1A01C: Operations Concept Validation
ANG-C4 Past Year Significant Accomplishments (July 2014)

Dynamic Network Analysis (DNA) Research: Completed initial NAS Dynamic Network Analysis (DNA) Research that focused on assessing changes in roles and responsibilities for airborne reroutes, including the role of Flight Operations Centers (FOC). The study examined the flow of aircraft and the organizational system managing these flights using air traffic flow data and the processes involved in routing and re-routing flights under current and NextGen technologies. The models suggest that NextGen tended to change the distribution of tasks. With NextGen, the communication burden from a nominal to an off-nominal condition is less than under the current system. For many actors, there was an increase in the number of tasks; however, many of these were monitoring tasks, and overall tasks were redistributed more equally across the various decision makers. These changes could indicate improved situational awareness throughout the system. FOCs take on a more central role for some airborne reroutes under NextGen, as data sharing and the ability to negotiate the reroute increases. System improvements enable Traffic Management units to play a more active role in airborne reroutes which should increase their ability to accommodate user preferences in strategic planning decisions.

Concept Development and Validation Branch signs Service Level Agreement with SBS Office: NextGen signed a Service Level Agreement (dated September 24, 2013) with the ATO's Surveillance and Broadcast Services (SBS) Program Office to develop the Computer-Human-Interface (CHI) for their proposed remote tower system, Blended Airspace. The Blended Airspace concept proposes to use legacy and emerging technologies to allow the provision of ATC services to non-towered airports from remote facility. Building on their previous research on remote towers, ANG-C43 will lead a 16-month study to determine the best CHI alternative. Multiple knowledge elicitation sessions and a real-time part-task simulation will be conducted to assess and evaluate the optimal CHI. The SBS Office will implement the preferred CHI in their Blended Airspace human-in-the-loop (HITL) simulation.

Dynamic – Required Navigation Performance Team Meeting: A Team meeting on Dynamic – Required Navigation Performance (D-RNP) on November 5-6, 2013 in Campbell, CA. The meeting included representatives from AJV-7, AIR-130, Saab-Sensis and Boeing. The purpose of this project is to develop high-level data communications requirements for the generation, uplink and execution of dynamic RNP clearances, and to identify down-link and ground automation requirements. Products will include a concept of operations, rough-order-of-magnitude benefits case and a white paper summarizing project results. The goal of the project team is to develop a research program that identifies NextGen concepts that may be enhanced by the use of "complex data-link clearances". Agency priorities have focused the Project on the concept development of D-RNP.

Dynamic - Required Navigation Performance Focus Group: On January 22-23, 2014, NextGen successfully conducted the Dynamic Required Navigation Performance (DRNP) Focus Group #2 Meeting in Washington, DC. FAA involvement included representatives from the Air Traffic Organization, Aviation Safety and NextGen. Other participants included members from Boeing, Saab Sensis, United Airlines, MITRE and Volpe. The focus group brought together research professionals as well as subject-matter-experts with current operational experience in Air Traffic Control, Traffic Management and Airline Pilot positions. Results from this effort will contribute to the development of FINAL DRNP Concept of Operations Document and defining future DRNP research activities.

Dynamic - Required Navigation Performance Cognitive Walkthrough: NextGen in partnership with the ATO conducted a Dynamic Required Navigation (DRNP) cognitive walk-through meeting on February 26-27. The purpose of this meeting was to bring active controllers from the field to review the

draft Concept of Operations (ConOps) for DRNP. DRNP is a future data-link capability that supports 4D trajectory operations by enabling the maintenance of flow or capacity in constrained airspace to near or the same level prior to the introduction of the constraint. A constraint could be weather, traffic, active special activity airspace (SAA), etc. The concept utilizes the dynamic generation of closely spaced RNP routes to increase the flow of traffic in constrained airspace. The controllers indicated that they like the concept and provided constructive feedback to the Team. The final DRNP ConOps will be delivered to the Radio Technical Commission for Avionics (RTCA) to support the development of avionics standards.

Space Vehicle Operations Focus Group #2: The Space Vehicle Operations (SVO) Focus Group #2 was held on September 25th-26th, 2013, in Washington D.C. Attendees included representatives from the commercial airline industry, the FAA Office of Commercial Space Transportation, the FAA Office of NextGen, the National Aeronautics and Space Administration, the FAA William J. Hughes Technical Center, the FAA Air Traffic Organization, and the Center for Excellence for Commercial Space Transportation. These experts from across the country participated in discussions of future NextGen technologies, tools, and procedures for managing the increasing numbers of space vehicles operating in the NAS. The focus group used future operational space scenarios to elicit subject-matter-expert knowledge in support of the development of the SVO Concept of Operations.

