the En Route and TRACON domains. This work establishes common functions and tasks as opportunities to implement a common look and feel with the above strategic objective in mind. The deliverables detail areas of opportunity, potential risks, and provide context for an implementation strategy supporting an evolution of these systems over time.

12.00.00 Program Support and Planning – Intuitive Design Solutions (IDS) will develop the PLA, update the strategic plan, coordinate with stakeholders and consumers to refine objectives, and provide ongoing program and project status to the Human Factors Division and external stakeholders.

## 3.4 Solution Description

This program will use the Human System Integration (HSI) approach to system engineering that has been firmly entrenched in the Department of Defense acquisition and development process for several decades. HSI accounts for the human component in the ownership of systems over their life cycle. The human component is more expensive and more complex than any other aspect of the air traffic system. The human component is at the heart of the safety of the system and its capabilities. A human-centered and work-centered approach to system design will result in maximizing system benefits while controlling and reducing cost over the system’s life cycle.

Human System Integration for NextGen will focus on the domain areas of Human Factors Engineering, Human Error and Safety, and Training. These HSI domains are the most relevant to the FAA’s mission and each effort in this portfolio has been selected to support our stakeholders and consumers within these domains. Specifically, the Human Factors Division actively collaborates with the office of Safety and Technical Training and NextGen Safety to provide key assessments of cross-cutting safety and training risks. This collaboration includes providing documentation of risk as well as development of mitigating requirements and strategies.

These focus areas are reflected in the work being done on this program to support not only the development of NextGen systems, but the future of the ATO regarding the role of humans in the system. The important aspect of HSI is not just the work conducted within each of these domain areas, but the linkage between them. We must build operable and maintainable systems that provide the human-in-the-loop benefits that are required by our system objectives. Our systems must support not only the required level of performance but also the maintenance and enhancement of safety in the National Airspace System (NAS). Since most safety metrics are associated with human performance and human error, these parameters must be managed as a part of systems engineering to include training and selection of individuals with the appropriate aptitudes to achieve the required performance levels and maintain safety in the NAS. These HSI domains need to develop a tight linkage to engage in an iterative and collaborative process to support an effective system development process within the specified schedule and cost structure.

This program puts an emphasis on Human Factors Engineering in terms of integrated controller tools to support achievement of NextGen human-in-the-loop performance as the focal point for the delivery of air traffic services. The safety aspects of human performance cannot be overstated since all NAS safety metrics are directly linked to human error. As NextGen brings changes in roles and responsibilities between controllers and pilots we must assure that there is a sustainable safety net in the system to mitigate new types of human error being introduced by NextGen’s new capabilities. These new capabilities will bring a requirement for training that will extend well beyond initial systems training as increased levels of automation bring the potential for skill degradation. A final issue to be resolved regards that of how the job of the controller will change in the NextGen environment. If the job changes to any major extent, the FAA will need to change the selection criteria for applicants and may need to retrain the existing pool of controllers.

Automation and technology must work in concert with the humans in the system to meet the targeted efficiency levels. This program targets the integration and harmonization of the various NextGen concepts into a workable solution that intelligently adds the many new capabilities, decision support tools and automation to the diverse NextGen actors’ workstations to achieve the desired performance outcome. This is necessarily a Human Factors role within the systems engineering construct. More specifically, only the Human Factors Division has the visibility across systems and domains to address this issue.

To properly integrate automation and technology, and have it work in concert with the human operators in the system, one must understand the human’s role, their abilities and limitations, and the specific cognitive functions that system designers are asking them to perform. With these task-specific parameters in mind, the Human Factors Division can inform concept development, provide context for the PMO for design decisions, and provide functional requirements to ensure systems consistently support cognitive tasks. It is then possible to apply this knowledge across tools that are intended to be used simultaneously. This forms the basis for true integration.

Achieving the efficiency targets of NextGen and the flight crew achieving delegated spacing between aircraft requires significant changes in the roles and responsibilities between pilots and controllers and between humans and automation. Integration of air and ground capabilities poses challenges for the air traffic service provider and the flight crew. A core human factors issue is to ensure that safety is maintained. Information on intent as well as positive information on delegation of authority must be clear and unambiguous; and analyses of new types of human error modes are required to manage safety risk in the changing environment.

## 3.5 Enterprise Architecture

* National Airspace System (NAS) Architecture
	+ The following description of the Project Roadmap has been copied from the NAS Architecture version 7
	+ Reference: <https://nasea.faa.gov/products/roadmap/main/display/9/tab/detail/rmd_id/23>

**

## 3.5a List of Operational Improvements and NSIP Increments

|  |  |  |
| --- | --- | --- |
| **Fiscal Year 2013 Milestone** | **NSIP Operational Improvements** | **NSIP Increments** |
| 01.00.00 Human Factors Guidance for RNAV/RNP Procedure Design | 104123, 104120, 108209 | 104123-11, 104117-11, 104120-(13, 21,23, 27), 108209 |
| 02.00.00 Update: NextGen Controller Strategic Job Analyses and Training Needs Analysis | N/A | N/A |
| 03.00.00 NextGen Mid-Term Strategic Training Needs Analysis for TechOps | All |  |
| 04.00.00 Tech Ops Integrated Work Environment – Advanced TechOps Concept Demonstrations | All |  |
| 05.00.00 NextGen Human Performance Hazard Assessment | All |  |
| 06.00.00 NextGen Controller Alarms & Alerts: Integration Risks and Alert Management Strategies | 102114,102137,104117,104120,104122,104123 |  |
| 07.00.00 HSI Project Integration, Stakeholder Coordination, and EA Alignment | All |  |
| 08.00.00 Guidance for HSI Methods in Service Analysis | To be established by Harmonization WG |  |
| 09.00.00 NextGen Automation and Decision Support Integration Guidance | 102114,102137,104117,104120,104122,104123 |  |
| 10.00.00 Human Factors Function in the Acquisition Management System  | All |  |
| 11.00.00 NextGen En Route/TRACON Controller Common Information Requirements | 102114,102137,104117,104120,104122,104123 | 105302 -25 |
| 12.00.00 Program Support | 102114,102137,104117,104120,104122,104123 |  |

# 4.0 Benefits

## 4.1 Key Performance Areas

The table below lists the Key Performance Areas (KPAs) covered in the NextGen Segment Implementation Plan (NSIP). All projects in NLP support one or more of these KPAs.

|  |  |
| --- | --- |
| **Key Performance Area (KPA)**  | **Description**  |
| Access and Equity  | Ensures that all users have right of access to the Air Traffic Management (ATM) resources needed to meet their specific operational requirements and that all customers can share the airspace safely.  |
| Capacity  | Apply the inherent capacity to meet airport and airspace user demand at peak times and locations while minimizing restrictions on traffic flow and minimizing temporary loss of capacity.  |
| Efficiency  | The cost-effectiveness of gate-to-gate flight operations from a single-flight perspective is managed through user-stated preferences. Airspace users can limit the operational impacts and economic costs when they identify the trajectories they determine to be best, given the constraints in each phase of flight.  |
| Flexibility  | Ensures the ability of all airspace users to modify flight trajectories dynamically and adjust departure and arrival times, thereby permitting them to exploit operational opportunities as they occur.  |
| Safety  | Uniform safety standards and risk and safety management practices should be applied systematically to the ATM system. In implementing elements of the aviation system, safety needs to be assessed against appropriate criteria and according to appropriate and standardized safety management processes and practices.  |
| Environment  | Ensure that elements of the aviation system contribute to the protection of the environment by considering noise, gaseous emissions, and other environmental issues in the implementation and operation of the aviation system.  |

## 4.2 Project Specific Benefits

|  |  |
| --- | --- |
| **Benefit Type** | **Benefit Description** |
| Capacity  | This portfolio of work will specifically address NAS capacity by optimizing human interactions with automation tools and increasing pilot compliance with PBN clearances. |
| Efficiency  | The results of this work support efficiency targets by demonstrating improvements in throughput and decreases in time to perform specific controller tasks.  |
| Flexibility  | A major component of the Human Factors R&D effort focuses on air/ground integration. This integration focus ensures that information, tools, and procedures are designed and provided for NAS participants to take full advantage of NextGen capabilities.  |
| Safety  | The Human Performance Hazard/Safety Assessment effort identifies hazards and potential errors due to NextGen improvements. Once identified, these hazards are cataloged in a safety database. These potential errors and hazards to human performance are translated into workstation requirements designed to mitigate the risk of each hazard occurrence and additionally provide for safe and easily recoverable conditions should errors occur.  |

