FAA NextGEN Program & NEAR Laboratory

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U.S. Air Traffic System – World’s Most Demanding

- 689M Passengers/Year
- 36B Pounds of Cargo/Year
- 5,000 Planes in the air at any time
- Linchpin of the U.S. Economy
- 5.6% of GDP, 11.5M Jobs

Linchpin of the U.S. Economy
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NextGen is more than just a...

• **Single project**... It is the integration of many projects, concepts, and technologies.

• **Program plan**... It is the integration of many program plans, some new and some ongoing, to deliver new service capabilities to meet increasing needs.

• **New system**... It is the integration of
  – new systems,
  – new procedures,
  – new aircraft performance capabilities,
  – renewable fuels,
  – new supporting infrastructure, and
  – a *new way to do business*

as the *Air Transportation System*. 
We Often Picture the Airspace as Looking Like This …

But In Reality, Today It Looks More Like …

Current NAS Problems
Today’s System Lacks Common Situational Awareness

- Different System Information, Trajectory and Problem View Causes Uncertainty & Inefficiency
- Limited Interoperability (Between ATC System Domains; Aircraft and Ground Systems)
- Unpredictable Results Lead to System Delays and Operational Costs

System Limitations Result in Increased Passenger Delays and Airline Costs
NextGen Con Ops Provides the Vision

- Collaborative, trajectory-based planning; Seamless airspace operations
- Fuel efficient, low noise flight profiles; Full airport capacity utilization!
- Predictable, fuel efficient departures!
- Increase arrival capacity; Efficient airport management
- Reduce taxi queues; Increase airport safety

NextGen Operational Improvements Provide Increases in Capacity & Shared Situation Awareness while Enhancing Safety
FAA’s OEP Provides Implementation Planning

Integrated Airport Builds on the FAA’s Operational Evolution Partnership

**FAA’s OEP Provides Implementation Planning**

**High Density Airports**
- Initial Surface Traffic Management
- Integrated Arrival/Departure Management

**Trajectory-Based Ops**
- 4D Trajectory Management
- Capacity and Efficiency Using RNP/RNAV

**Flexible Terminals & Facilities**
- Shared Surface Situation
- Runway Safety Alerting
- Tower Data Link Taxi Clearance
- Wind and Wake Procedures
- Staffed Virtual Tower

**Reduce Weather Impact**
- Integrate Weather into DSTs

**Collaborative ATM**
- Flight Plan Constraint Evaluation
- On-Demand NAS Information
- Trajectory Flight Data Management

**Net Centric SWIM Enabled**

We must enable broad access to A/P Info!!
FAA’s NextGEN Testbed

[Map showing NextGen Test Beds with Central Service Area and Eastern Service Area highlighted.]
NEAR Overview

• ERAU technical arm in NextGen testbed
• Resources and Capabilities
  – 11 full time staffs (7 Software Eng., 2 Analyst, 2 PhD Research faculty) + Affiliated faculty & students (grad, under grad)
  – Live data feed from FAA (ASDI, ABS-B, WX)
  – Part of Aviation SimNet
  – Flight & WX Historical Data (since 1997)
  – In house and 3rd party simulation and modeling tools
NEAR Lab Research Areas

• Fast and real-time Simulation and Modeling
• Mobile Aviation Application Development (IPAD, IPhone, Smart Phone)
• Data Mining
• Data Acquisition
• UAS (Unmanned Autonomous System)
• Small Avionics
NEAR NextGEN
Projects
2015/2016 AAtS Objective

- Command & Control
  Voice, Data Comm, ADS-B, ADS-C
- NAS Boundary Protection Services
- Third Party DMS
- Commercial Data Link
- Service Management
- AOC / FOC
- Data Link, Voice

- Air Traffic Management Systems
- NAS Boundary Protection Services
- AOC / FOC

NEMS SWIM SOA Messaging Infrastructure

- Weather Information Sources
- Aeronautical Information Sources
- Flight Information Sources

Data Fusion
Mini Global II GEMS

Global Enterprise Messaging Service
Proposed Mini Global II Architecture
UAS Integration to NAS

- Multiple Classes of UAV
- Different Capabilities
- Safe Integration

Picture Courtesy of Amazon
NEAR Products
EMID
ERAU Multi-Information Display

- Real Time aircraft
- Geospatial data
- Aircraft tracking
- Ready for App Store
EFB
Electronic Flight Bag

- Weather direct from FAA
- Push updates
- Background maps
- Multiple platforms
EFB Security

EFB Security Research Task

- Management
- Threat Identification & Mitigation
- Prioritizing data
- Quality of service measures
- Test case development
CASP
Common Air Surveillance Picture

- Composite image of NAS
- Real-Time aircraft information
- Real-time weather
- Flight plans
Data Archive

- Airspace Situation Display to Industry (ASDI) Class 1 real-time feed
  - ASDI Data Archive Starting 1999

- ADS-B, TIS-B real-time Development Chain Feed
  - ADS-B, TIS-B Data Archive Starting 2007
TAAM
Total Airspace and Airport Modeler

• Fast-time simulation
• Gate-to-gate
• Ground and air
• “What if?” scenarios
RTDS
Real Time Distributed Simulation System

- Flight-plan filer
- Pilot and ATC displays
- Target generator
- Voice-communication
- Distributed
Aviation SimNet

C2C and CAASD Standard for Data Communications: HLA
Standard for Voice Communications: DIS 1278.1a

NASA Ames
NASA Langley
Embry Riddle
Lockheed Martin
FAA WJHTC
MITRE

AviationSimNet Collaborator

Internet or Dedicated Line

Gateway
Gateway
Gateway
Gateway

voic e Hub
Data Hub
Flight Simulator & Flight Management System (FMS)

- High Fidelity Flight Sim
  - Boeing 737
  - Bombardier 5000
  - JSBSim
  - Supports Autopilot
    - UAS
- FMS
  - Supports 4-DT
Virtual 3D NAS

- Virtual tower
- Real-time weather
- Real-time aircraft
- Simulated aircraft
- Playback
Sub-orbital ADS-B

ADS-B Prototype for Suborbital Reusable Launch Vehicles

- Track sub-orbital
- Prototype transponder
- Balloon high-altitude flight
- Rocket demonstration
GALE
UAS for Hurricane Research

- Tube launch
- Survey boundary layer
- PTH and winds
- Disposable
Questions?