Improved Departure Prediction Research: Volpe Center's Air Traffic Management Systems Division completed research into the quantitative benefits of using improved departure time predictions during ground delay programs (GDP). Research evaluated multiple departure time sources (e.g., operator information, TFDM and ASDE-X updates) at the eight airports that account for 95% of GDP activity. Improvements were categorized by percent reduction in prediction error and look-ahead time relative to the actual time of departure. Results show substantial opportunities to reduce the cost of GDP's and improve efficiency, even if better departure times are available only for a subset of flights. Results are particularly impressive considering the conservative assumptions throughout. This research can be applied to quantify benefit for any program or process that improves the estimated time of departure more than 10 minutes before departure.

NextGen Trajectory Negotiation Cognitive Walkthrough #2: On December 17th-18th, 2013, NextGen conducted the NextGen Trajectory Negotiation (NTN) cognitive walkthrough #2. This event refined results from the first NTN cognitive walkthrough (conducted in 2012) to identify specific roles and responsibilities, distribution of tasks, and technological integration in multiple NAS trajectory reroute scenarios. The NTN cognitive walkthrough #2 brought together Subject Matter Experts with current operational experience in Air Traffic Control, Traffic Management, Airline Pilot, and Airline Dispatcher positions to provide input on how to handle these scenarios.

NextGen Trajectory Negotiation Concept of Operations Annotated Outline: NextGen developed an annotated outline for the NextGen Trajectory Negotiation (NTN) Concept of Operations. NTN provides shared situational awareness among the flight crew, flight operations center, air traffic control, and air traffic management to facilitate agreement on trajectory amendment requests that meet NAS constraints and flight operator objectives. NTN also provides procedures for achieving negotiated trajectories that are safe, efficient, and consistent with regulatory requirements. Actors, methods, and procedures for

implementing NTN are defined and the development of functional analyses, operational requirements, and support for concept validation planning are presented.

Bayesian Belief Network (BBN) Approach: Developed the Bayesian Belief Network (BBN) model approach. This report summarizes the work, modeling plan and preliminary BBN model conducted in the 3-month Phase I of the Statistical Methods for Departure Predictability (SMDP) study. All findings and modeling results are considered preliminary as there is more data to be acquired as well as more work to be done on the model itself. A final report will be completed at the end of the study.

Vertical Conformance Verification Kickoff Meeting: Kicked off meeting the Vertical Conformance Verification (VCV) project at Boeing was conducted during the week of Dec 2, 2013. The project will assess any shortfalls associated with the lack of vertical rate information on existing separation assurance tools and whether such information could be provided via NextGen avionics. The VCV concept would provide ATCs with a means for visually verifying an aircraft's climb and descent rate without relying exclusively on pilot reporting or computing it cognitively based on previous Mode C reports. VCV would provide this information to ATC in real time and could yield operational benefits. The VCV Concept may also reduce ground to air communication congestion by eliminating the need for frequent vertical rate inquiries and verification of vertical RNAV procedures and ultimately could result in a more optimal design of future RNP procedures. Key deliverable will be a VCV Concept Assessment and shortfall analysis, deriving potential solutions for the VCV technology opportunities and assessing operational improvements for the VCV concept.

Integrated Arrival/Departure Control Services (IADCS) Concept Validation Final Report:
NextGen submitted the IADCS Concept Final Validation report on April 30, 2014. The Integrated Arrival/Departure Control Service (IADCS) toolset are a set of Air Traffic Management procedures (routes and airspace adjustments) aimed at providing Air Traffic Control personnel with tools that allow for a more fluid, flexible National Airspace System that can be readily adjusted to meet changing operational demands and conditions. This document outlines the FAA's validation research activities aimed at measuring the feasibility and validity of the proposed IADCS procedures. The focus of the IADCS validation program was to model the IADCS tools and to determine what the effects upon efficiency, capacity, safety, controller workload, situational awareness, and overall system performance. The tools were modeled in the existing structure of the Atlanta Metroplex airspace and the validation effort included Cognitive Walk-throughs with Subject Matter Experts, Fast-time Modeling and Human in the Loop simulations. The results suggest that the IADCS procedures can be safely and efficiently implemented in the Atlanta Metroplex and other similar environments (e.g., Dallas-Fort Worth, Minneapolis, etc.). The monetary and time savings associated with the new procedures are substantial, and both ATC professionals and NAS users will benefit from their implementation.

Traffic Management Initiative (TMI) Attribute Standardization (TAS): On April 2, 2014, the TAS project team conducted a SME knowledge elicitation event with traffic management personnel at the New York Air Route Traffic Control Center (ZNY ARTCC). The results support the development of a TAS Ontology final report. The TAS Ontology final report will define the classification schema that comprehensively outlines TMI attributes. The TMI ontology is designed for use by existing and future traffic management tools and will result in standardized TMI entry, parsing, tracking, and logging by enhancing existing traffic management tools.