# 5.0 Program Schedule

| **Type** | **Milestone Number** |  **Description** | **Start Date[[2]](#footnote-2)** | **EndDate[[3]](#footnote-3)** | **NSIP Segment** | **NASEA DP** | **AMS Milestone** | **FAA BP Goal** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***M*** | ***00.00.00*** | ***Program Management Activities (Continuing PLA)*** |  | ***T+24*** |  |  |  |  |
| *D* | *00.01.00* | *Updated Multi Year Program Plan*  | *T* | *T+5* |  |  |  |  |
| *A* | *00.01.01* | *Draft Updated Multi-Year Program Plan* | *T* | *T+2* |  |  |  |  |
| *A* | *00.01.02* | *Complete final version of Updated Multi-Year Program Plan and submit to SSC* | *T+2* | *T+5* |  |  |  |  |
| *D* | *00.02.00* | *Monthly IMS Status Updates provided to NLP* | *T+1* | *Monthly* |  |  |  |  |
| *A* | *00.02.01* | *Gather status update information* | *T+1* | *Monthly* |  |  |  |  |
| *A* | *00.02.02* | *Update IMS through workflow* | *T+1* | *Monthly* |  |  |  |  |
| *D* | *00.03.00* | *Quarterly\* Program Management Reviews (PMR)* | *T* | *Quarterly* |  |  |  |  |
| *A* | *00.03.01* | *Schedule PMR date* | *T* | *Quarterly* |  |  |  |  |
| *A* | *00.03.02* | *Submit PowerPoint presentation deck 48 hours prior to PMR* | *T* | *Quarterly* |  |  |  |  |
| **M** | **01.00.00** | **Human Factors Guidance for RNAV/RNP Procedure Design** |  | T+12 | Alpha-Bravo | 568, 579 | Solution Implementation | Next Level of Safety |
| D | 01.01.00 | Report: RNAV/RNP Non-Conformance - Initial findings and recommendations | T+1 | T+12 | Alpha-Bravo | 568, 579 | Solution Implementation | Next Level of Safety |
| A | 01.01.01 | Interview Subject Matter Experts | T+1 | T+12 | Alpha-Bravo | 568, 579 | Solution Implementation | Next Level of Safety |
| A | 01.01.02 | Identify and apply human factors/safety tools for root cause analysis | T+3 | T+9 | Alpha-Bravo | 568, 579 | Solution Implementation | Next Level of Safety |
| D | 01.02.00 | RNAV/RNP mitigation strategy validation and simulation requirements | T+6 | T+12 | Alpha-Bravo | 568, 579 | Solution Implementation | Next Level of Safety |
| A | 01.02.01 | Develop validation metrics | T+7 | T+8 | Alpha-Bravo | 568, 579 | Solution Implementation | Next Level of Safety |
| A | 01.02.02 | Develop simulation requirements | T+9 | T+12 | Alpha-Bravo | 568, 579 | Solution Implementation | Next Level of Safety |
| **M** | **02.00.00** | **Update: Controller Strategic Job Analyses and Training Needs Analysis** |  | T+18 | Bravo | 584 | N/A | Aviation Access |
| D | 02.01.00 | Updated NextGen Job Descriptions for ATCSs | T | T+18 | Bravo | 584 | N/A | Aviation Access |
| A | 02.01.01 | Revise Language in Current ATCS Job Analysis (Optional) | T | T+1 | Bravo | 584 | N/A | Aviation Access |
| A | 02.01.02 | Update NextGen Mid-Term Literature Review | T+1 | T+3 | Bravo | 584 | N/A | Aviation Access |
| A | 02.01.03 | Update NextGen Mid-Term Driver List | T+4 | T+8 | Bravo | 584 | N/A | Aviation Access |
| A | 02.01.04 | Update Impact of NextGen Drivers on ATCS Job | T+8 | T+18 | Bravo | 584 | Solution Implementation | Aviation Access |
| **M** | **03.00.00** | **NextGen Mid-Term Strategic Training Needs Analysis for TechOps** |  | T+12 | Bravo | N/A | Solution Implementation | Aviation Access |
| D | 03.01.00 | NextGen Training Needs for TechOps | T+2 | T+12 | Bravo | N/A | Solution Implementation | Aviation Access |
| A | 03.01.01 | Conduct Literature Review | T+2 | T+4 | Bravo | N/A | Solution Implementation | Aviation Access |
| A | 03.01.02 | Identify NextGen Drivers for TechOps | T+4 | T+8 | Bravo | N/A | Solution Implementation | Aviation Access |
| A | 03.01.03 | Identify Impact of NextGen Drivers on TechOps | T+8 | T+12 | Bravo | N/A | Solution Implementation | Aviation Access |
| **M** | **04.00.00** | **Tech Ops Integrated Work Environment – Advanced TechOps Concept Demonstrations** |  | T+12 | Bravo | N/A | Solution Implementation | Aviation Access |
| D | 04.01.00 | Provide Advance Tech Ops Operational Concept updates to “Tech Ops Maintenance Concept of Operations for 2014 and Beyond” | T+2 | T+12 | Bravo | N/A | Solution Implementation | Aviation Access |
| A | 04.01.01 | Develop narratives of advanced operational concepts  and proposed implementations | T+2 | T+11 | Bravo | N/A | Solution Implementation | Aviation Access |
| A | 04.01.02 | Prepare Draft | T+9 | T+12 | Bravo |  |  | Aviation Access |
| **M** | **05.00.00** | **NextGen Human Performance Hazard Assessment** |  | T+12 | Bravo | 575, 579 | Solution Implementation | Next Level of Safety  |
| D | 05.01.00 | NextGen Human Performance Baseline Risk Assessment Report | T | T+12 | Bravo | 575, 579 | Solution Implementation | Next Level of Safety |
| A | 05.01.01 | Determine Key NextGen Human Performance Tasks | T | T+2 | Bravo | 575, 579 | Solution Implementation | Next Level of Safety |
| A | 05.01.02 | Review operational data to assess human performance risk levels | T+2 | T+10 | Bravo | 575, 579 | Solution Implementation | Next Level of Safety |
| A | 05.01.03 | Document baseline human performance risk levels for associated NextGen Activities  | T+10 | T+12 | Bravo | 575, 579 | Solution Implementation | Next Level of Safety |
| **M** | **06.00.00** | **NextGen Controller Alarms & Alerts: Integration Risks and Alert Management Strategies** |  | T+24 | Bravo | 57 | Solution Implementation | Next Level of Safety |
| D | 06.01.00 | Report: Legacy vs. NextGen ATC alarms and Alerts Analysis | T | T+6 | Bravo | 57 | Solution Implementation | Next Level of Safety |
| A | 06.01.01 | Conduct SME interviews and site visits | T+1 | T+4 | Bravo | 57 | Solution Implementation | Next Level of Safety |
| A | 06.01.02 | Review system documentation and relevant CONOPS | T | T+6 | Bravo | 57 | Solution Implementation | Next Level of Safety |
| D | 06.02.00 | NextGen Alarms & Alerts Taxonomy | T+2 | T+10 | Bravo | 57 | Solution Implementation | Next Level of Safety |
| A | 06.02.01 | Review relevant standards and guidance | T+2 | T+5 | Bravo | 57 | Solution Implementation | Next Level of Safety |
| A | 06.02.02 | Conduct working groups for refining taxonomy | T+5 | T+8 | Bravo | 57 | Solution Implementation | Next Level of Safety |
| A | 06.02.03 | Draft initial Taxonomy Report | T+7 | T+10 | Bravo | 57 | Solution Implementation | Next Level of Safety |
| D | 06.03.00 | NextGen Alarms & Alerts Prioritization Schema | T+10 | T+20 | Bravo | 57 | Solution Implementation | Next Level of Safety |
| A | 06.03.01 | Conduct SME interviews  | T+10 | T+16 | Bravo | 57 | Solution Implementation | Next Level of Safety |
| A | 06.03.02 | Evaluate current standards and guidance for applicability | T+10 | T+14 | Bravo | 57 | Solution Implementation | Next Level of Safety |
| A | 06.03.03 | Develop objective prioritization schema | T+10 | T+14 | Bravo | 57 | Solution Implementation | Next Level of Safety |
| A | 06.03.04 | Prepare simulation plan  | T+13 | T+15 | Bravo | 57 | Solution Implementation | Next Level of Safety |
| A | 06.03.05 | Conduct validation simulations and cognitive walkthroughs | T+15 | T+18 | Bravo | 57 | Solution Implementation | Next Level of Safety |
| A | 06.03.06 | Refine prioritization schema and draft report | T+17 | T+20 | Bravo | 57 | Solution Implementation | Next Level of Safety |
| D | 06.04.00 | NextGen Alarms and Alerts Implementation Guidebook | T+6 | T+24 | Bravo | 57 | Solution Implementation | Next Level of Safety |
| A | 06.04.01 | Draft Initial Guidebook | T+8 | T+12 | Bravo | 57 | Solution Implementation | Next Level of Safety |
| A | 06.04.02 | Finalize Guidebook with stakeholder comments | T+17 | T+20 | Bravo | 57 | Solution Implementation | Next Level of Safety |
| A | 06.04.03 | Update Guidebook with updated standards developed by Core program | T+20 | T+24 | Bravo | 57 | Solution Implementation | Next Level of Safety |
| **M** | **07.00.00** | **HSI Project Integration, Stakeholder Coordination, and EA Alignment** |  | T + 12 | Alpha-Charlie | Cross-Cutting | Solution Implementation | Aviation Access |
| D | 07.01.00 | Finalized 2014 Human Systems Integration Roadmap | T | T + 12 | Alpha-Charlie | Cross-Cutting | Solution Implementation | Aviation Access |
| A | 07.01.01 | Review existing infrastructure roadmaps and planned NextGen improvements to determine needed updates | T | T + 4 | Alpha-Charlie | Cross-Cutting | Solution Implementation | Aviation Access |
| A | 07.01.02 | Add new or updated activities, decision points, and actor impacts to HSI roadmap for 2014 version | T + 4 | T + 8 | Alpha-Charlie | Cross-Cutting | Solution Implementation | Aviation Access |
| A | 07.01.03 | Complete roadmap review and publication cycle including necessary updates | T + 8 | T + 12 | Alpha-Charlie | Cross-Cutting | Solution Implementation | Aviation Access |
| **M** | **08.00.00** | **Guidance for HSI Methods in Service Analysis** |  | T + 12 | Alpha-Charlie | Cross-Cutting | Solution Implementation | Next Level of Safety |
| D | 08.01.00 | NextGen Implementation Support Plan | T + 1 | T + 6 | Alpha-Charlie | Cross-Cutting | Solution Implementation | Next Level of Safety |
| A | 08.01.01 | Conduct Implementation Workgroups to establish priority systems and strategies | T + 1 | T + 4 | Alpha-Charlie | Cross-Cutting | Solution Implementation | Next Level of Safety |
| A | 08.01.02 | Review legacy system documentation and NextGen system risks | T + 4 | T + 6 | Alpha-Charlie | Cross-Cutting | Solution Implementation | Next Level of Safety |
| A | 08.01.03 | Develop Human System Integration Approach to implementation with stakeholder buy-in | T + 2 | T + 6 | Alpha-Charlie | Cross-Cutting | Solution Implementation | Next Level of Safety |
| D | 08.02.00 | Develop prototype FAA Human Systems Integration Plan template for priority systems | T + 6 | T + 12 | Alpha-Charlie | Cross-Cutting | Solution Implementation | Next Level of Safety |
| A | 08.02.01 | Identify priority components of template that serve to minimize lifecycle cost and controller system acceptance risk | T + 6 | T + 8 | Alpha-Charlie | Cross-Cutting | Solution Implementation | Next Level of Safety |
| A | 08.02.02 | Examine comparable agency use (DHS, other DOT) and successes using HSI for lessons learned | T + 6 | T + 11 | Alpha-Charlie | Cross-Cutting | Solution Implementation | Next Level of Safety |
| A | 08.02.03 | Conduct stakeholder working groups to refine process and templates | T + 10 | T + 12 | Alpha-Charlie | Cross-Cutting | Solution Implementation | Next Level of Safety |
| **M** | **09.00.00** | **NextGen Automation and Decision Support Integration Guidance** |  | T + 15 | Alpha-Charlie | **856** | Solution Implementation | Next Level of Safety |
| D | 09.01.00 | Report: NextGen Decision Support Tools & Automation Systems – Integration, Interactions, & Interference Human Factors Risk Assessment | T  | T + 4 | Alpha-Charlie | **856** | Solution Implementation | Next Level of Safety |
| A | 09.01.01 | Review NextGen CONOPS, system documentation, and existing operational scenarios | T  | T + 2 | Alpha-Charlie | **856** | Solution Implementation | Next Level of Safety |
| A | 09.01.02 | Conduct Review of initial lists and operational characteristics with NextGen SMEs | T + 3 | T + 4 | Alpha-Charlie | **856** | Solution Implementation | Next Level of Safety |
| A | 09.01.03 | Draft Catalog of Proposed NextGen En Route Decision Support Tools & Automation Systems | T + 3 | T + 4 | Alpha-Charlie | **856** | Solution Implementation | Next Level of Safety |
| D | 09.02.00 | Report: "Legacy NAS vs Nextgen: Adverse Event Recovery and System Resiliency" | T | T + 15 | Alpha-Charlie | **856** | Solution Implementation | Next Level of Safety |
| A | 09.02.01 | Assess controller recovery procedures for specific adverse events | T  | T + 6 | Alpha-Charlie | **856** | Solution Implementation | Next Level of Safety |
| A | 09.02.02 | Define initial human performance metrics for recovery procedures | T + 4 | T + 6 | Alpha-Charlie | **856** | Solution Implementation | Next Level of Safety |
| A | 09.02.03 | Define system "degraded modes" and proposed recovery procedures in NextGen | T + 5 | T + 12 | Alpha-Charlie | **856** | Solution Implementation | Next Level of Safety |
| A | 09.02.04 | Draft simulation requirements for procedure and human performance metrics verification | T + 10 | T + 15 | Alpha-Charlie | **856** | Solution Implementation | Next Level of Safety |
| **M** | **10.00.00** | **Human Factors Function in the Acquisition Management System** |  | T + 12 | Bravo | Cross-Cutting | All | Aviation Access |
| D | 10.01.00 | Human Factors AMS Integration Plan | T + 1 | T + 8 | Bravo | Cross-Cutting | All | Aviation Access |
| A | 10.01.01 | Pre-Program Setup for Human Factors Functions | T + 1 | T + 3 | Bravo | Cross-Cutting | All | Aviation Access |
| A | 10.01.02 | AMS Process Integration | T + 2 | T + 12 | Bravo | Cross-Cutting | All | Aviation Access |
| **M** | **11.00.00** | **NextGen EnRoute/TRACON Controller Common Information Requirements** |  | T + 12 | Bravo | **198, 856** | Solution Implementation | Next Level of Safety |
| D | 11.01.00 | EnRoute/TRACON functional commonality assessment | T + 1 | T + 12 | Bravo | **856** | Solution Implementation | Next Level of Safety |
| A | 11.01.01 | Extract common elements from previous job and task analyses | T + 1 | T + 12 | Bravo | **856** | Solution Implementation | Next Level of Safety |
| A | 11.01.02 | Conduct SME interviews and cognitive walk throughs to fill knowledge gaps | T + 4 | T + 12 | Bravo | **856** | Solution Implementation | Next Level of Safety |
| A | 11.01.03 | Conduct working groups to validate final models | T + 8 | T + 12 | Bravo | **856** | Solution Implementation | Next Level of Safety |
| **M** | **12.00.00** | **Program Support** |  | T + 12 | Bravo | 57, 568,575, 579, 856  | Solution Implementation | Aviation Access |
| D | 12.01.00 | Develop FY14 Project-Level Agreement  | T + 1 | T + 12 | Bravo | 57, 568,575, 579, 856 | Solution Implementation | Aviation Access |
| A | 12.01.01 | Develop FY14 project summary sheets for stakeholder engagement and executive review | T + 2 | T + 3 | Bravo | 57, 568,575, 579, 856 | Solution Implementation | Aviation Access |
| A | 12.01.02 | Develop FY14 Draft PLA in response to stakeholder feedback | T + 2 | T + 8 | Bravo | 57, 568,575, 579, 856 | Solution Implementation | Aviation Access |
| A | 12.01.03 | Participate in stakeholder engagement and project coordination meetings | T | T + 12 | Bravo | 57, 568,575, 579, 856 | Solution Implementation | Aviation Access |

**\*Note Performance Management Review (PMR) cycles are subject to SSC discretion**

# 6.0 Spend Plan

Total funding requirements for FY13 work recommended by the Human Factors Division in response to NextGen priorities totals $5,840,000. This spend plan reflects a reduction of $2,160,938 to achieve the $3,679,062 budget target allocated for FY13.

To achieve this reduction, the following projects were removed from this spend plan and deferred for inclusion in the FY14 PLA:

1. 01.01.00 “RNAV/RNP Non-Conformance Mitigations Validation Simulation Results”
2. 02.02.00 “Updated NextGen Mid-Term Strategic Training Needs Analysis”
3. 04.01.00 “Business Process Models Depicting actors, processes, information requirements, performance metrics, technology”
4. 09.03.00 “Automation Degraded Modes Operations – Simulation Plan”
5. 09.04.00 “Report: NextGen Automation Implementation Guidance”
6. 11.02.00 “En Route/TRACON Controller Common Information Requirements”

Additionally, the Human Factors Division analyzed each project below for additional cost savings opportunities by leveraging efficiencies between and across programs. This resulted in an additional cost reduction of $705,938 in FY13.

| **ATC/Tech Ops Human Factors – Controller Efficiency – Air/Ground Integration FY2013 SPEND PLAN** |
| --- |
| Deliverable (What) | Vendor(Who) | Delphi Project Number | Cost (How Much) |
| 00.01.00 Updated Multi Year Program Plan | Intuitive Design Solutions (IDS) | 1213WA5350 | $15,000 |
| 00.02.00 Monthly IMS Status Updates provided to NLP | Intuitive Design Solutions (IDS) | 1213WA5350 | $15,000 |
| 00.03.00 Quarterly\* Program Management Reviews (PMR) | Intuitive Design Solutions (IDS) | 1213WA5350 | $15,000 |
| 01.01.00 Report: RNAV/RNP Non-Conformance - Initial findings and recommendations | Fort Hill Group | 1213WA5350 | $225,000 |
| 01.02.00 RNAV/RNP mitigation strategy validation and simulation requirements | Fort Hill Group | 1213WA5350 | $275,000 |
| 02.01.00 Updated NextGen Job Descriptions for ATCSs | American Institutes for Research | 1213WA5350 | $245,000 |
| 03.01.00 NextGen Training Needs for TechOps | American Institutes for Research | 1213WA5350 | $550,000 |
| 04.01.00 Provide Advance Tech Ops Operational Concept updates to “Tech Ops Maintenance Concept of Operations for 2014 and Beyond” | American Institutes for Research | 1213WA5350 | $200,000 |
| 05.01.00 NextGen Human Performance Baseline Risk Assessment Report | Fort Hill Group | 1213WA5350 | $600,000 |
| 06.01.00 Report: Legacy vs. NextGen ATC alarms and Alerts Analysis | Intuitive Design Solutions (IDS) | 1213WA5350 | $75,000 |
| 06.02.00 NextGen Alarms & Alerts Taxonomy | Intuitive Design Solutions (IDS) | 1213WA5350 | $35,000 |
| 06.03.00 NextGen Alarms & Alerts Prioritization Schema | Intuitive Design Solutions (IDS) | 1213WA5350 | $109,062 |
| 06.04.00 NextGen Alarms and Alerts Implementation Guidebook | Intuitive Design Solutions (IDS) | 1213WA5350 | $200,000 |
| 07.01.00 Finalized 2014 Human Systems Integration Roadmap | Fort Hill Group | 1213WA5350 | $250,000 |
| 08.01.00 NextGen Implementation Support Plan | Intuitive Design Solutions (IDS) | 1213WA5350 | $50,000 |
| 08.02.00 Develop prototype FAA Human Systems Integration Plan template for priority systems | Intuitive Design Solutions (IDS) | 1213WA5350 | $25,000 |
| 09.01.00 Report: NextGen Decision Support Tools & Automation Systems – Integration, Interactions, & Interference Human Factors Risk Assessment | Intuitive Design Solutions (IDS) | 1213WA5350 | $75,000 |
| 09.02.00 Report: "Legacy NAS vs Nextgen: Adverse Event Recovery and System Resiliency" | Intuitive Design Solutions (IDS) | 1213WA5350 | $135,000 |
| 10.01.00 Human Factors AMS Integration Plan | Intuitive Design Solutions (IDS) | 1213WA5350 | $250,000 |
| 11.01.00 EnRoute/TRACON functional commonality assessment | CAMI | 1213WA5350 | $300,000 |
| 12.01.00 Develop FY14 Project-Level Agreement | Intuitive Design Solutions (IDS) | 1213WA5350 | $35,000 |
| **TOTAL** |  **$3,679,062** |

***NOTE: Achievement of milestones and obligation goals contained herein are contingent upon timely enactment of the FY2013 appropriations.***

# 7.0 Roles and Responsibilities

It is the duty of each member to understand the level of services documented and his/her responsibilities in providing these services. The NLP Integrated Management System (NLPIMS) provides a capability to manage the level of services for projects, activities, and initiatives for performance monitoring as well as cost and schedule control. Much of the information contained in the PLA is maintained in this system. It is the responsibility of the Performing Organization to keep this information complete, current, and correct.

## 7.1 Performing Organization

The Performing Organization, ANG-C1, performs the following:

* Co-authors Project Level Agreements
* Performing service or delivering a product
* Developing and managing the obligation plan, milestones
	+ Reconciling with Delphi every Month
* Responsible for outsourcing if required to meet milestones
* Participating in Monthly/Quarterly Project Management Reviews as specified by SSC
* IMS Responsibilities
	+ Maintenance of project schedules (updated Weekly or as changes occur) in NLP IMS
	+ Providing and maintaining the following points of contact in NLP IMS: Program Manager, RPD Writer(s), Lead Scheduler, Business Manager and IMS Updater (where IMS is not updated by one of the other required POCs).
	+ By the 5thbusiness day of each month all Activities must be statused in IMS with the appropriate data fields completed (Actual Start Date, Estimated End Date, Actual End Date). All items in the IMS Schedule (Milestones/Deliverables/Activities) must have a detailed, substantive comment detailing the progress towards completion.

## 7.2 Solution Set Coordinators Team

The Solution Set Coordinator is responsible for monitoring the technical performance of the projects within the solution set. This includes cross-cutting capabilities that are primarily within other solution sets or domains.

The Solution Set Coordinator is responsible for the following:

* Co-Authoring the Project Level Agreement (PLA)
* Establishing performance metrics (other than milestones and cost)
* Plans, facilitates, and cross-cuts domains to ensure satisfactory completion of end products
* Actions necessary for achieving Solution Set goals and objectives
* Scheduling and holding Monthly/Quarterly Project Management Reviews
* Ensuring Milestone/Deliverable statusing in IMS is occurring on a regular basis
* Generate monthly Status Report on the Solution Set(s)
* Review and ensure alignment of PLA spend plan and authorize funding release to ANG-A

## 7.3 NAS Programming & Financial Management Division

The NAS Programming & Financial Management Division (ANG-A4) is responsible for supporting the NLP Portfolio Management Process and monitoring the execution of funds in accordance with the signed PLA.

* Maintains configuration control of the NextGen Investment Portfolio, supporting PLAs, and NextGen travel budget
* Coordinates capitalization requirements and new Delphi project code requirements for all new projects with the Office of Budget and Programs (ABP-310)
* Facilitates the issuance of Facilities and Equipment Project Authorization funding documents upon PLA consummation with the Office of Budget and Programs (ABP-350)
* Maintains the historical library of all signed PLAs
* Reviews requests for all proposed reprogramming actions and coordinates funding adjustments as necessary
* Provides status of funds reporting

## 7.4 Investment Portfolio Manager

For activities in the investment phase (starting with post-CRDR through FID) or implementation of non-investment activities, the Investment Portfolio Manager (IPM) is a full partner with the performing organizations and is responsible for:

* Co-authors with the Capture Team Leads and executing organization the Project Level Agreements as executing partners
* Participating in Monthly/Quarterly Project Management Reviews as specified by SSC
* Review and concur on the executing office submissions of projected milestones, and obligation plans
* In accordance with responsibility to develop and maintain Operational Capability Integration Plan, provide the artifacts to map the PLA activities to the Operational Capability Integration Plan and provide monthly tracking report on the interdependencies including the multi-year project plan
* Identify to the Solution Set Coordinators any amendments, funding adjustments, or potential shortfalls for consideration
* IMS Responsibilities
	+ Ensure maintenance of project schedules (updated Weekly or as changes occur) in NLP IMS
	+ Ensure that by the 5th business day of each month that all activities are statused in IMS with the appropriate data fields completed (Actual Start Date, Estimated End Date, Actual End Date) and that all items in the IMS Schedule (Milestones/Deliverables/Activities) have a detailed, substantive comment detailing the progress towards completion

# 8.0 Dependencies

One of the primary goals of the PLA Agreement is to facilitate tracking of the project with the guiding principles of good program management. An essential part of any program management plan is awareness of any possible dependencies on items out of the program manager’s direct control. The ultimate outcome of this section is to ensure that all parties to this PLA Agreement are fully aware of any potential dependencies.

In this section are listed any known dependencies on travel, subject matter experts, resource (laboratory) requirements, contracts, and interdependencies with other FAA programs/projects. Knowledge of these dependencies helps NLP and the Program Office to actively manage these programs to mitigate any potential setbacks (due to dependencies being unfulfilled) during the execution of this agreement.

## 8.1 Travel

| **Trip Description** | **Deliverable\*** | **# of people** | **Estimate of Total Cost** | **Duration(Days)** |
| --- | --- | --- | --- | --- |
| Travel to FAA HQ, WJHTC, or CAMI for Working Group Meeting | 01.01.00 Report: RNAV/RNP Non-Conformance - Initial findings and recommendations | 6 | $6,500 | 3 |
| Travel to FAA HQ, WJHTC, or CAMI for Working Group Meeting | 02.01.00 Updated NextGen Job Descriptions for ATCSs | 6 | $6,500 | 3 |
| Travel to FAA HQ, WJHTC, or CAMI for Working Group Meeting | 03.01.00 NextGen Training Needs for TechOps | 6 | $6,500 | 3 |
| Travel to FAA HQ, WJHTC, or CAMI for Working Group Meeting | 09.01.00 Report: NextGen Decision Support Tools & Automation Systems – Integration, Interactions, & Interference Human Factors Risk Assessment | 6 | $6,500 | 3 |
| Travel to FAA HQ, WJHTC, or CAMI for Working Group Meeting | 11.01.00 EnRoute/TRACON functional commonality assessment | 9 | $10,000 | 3 |
| **TOTAL** | **$36,000** |

***\*Deliverable to coincide with Section 5.0 Program Schedule***

## 8.2 Subject Matter Expert Requirements

| **Deliverable** | **Type** | **When (Month, Year)** | **Duration (Days)** |
| --- | --- | --- | --- |
| 01.01.00 Report: RNAV/RNP Non-Conformance - Initial findings and recommendations | 2 each: Senior level – TRACON, En Route, & Tower CPCs | January, 2014 | 3 |
| 02.01.00 Updated NextGen Job Descriptions for ATCSs | 2 each: Senior level – TRACON, En Route, & Tower CPCs | February, 2014 | 3 |
| 03.01.00 NextGen Training Needs for TechOps | TBD | TBD | 3 |
| 06.01.00 Report: Legacy vs. NextGen ATC alarms and Alerts Analysis | 2 each: Senior level – TRACON, En Route, & Tower CPCs | October, 2013 | 3 |
| 06.02.00 NextGen Alarms & Alerts Taxonomy | 2 each: Senior level – TRACON, En Route, & Tower CPCs | November, 2013 | 3 |
| 06.03.00 NextGen Alarms & Alerts Prioritization Schema | 2 each: Senior level – TRACON, En Route, & Tower CPCs | January, 2014 | 3 |
| 09.01.00 Report: NextGen Decision Support Tools & Automation Systems – Integration, Interactions, & Interference Human Factors Risk Assessment | 2 each: Senior level – TRACON, En Route, & Tower CPCs | March, 2014 | 3 |
| 09.02.00 Report: "Legacy NAS vs Nextgen: Adverse Event Recovery and System Resiliency" | 2 each: Senior level – TRACON, En Route, & Tower CPCs | June 2014 | 3 |
| 11.01.00 EnRoute/TRACON functional commonality assessment | 3 each: Senior level – TRACON, En Route, & Tower CPCs | November, 2013 | 3 |

***\*Deliverable to coincide with Section 5.0 Program Schedule***

## 8.3 Resource (Laboratory) Requirements

| **Deliverable** | **Laboratory/ Location** | **When (Month, Year)** | **Duration** |
| --- | --- | --- | --- |
| N/A | N/A | N/A | N/A |

## 8.4 Contract Risks

| **Deliverable\*** | **Contract Name** |
| --- | --- |
| N/A | N/A |

## 8.5 Federal Staffing Requirements

1 Federal FTE required to complete this project on time. Current FTE requirements not being met as this is an F&E funded PLA and there are no F&E employees to support it.

## 8.6 Project Level Interdependencies

| **Project** | **System** |
| --- | --- |
| N/A | N/A |

# 9.0 Project Level Agreement Amendment Process

Modifications to any provision within this PLA may be based on changing service requirements or reprioritization of requirements from the NLP Integration and Implementation Office. If the status of milestones and/or deliverables for reporting is “red” or cannot be met, with surety, an amendment of those dates is appropriate.

Modifications may also be accomplished at the request of any party with prior notification and mutual agreement. Changes to this PLA will be coordinated in advance with the appropriate parties, reviewed and re-signed. No oral statement by any participant shall be interpreted as modifying or otherwise affecting the terms of this agreement.

Changes will be documented as a revision to this document and will only become effective after all responsible parties have signed. Configuration Management will be applied to track changes.

## 9.1 Termination Review Criteria

The Solution Set Coordinator may terminate this PLA at any time prior to its expiration date, with due cause, and without incurring any liability of obligation to the terminated party (other than payment of amounts due and performance of obligations accrued in each case on or prior to the termination date) by giving the other parties at least (30) days prior written notice of termination. Upon receipt of a notice of termination, the receiving party shall take immediate steps to stop the accrual of any additional obligations that might require payment.

## 9.2 Disputes

The objective of this Agreement is to facilitate strong communication among the participating parties. Accordingly, the goal is to manage conflict resolution or service issues at the lowest point of service when at all possible.

Situations may occur, however, that require attention of the signatories of this agreement possibly to clarify specific requirements or provide higher priority. In such instances, disputes will be resolved by informal discussions between the signatories of this Agreement, or designees.

# Appendix A – Project Executive Summary Sheets

# Human Factors Guidance for RNAV/RNP Procedure Design

|  |  |
| --- | --- |
| Point of Contact & Organization: | Rachel Seely, ANG-C1 |
| Project Status: | New Project |

## Executive Summary

* Address the impact of known non-conformance human performance causal factors such as controller communication, automation interaction, and procedure design as they affect controller performance across RNAV/RNP dependent Operational Improvements
* Review NextGen RNAV/RNP concepts to detail the interactions between air traffic controllers, flight crews, and automation when assigning, executing, and monitoring RNAV/RNP routes
* Identify key controller information requirements to support optimal controller-flight deck communication and controller-automation interactions across a variety of operating conditions
* Outputs of this effort will include cross-cutting functional requirements, controller information requirements, and operational scenarios that will support the testing of non-conformance causal factors across RNAV/RNP dependent OIs during development and implementation

## Executive Direction

* Estimated FY13 funding - $600k
* Supports DP 579 Decision to use Guidelines for Human Reliability and Safety Enhancements
* Work will be applicable across all RNAV/RNP OIs with an initial focus on:
	+ 104123 – Time Based Metering Using RNAV and RNP Route Assignments
	+ 104124 – Use Optimized Profile Descent
	+ 108209 – Increase Capacity and Efficiency Using RNAV and RNP

## Description

AN FY12 analysis of current RNAV/RNP safety reports identified several high-level human performance causal factors related to route non-conformance. The sample of reports analyzed showed 71% of the safety events resulted in either a pilot deviation or unanticipated aircraft performance characteristics. The top identified causal factors associated with non-conformance included communication issues, automation interaction issues, and procedure design issues. Many NextGen OIs depend on the increased usage of RNAV/RNP routes to provide new operational capabilities in order to achieve proposed efficiency and capacity gains. The underlying similarities of RNAV/RNP usage across these OIs provides the opportunity for cross-cutting research on human performance requirements for mitigating known non-conformance causal factors. Completing an integrated assessment of midterm OIs with RNAV/RNP dependencies will allow for mitigating non-conformance issues and a reduction in the costs and time associated with concept development and implementation.

This work will assess non-conformance issues associated with midterm OIs which rely on RNAV/RNP routes with an initial focus on: 104123 - Time Based Metering Using RNAV and RNP Route Assignments, 104124 - Use Optimized Profile Descent, and 108209 - Increase Capacity and Efficiency Using Area Navigation (RNAV) and Required Navigation Performance (RNP). Phase one will apply a human-systems engineering approach to outlining the interactions between the controller, flight deck, and automation systems associated with each RNAV/RNP dependent OI and increment. The resulting human-system structures for each OI will highlight interrelationships between actors, the flow of information, and will provide a mechanism for identifying the impact of nonconformance causal factors across the OIs. These structures will then be combined to outline the integrated impact of non-conformance causal factors across midterm RNAV/RNP dependent OIs. Phase two will assess the interrelationships of the model to define functional requirements necessary for mitigating the impact of non-conformance causal factors on controller performance. These cross-cutting requirements will serve as inputs for each operational capability that relies on RNAV/RNP routes. Operational scenarios will then be created that will ensure the impacts of various non-conformance causal factors and related off-nominal conditions have been mitigated during concept development and implementation.

The outputs of this effort will be delivered in two parts. Part 1 will detail the functional and information requirements necessary to reduce the likelihood and consequences associated with RNAV/RNP non-conformance causal factors across relevant OIs. Part 2 will provide a series of cross-cutting operational scenarios to be utilized during the testing of RNAV/RNP dependent OIs to ensure that key human factors related non-conformance causal factors have been mitigated before systems are implemented. These outputs will be made available to those responsible for, accountable for, and supporting OI development. The use of the requirements and human performance testing scenarios developed in this effort aims to reduce development and implementation costs and time, while promoting NAS safety and controller support of new systems.

## Activities & Funding

| FY$ | Activity | Finish Date | Funding |
| --- | --- | --- | --- |
| FY13 | * Assess RNAV/RNP dependent OIs using operational data, subject matter expert input, and human factors safety tools to address the impact of non-conformance causal factors on human performance
* Generate targeted mitigation strategies in the form of functional requirements to support OI development and human performance criteria and scenarios to support testing and implementation
 | FY14 | $500k |

## References

|  |  |
| --- | --- |
| Operational Improvement: | * Impacts all RNAV/RNP dependent OIs
* Initial focus on:
	+ 104123 - Time Based Metering Using RNAV and RNP Route Assignments
	+ 104124 - Use Optimized Profile Descent
	+ 108209 - Increase Capacity and Efficiency Using Area Navigation (RNAV) and Required Navigation Performance (RNP)
 |
| Source: | * NAS Enterprise Architecture
 |
| Portfolio: | * Performance Based Navigation
 |
| Decision Points: | * DP 579 - Decision to use Guidelines for Human Reliability and Safety Enhancements
* DP 568 - Decision to use Human Factors Guidelines for NextGen Instrument Procedures
 |

# Update: NextGen Mid-Term Controller Strategic Job Analyses and Training Needs Analysis

|  |  |
| --- | --- |
| Point of Contact & Organization: | Rachel Seely, PhD, ANG-C1 |
| Project Status: | Continuing work  |

## Executive Summary

* Builds upon previous research
* Revises list of NextGen Drivers to take into account recent changes, allowing for a more complete picture of the NextGen work environment in the Mid-Term.
* Evaluates the impact of these changes on the ATCS job as it is performed in ATCTs, TRACONs, and ARTCCs
* Results in job descriptions that explain what the ATCS job will look like in the Mid-Term as well as several training products including training plans, requirements, and algorithms that can be used to estimate the resources required to support the new training
* Required to update estimations of if and how the pre-employment selection test battery needs to change
* Required to update estimations of if and how the ATCS training program needs to change

## Executive Direction

Initial response from meeting 4/12:

* Good with updates to the write-up
* Characterize the delta with NSIP 5.0 to describe the nature of the update

## Description

American Institutes for Research (AIR) recently completed strategic analyses to determine the impact of NextGen on the job of Air Traffic Control Specialists (ATCSs). The research was conducted in phases. First, AIR updated the current ATCS job analysis. Next, AIR identified the NextGen technologies, automation, and procedures (i.e., NextGen Drivers) that were proposed to be implemented by 2018. Once the Drivers were identified, AIR evaluated the impact of these Drivers on the ATCS job. The resulting NextGen job descriptions provide detailed information regarding the job as it is proposed to exist in 2018, and were used to help determine whether the pre-employment selection test needed to be modified. Next, using the SJA as a foundation, AIR conducted a strategic training needs analysis (STNA) to estimate the impact of NextGen on ATCS Training. For each job option, AIR created a training plan and identified the associated training requirements. In addition, in coordination with FAA instructional system designers (ISDs), AIR developed training algorithms that can be used to estimate the resources required to conduct ATCS NextGen training. This work was completed in 2012. However, NextGen is evolving. As expected, changes have already occurred that influence the results of this previous results. The tasks outlined below are proposed in order to update the strategic analyses to reflect the new information known about NextGen in the Mid-term.

## Activities & Funding

| FY$ | Activity | Finish Date | Funding |
| --- | --- | --- | --- |
| FY13 | * Update current job analysis
* Conduct environmental scan
* Conduct focus groups and interviews with NextGen SMEs
* Update NextGen Mid-Term Strategic Job Analysis
* Revise Job Descriptions
* Write technical report
 | FY14 | $245,000 |
| FY14 | * Conduct environmental scan
* Update NextGen Mid-Term Training Plans
* Work with SMEs to update the NextGen Mid-Term Training Requirements
* Work with SMEs to update training resource algorithms
* Apply algorithms to estimate training resource requirements
* Write technical report
 | FY15 | $405,000 |
| FY15 | * Wrap up and complete publications
 | FY16 | 25,000 |

## References

|  |  |
| --- | --- |
| Operational Improvement: | * All
 |
| Source: | * NAS EA
 |
| Portfolio: | * ALL
 |
| Solution Sets | * All
 |

# NextGen Mid-Term Strategic Training Needs Analysis for TechOps

|  |  |
| --- | --- |
| Point of Contact & Organization: | Rachel Seely, PhD, ANG-C1 |
| Project Status: | Continuing work |

## Executive Summary

* Builds a list of NextGen technology, automation, and procedures (i.e., Drivers) that capture the OIs and that are proposed to impact TechOps in the Mid-Term
* Evaluates the impact of the Drivers on TechOps
* Results in job descriptions that explain what the TechOps jobs will look like in the Mid-Term
* Results in training products including estimates of the new training that will be required and the resources required to support the new training for TechOps personnel
* Required to ensure that TechOps personnel are prepared to successfully support the technologies, automation and procedures that will be in place by the Mid-Term

## Executive Direction

Initial response from meeting 4/12:

* What part is NextGen specific? Wouldn't tech ops evolve without NextGen? NextGen isn't causing the modernization.
* Why should HF be involved?

## Description

American Institutes for Research (AIR) recently completed strategic analyses to determine the impact of NextGen on the job of Air Traffic Control Specialists (ATCSs). That work identified numerous NextGen Drivers that will directly affect TechOps. The purpose of this research is to identify a list of TechOps specific Drivers and to estimate the impact of those Drivers on the jobs of TechOps employees. First, AIR will evaluate the current job analysis data. Next, AIR will identify the NextGen technologies, automation, and procedures (i.e., NextGen Drivers) that are proposed to be implemented by the Mid-Term. Once the Drivers are identified, AIR can evaluate the impact of these Drivers on the TechOps jobs. The resulting NextGen job descriptions will provide detailed information regarding the job as it is proposed to exist in 2018. This information will be used to determine what organizational processes need to be implemented to ensure that TechOps personnel are prepared to perform the new job as it will exist in the Mid-Term. Next, using the SJA as a foundation, AIR will conduct a strategic training needs analysis (STNA) to estimate the impact of NextGen on TechOps training. AIR will create a training plan and identified the associated training requirements. In addition, in coordination with FAA instructional system designers (ISDs), AIR will develop training algorithms that can be used to estimate the resources required to conduct NextGen training for TechOps. It is anticipated that some of the research results (e.g., Drivers) and tools (e.g., matrices used for evaluating impact) that were developed for the ATCS strategic analyses can be used for this project.

## Activities & Funding

| FY$ | Activity | Finish Date | Funding |
| --- | --- | --- | --- |
| FY13 | * Evaluate current TechOps job analysis
* Conduct environmental scan
* Support concept development
* Conduct focus groups and interviews with NextGen TechOps SMEs
* Update NextGen Mid-Term Strategic Tech Ops Job Analysis
* Revise Job Descriptions
* Write technical report
 | FY14 | $550,000 |
| FY14 | * Conduct environmental scan
* Create NextGen Mid-Term Strategic TechOps Training Plans
* Work with SMEs to identify the NextGen Mid-Term Training Requirements for TechOps
* Work with SMEs to build training resource algorithms
* Apply algorithms to estimate training resource requirements
* Write technical report
 | FY15 | 625,000 |
| FY15 | * Wrap up and complete publications
 | FY16 | 25,000 |

## References

|  |  |
| --- | --- |
| Operational Improvement: | * All
 |
| Source: | * Barbara Fisher, Kim Taylor, Greta Ballentine
 |
| Portfolio: | * All
 |
| Solution Sets | * All
 |

# TechOps Workplace Integration

# NextGen Human Performance Safety Hazard Assessment

|  |  |
| --- | --- |
| Point of Contact & Organization: | Rachel Seely, ANG-C1 |
| Project Status: | On-Going Work |

## Executive Summary

* Conduct human performance safety hazard assessments of NextGen changes to identify potential safety hazards and to develop targeted mitigation strategies in the form of functional, system, research, and training requirements
* Conduct human performance benefits assessment of NextGen changes to identify capabilities enhanced by human performance benefits and to develop detailed lessons learned in the form of benefit strategies to enable optimal human performance in regards to safety
* Develop a set of baseline human performance safety risk measures of impacted controller tasks that will allow for assessing the impact of NextGen concepts on controller performance during concept development, testing, and implementation

## Executive Direction

Initial response from meeting 4/12:

* Refine the gap that is being addressed. Make this more specific (in terms of the products?).
* Identify relationship to Sherri Boerner (SSMT) and Jim Daum's work. Show how this differs from other safety work being done as part of the design.
* Define either new process or new results and why different from SRMD process and work performed by safety group
* Describe the well-known categories of nonconformance, and indicate the area of focus.

## Description

The integration of proactive human factors safety research into the early stages of system design has the potential to not only reduce industry cost, but also to improve system design, development, and implementation. ANG-C1 is committed to proactively improving human performance and safety through the identification and mitigation of human performance benefits and risks in the NextGen environment. This commitment will be achieved by the identification and mitigation human performance risks and hazards, the identification and expansion human performance benefits, and the development of human performance safety metrics. The tasks associated with this commitment will not only building upon existing work, but will also expanded the work to incorporate a more substantial human performance view of NextGen. These tasks include:

Building upon previous assessments, mitigation strategies addressing Segment Bravo human performance risks will be developed and monitored to ensure effectiveness. Selected NextGen Segment Bravo concepts will be utilized in a drill-down human performance risk assessment to ensure optimal human performance in key, high-priority human performance safety concepts.

The identification of human performance benefits within NextGen Segment Bravo will assist in the development of detailed lessons learned plans. These human performance benefit plans can then be fed-forward to encourage optimal human performance in respect to safety. The plans will build upon previous work while incorporating current day operational safety benefits.

The development of human performance safety metrics will assist in ensuring the NextGen level of human performance safety remains at an acceptable level of safety. In order to develop such metrics, a human performance safety baseline risk assessment will assist identifying measurable human performance and safety measures. These measures will then serve as the basis of the human performance safety metrics, which will be utilized to monitor and track human performance mitigation strategies.

## Activities & Funding

| FY$ | Activity | Finish Date | Funding |
| --- | --- | --- | --- |
| FY13 | * Development of Segment Bravo Human Performance Hazards Mitigation Strategies
* Human Performance Baseline Risk Assessment
 | FY14 | $600k |
| FY14 | * Detailed NextGen Segment Bravo Concept Assessment
* Development of NextGen Human Performance Safety Metrics
* Human Performance Benefits Assessment
 | FY15 | $500K |
| FY15 | * Segment Charlie Human Performance Hazard Assessment
* NextGen Human Reliability Assessment Tool Update
* NextGen Implementation Hazard Monitoring
 | FY16 | $500k |

## References

|  |  |
| --- | --- |
| Operational Improvement: | * Cross-cutting – Relates to all operational improvements and increments potentially affecting controller performance in the midterm
 |
| Source: | * NAS Enterprise Architecture
 |
| Portfolio: | * Cross-Cutting
 |

# NextGen Controller Alarms and Alerts: Integration Risks and Alert Management Strategies

|  |  |
| --- | --- |
| Point of Contact & Organization: | Rachel Seely, ANG-C1 |
| Project Status: | New Work |

## Executive Summary

* NextGen will introduce new alarms and alerts for controllers. These will be in response to new capabilities for increasing air and ground capacity, new controller strategies for managing traffic, and tighter tolerances for procedure conformance.
* These new alerts must be displayed, interpreted, and managed differently than in legacy systems and thus may require a new training elements.
* To reduce safety and human performance risk, these new alerts must be understood in the context of legacy systems and procedures. To do this, ANG-C1 must catalog both old and new alerts, develop a formal taxonomy, and finally, develop a prioritization schema for displaying alerts. (only looking at Tower alerts now)
* This ensures that controllers will see and understand what is important exactly when they need it, and have a management strategy for numerous/simultaneous alerts.
* NextGen systems using this hierarchy and prioritization schema will avoid controller alarm fatigue, ignored alerts, and lost situational awareness during critical periods.

## Executive Direction

Initial response from meeting 4/12:

* Overall good idea.
* Need to get specific on area of focus.

## Description

New NextGen capabilities and systems allow controllers to have unprecedented situational awareness with many new tools to reduce workload through automation and decision support mechanisms. However, where systems require immediate human intervention, controllers must be alerted to situations such as pilot non-conformance, system malfunctions, or inadequate performance from rule-based automations systems. This will result in hundreds of new alerts and alarms intended to inform controllers of changing circumstances that require their immediate attention.

As the leader in Human Systems Integration, it is the charter of ANG-C1 to examine the impact of these new types of alarms and alerts as they are implemented among legacy systems. This work will ensure that controllers understand new alarms and alerts and their meaning as their roles change due to implementation of NextGen capabilities and procedures. This work will also ensure that system vendors, FAA PMOs, and FAA T&E groups have the science, tools, and training to recognize both good and bad implementations and avoid safety hazards due to confusing alarms and alerts.

This work catalogs legacy alarms and alerts and defines alarm types with a formal taxonomy. These definitions will be used to catalog NextGen alarms and alerts. Next, research performers will develop a prioritization schema based on known research and existing implementation strategies. Both legacy alarms and alerts, and those predicted by NextGen system developers, will be evaluated against this prioritization schema through cognitive walkthroughs with SMEs and subsequent formal simulation events. The results will form a NextGen Alarms and Alerts taxonomy, prioritization schema, and implementation guidebook for all NextGen systems. This guidebook will leverage the 2013 work performed by the ANG-C1 Core program in the development of an ATC Tower Alerts standard.

## Activities & Funding

| FY$ | Activity | Finish Date | Funding |
| --- | --- | --- | --- |
| FY13 | * Leverage Core ATC Tower alerts standards work to baseline NAS legacy alarms and alerts.
* Catalog NextGen alarms and alerts through SME interviews, previous human performance hazards analysis, and existing CONOPS.
* Develop formal NextGen Alarms and Alerts Taxonomy
* Develop prioritization schema with SMEs
* Draft initial NextGen Alarms and Alerts implementation guidebook
 | FY14 | $350,000 |
| FY14 | * Perform cognitive walkthroughs exercising NextGen prioritization schema and hierarchies
* Participate in Air/Ground integration simulations events using new alerts and alarms
 | FY15 | $400,000 |
| * Refine prioritization schema and taxonomy.
* Add additional Core standards developed for TRACON
 |  |  |
| * Complete implementation guidebook.
 |  |  |
| FY15 | * Refine Guidebook with new standards developed for Core program in En Route Domain
 | FY16 | $100,000 |

## References

|  |  |
| --- | --- |
| Operational Improvement: | * 102114 – Initial Conflict Resolution Advisories
* 102137 – Automation Support for Separation Management
* 104117 - Improved Management of Arrival/Surface/Departure Flow Operations
* 104120 - Point-in-Space Metering
* 104122 - Integrated Arrival/Departure Airspace Management
* 104123 - Time Based Metering Using RNAV and RNP Route Assignments
 |
| Source: | * NSIP 5.0, Destination 2025 – Next Level of Safety
 |
| Portfolio: | * Performance Based Navigation
* Separation Management
* Improved Surface Operations
 |
| Solution Sets: | * Trajectory-Based Operations
* Increase Arrivals/Departures at High Density Airports
 |

|  |  |
| --- | --- |
| Operational Improvement: | * 104123 Time-Based Metering for RNAV/RNP route assignments
 |
| Source: | * Destination 2025 Next Level of Safety, Aviation Access
 |
| Portfolio: | * Performance Based Navigation
* Separation Management
 |
| Solution Sets | * Trajectory Based Operations
* Increased Arrivals/Departures at High Density Airports
 |

# HSI Project Integration, Stakeholder Coordination, and EA Alignment

|  |  |
| --- | --- |
| Point of Contact & Organization: | Rachel Seely, ANG-C1 |
| Project Status: | Ongoing |

## Executive Summary

* The HSI Roadmap is an executive planning tool that is used to engage FAA programs and stakeholders to influence NAS EA developments from the human perspective throughout the concept development and AMS lifecycles.
* The roadmap supports the execution of human factors research, engineering, and development activities for NAS EA and NextGen developments
* Serves as a technical coordination tool to facilitate a system of systems approach from the human perspective

## Executive Direction

* Notes from initial meeting: Good.

## Description

The HSI roadmap was developed in 2008. It was intended to serve as a planning mechanism for identifying and addressing the coordinated impacts of NextGen activities on human performance across the NAS. The roadmap has been updated annually to reflect the dynamic nature of NextGen activities and to better depict the potential impact of the planned changes by domain and the corresponding NAS actors. The proposed effort will focus on significantly improving the connections and interdependencies of the HSI roadmap with other infrastructure roadmaps, decision points, activities, and programmatic milestones. This will improve the impact that human factors activities have on supporting the development and implementation of other NextGen concepts.

## Activities & Funding

| FY$ | Activity | Finish Date | Funding |
| --- | --- | --- | --- |
| FY13 | * Comprehensive update of the HSI roadmap to reflect the current view of NAS EA and NextGen activities
* Engage other infrastructure roadmaps to facilitate a coordinated position on decision points and activities
* Promote and utilize the HSI roadmap as a method to identify human factors impacts across Segment Bravo and utilization of the roadmap to drive future human activities
 | FY14 | $250k |
| FY14 | * Update HSI roadmap activities and decision points to reflect updates of planned NextGen activities
 | FY15 | $125k |
| FY15 | * Update HSI roadmap activities and decision points to reflect updates of planned NextGen activities
 | FY16 | $125k |

## References

|  |  |
| --- | --- |
| Operational Improvement: | * Cross-cutting – Relates to all operational improvements and increments which potentially affect human performance in the NextGen midterm
 |
| Source: | * NAS Enterprise Architecture
* Infrastructure Roadmap Leads:
	+ Automation: Francisco Bermudez
	+ Airspace and Procedures: Pam Dees
	+ Safety: James Daum
	+ Air/Ground: Ron Stroup
	+ Communications: Brent Phillips
	+ Surveillance: James Baird
	+ Aircraft: Stephen VanTrees
 |
| Portfolio: | * Cross-cutting
 |

# NextGen Implementation Support

# NextGen Automation and Decision Support Implementation Guidance

|  |  |
| --- | --- |
| Point of Contact & Organization: | Rachel Seely, PhD, ANG-C1 |
| Project Status: | New Work |

## Executive Summary

* The current NAS has high system "resiliency" because of controllers. This work ensures that NextGen automation and decision support strategies and automation features do not create a more "brittle" system that introduces greater safety risk.
* Assesses new interactions between controllers and systems due to automation, decision support features, and new procedures such as self-spacing.
* Provides cross-domain (En Route and Terminal) guidance on required functionality under “blue sky”, and degraded modes operations.
* Supports creation of maximally resilient future NAS capable of graceful system degradation and recovery following malfunctions, outages, weather, and airborne/ground-based adverse events.

## Executive Direction

Initial response from meeting 4/12:

* Need to get specific on area of focus.
* Need to be more specific about process and products

## Description

As a result of NextGen, individual controller interactions with NAS systems will change. As controllers are forced to interpret more information in their decision making process, decision support tools, automation, and new procedures are employed with ever-tighter tolerances for human performance.

This work examines how individual NextGen system features and controller performance requirements may create a system that is more “brittle”. System “brittleness” occurs when high levels of information automation and tight tolerances do not allow the system and its human participants any leeway for graceful system degradation and recovery in response to adverse events.

In the legacy NAS, the system is resilient to adverse events such as weather, system malfunctions, and controller error, because the system as a whole is flexible and allows for graceful degradation from, and recovery to, high capacity levels. This work ensures that as NextGen tools are developed, NextGen recovery procedures and system functions are built knowing the context of legacy procedures and concurrent development efforts. Most importantly, this work ensures that NextGen automation and decision support developers have the guidance and functional requirements that maintain resiliency.

Ultimately, this results in greater system resiliency as both controllers and advanced technology continue to contribute to solution identification as the NAS evolves.

## Activities & Funding

| FY$ | Activity | Finish Date | Funding |
| --- | --- | --- | --- |
| FY13 | * Perform initial catalog of NextGen decision support tools and proposed automation systems.
* Select automation and DST “levels” taxonomy
* Assess current efforts in defining automation philosophy for system developers
* Identify automation standards and guidance for suitability/applicability
* Develop metrics for system brittleness and resiliency for use in documenting NAS baseline configuration against NextGen proposed changes.
* Identify instances of simultaneous automation usage and associated risks due to trust, conflicting alarms
 | FY14 | $300,000 |
| FY14 | * Assess controller recovery procedures for specific system outages and airborne adverse events.
* Define system degraded modes
* Identify opportunities for system support during operations in degraded modes.
* Develop system functional requirements for degraded modes operations.
 | FY15 | $500,000 |
| FY15 | * Update and align alarms and alerts implementation guidance/standards with new degraded modes system indicators.
* Simulate degraded modes operations, new automation alerts, degradation and recovery procedures, and measure NAS resiliency in specific configurations.
 | FY16 | $450,000 |

## References

|  |  |
| --- | --- |
| Operational Improvement: | * 102114 – Initial Conflict Resolution Advisories
* 102137 – Automation Support for Separation Management
* 104117 - Improved Management of Arrival/Surface/Departure Flow Operations
* 104120 - Point-in-Space Metering
* 104122 - Integrated Arrival/Departure Airspace Management
* 104123 - Time Based Metering Using RNAV and RNP Route Assignments
 |
| Source: | * NSIP 5.0, Destination 2025 – Next Level of Safety
 |
| Portfolio: | * Performance Based Navigation
* Separation Management
* Improved Surface Operations
 |
| Solution Sets | * Trajectory-Based Operations
* Increase Arrivals/Departures at High Density Airports
 |

# Human Factors Function in the Acquisition Management System

|  |  |
| --- | --- |
| Point of Contact & Organization: | Edmundo Sierra, ANG-C1 |
| Project Status: | New |

## Executive Summary

* This year, the Ideas to In-Service framework for shepherding NextGen initiatives from concept to implementation was incorporated into the Acquisition Management System. As a result human factors engineering guidance is out of date and programs lack guidance for how to apply this specialized discipline required in lifecycle acquisition management.
* This investment provides solutions for compliance with the updates to Acquisition Management System (AMS) Policy and with Section 4.7 for human factors by Next Generation Air Transportation System (NextGen) Programs and other programs that use AMS.
* The results of this investment include 1) integration of human factors guidance into systems engineering and other FAA process guidance, 2) strengthening compliance with human factors AMS policy, and 3) an expansion of needed human factors coordination across the agency.

## Executive Direction

* These new organizational capabilities will support a potential new initiative- the assigning of a lead organization on human factors. Briefings by ANG-C and ANG-C1 to ANG-1 concerning the new initiative have already taken place.

## Description

This investment provides capabilities for centralized management of the human factors function in the Acquisition Management System (AMS). Capabilities include planning, integration, coordination, and implementation of various components required for changes to- or development of- new human factors function guidance for AMS in accordance with AMS Policy Governance. It provides solutions for policy, process, and guidance required for effective human system engineering across programs. The investment will support the practical application of human factors policy and encourage applied human factors research.

## Activities & Funding

| FY$ | Activity | Finish Date | Funding |
| --- | --- | --- | --- |
| FY13 | * Pre-Program Set Up for Human Factors Function
* AMS Process Integration
 | FY14 | $250k |
| FY14 | * Establish Human Factors Function Program Management and Infrastructure
 | FY15 | $735k |
| FY15 | * Support Human Factors Function Governance
* Deliver Incremental Benefits
 | FY16 | $735k |

## References

|  |  |
| --- | --- |
| Operational Improvement: | * Cross-cutting – Relates to all operational improvements and increments which potentially affect human performance in the NextGen midterm
 |
| Source: | * Stakeholder Organizations:
	+ ANG-C1, Human Factors Division
	+ ANG-D3, Implementation Harmonization Division
	+ ANG-C6, Aviation Weather Division
	+ ANG-C4, Advanced Operational Concepts Division
	+ AAM-500, Office of Aerospace Medicine - Aerospace Human Factors Division
	+ AJM-11, Specialty Engineering & Risk Management
	+ AJM-12, Engineering Analysis
	+ AJW-13, NAS Integration & Support Group
 |
| Portfolio: | * Cross-cutting
 |

# NextGen En Route/TRACON Controller Common Information Requirements

|  |  |
| --- | --- |
| Point of Contact & Organization: | Rachel Seely, ANG-C1 |
| Project Status: | New Work |

## Executive Summary

* Great cost savings and improved safety can be achieved by strategic implementation of common En Route and TRACON tasks and tools.
* This work establishes common functions and tasks as opportunities to implement a common look and feel with the above strategic objective in mind.
* Deliverables detail areas of opportunity, potential risks, and provide context for an implementation strategy supporting an evolution of these systems over time.

## Executive Direction

Initial response from meeting 4/12:

* Good with updates to the write-up
* Needs to address agency’s charter to seek/develop commonality in systems where appropriate
* Is this a documented charter? Where do we derive priority for common systems?
* Provide specific charter and deliverables and explain why this is different from the MITRE work, the CAMI work, and spell out where they started and stopped and explain why this takes it to the “next level”.
* Outline the previous work and leverage existing results and infrastructure
* Specify that the output is a strategic plan for the analysis and roll out of common elements between the two systems, not infrastructure
* Make product description more specific - advocate to commonality, change management

## Description

Great cost savings and improved safety can be achieved when tools within a system achieve a common look and feel. NextGen can achieve this common look and feel across the En Route and TRACON domains by systematically introducing tool functions, controller tasks, and display elements with this strategic objective in mind. This project begins the process of achieving that goal.

The first step in this process is a thorough assessment of existing and proposed functions and task that are common to both En Route and TRACON domains. Civil Aviation Medical Institute (CAMI) and MITRE researchers already familiar with the previous Common Workstation project work will extract common functions and tasks from existing job tasks analyses and previous ATC reports on the subject. CAMI will produce the ***"En Route/TRACON functional commonality assessment"***as the first project deliverable.The contents of this report will be verified by interviewing subject matter experts, performing cognitive walkthroughs of each task, and exploring task nuance through SME working groups familiar with both En Route and TRACON as well as Legacy NAS and NextGen systems.

This first report details functions and tasks that are common to both domains. More importantly, this report details similar or overlapping tasks that are not identical, and tasks that are absolutely different. These distinctions provide the context for not only what ***is*** common but what ***should*** be common.

Next, MITRE project performers will use this initial report to develop controller information requirements based on functions and tasks which should be common in NextGen. This results in the second project deliverable: ***"En Route/TRACON Controller Common Information Requirements".***

This second deliverable will serve to inform tool development and NAS strategic implementation of NextGen tools and functions with the goal of reaching a common look and feel across common tasks in the En Route and TRACON domains.

## Activities & Funding

| FY$ | Activity | Finish Date | Funding |
| --- | --- | --- | --- |
| FY13 | * Assess previous common workstation development efforts
* Extract common controller tasks and system functions for commonality
* Develop initial "En Route/TRACON functional commonality assessment"
* Conduct SME interviews, cognitive walkthroughs, and working groups to validate initial assessments.
 | FY14 | $500k |
| FY14 | * Develop "En Route/TRACON Controller Common Information Requirements".
 | FY15 | $500K |
| FY15 | * Develop "En Route/TRACON Controller Common Function Implementation Recommendations: Strategy, Schedule, & Human Performance Safety Risk Considerations ".
 | FY16 | $500k |

## References

|  |  |
| --- | --- |
| Operational Improvement: | * 102114 – Initial Conflict Resolution Advisories
* 102137 – Automation Support for Separation Management
* 104117 - Improved Management of Arrival/Surface/Departure Flow Operations
* 104120 - Point-in-Space Metering
* 104122 - Integrated Arrival/Departure Airspace Management
* 104123 - Time Based Metering Using RNAV and RNP Route Assignments
 |
| Source: | * Steve Bradford (ORG) Chuck Perala (ORG), Pam DellaRocco (ORG)
 |
| Portfolio: | * Performance Based Navigation
* Separation Management
 |

1. Time in months from the assigned T-Date (based on funding) of the PLA. [↑](#footnote-ref-1)
2. The start date is the planned date that work will commence on the specific milestone, being no earlier than the assigned T-Date. [↑](#footnote-ref-2)
3. Time in months from the assigned T-Date (based on funding) of the PLA. [↑](#footnote-ref-3)