Subcommittee on Human Factors Fall 2013 Review

NextGen Flight Deck Human Factors

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NextGen Flight Deck Human Factors

- ***Purpose:*** To conduct HF research & development oriented to NextGen changes to address specific NextGen Capabilities, Operational Improvements, and Segment Implementation Plan Increments.
- ***Benefits:*** To reduce risks associated with human performance while ensuring system safety and supporting NextGen efficiency and capacity goals.
- ***Success:*** Results of research support development of standards, procedures, training, policy and other regulatory and guidance material as well as human factors assessments of NextGen technologies and procedures.
- ***Technical Sponsors:***
  - AVS (AIR and AFS), ATO (Program Offices), ANG (NAS Lifecycle Integration Office, Office of the Chief Scientist)

FY13-FY16 NextGen Flight Deck HF Research Requirements Overview

	FY 2013	FY 2014	FY 2015	FY 2016
NextGen: Complex Systems and Human Error Formerly titled “Roles, Responsibilities, Airworthiness, and Operational Requirements for the Integration of Automated Systems and Functions in NextGen Aircraft Systems”	◆	◆	◆	◆
NextGen: Human Factors Guidelines for Advanced Instrument Procedure Design and Use	◆	◆	◆	◆
NextGen: Procedures, Tasks, Skills and Training for NextGen Air Carrier Pilots and Dispatchers	◆	◆	◆	◆
NextGen: Flight deck systems: flightcrew interfaces, installation, integration and operations	◆	◆	◆	◆
NextGen: DataComm Human Factors R&D	◆	◆	◆	◆

NextGen: Complex Systems and Human Error

Research Requirement

- 66% - 75% of all accidents have pilot error as a primary factor
- Research needs to examine changing roles and responsibilities in human-system coordination, flight deck-ATC negotiation, and potential knowledge and skill loss
- Results will be used to develop guidance for the design of standard operating procedures and operational policy for flight path management with respect to automation integration
- Sponsor: Kathy Abbott (CSTA), Doug Farrow (AFS-230), Cathy Swider (AIR-120)

Execution of the Requirement

- Performer(s)
  - Honeywell
  - Iowa State University (grant initiated March 2013)
  - NASA-Ames
- Start Date: Research ongoing from FY12 requirement
- Current status: **Green**

FY 2013 Accomplishment/Issues

- Report identifying human factors Issues regarding information automation
- Reports will include data to support guidance on compliance with the human factors related regulations (e.g., 14 CFR § 121 Subparts N&O; 14 CFR § 121 Subpart Y; 14 CFR §§ 2X.1301, proposed 25.1302, 2X.1329)

Out Year Funding Requirements

FY 13	FY 14	FY 15	FY 16	FY 17
$ 2,446	$ 3,200	$ 2,700	TBD	TBD

Note: Funding for outyears (FY14+) is for planning purposes only.

NextGen: Complex Systems and Human Error

	FY 2013	FY 2014	FY 2015	FY 2016
Human factors issues analysis of information automation	◆	◆		
Conduct empirical evaluation of information automation	◆	◆		
Conduct literature review to identify issues and mitigations related to knowledge and skill loss		◆		
Conduct evaluations of mitigations for knowledge and skill loss.			◆	
Draft report providing information for the development of methods to support evaluation processes and certification specialists			◆	
Develop methods to address complexity/authority issues (e.g., what form could it take to show critical assumptions)				◆

NextGen: Human Factors Guidelines for Advanced Instrument Procedure Design and Use

Research Requirement

- Conduct R&D to identify issues and develop human factors guidelines for the design, depiction, usability, and flyability of instrument procedures and associated charts for inclusion in advisory material and standards for instrument procedures and associated charting.
- R&D efforts address instrument procedure complexity and interactions between flight deck design implementations and surface and airborne operations for Part 91, 135, and 121 operators.
- Sponsors: Kathy Abbott (CSTA), Mark Steinbicker (AFS-470)

Execution of the Requirement

- Performer: US DOT Volpe Center
- Start Date: Research ongoing from FY 07
- Current status: **Green**

FY 2013 Accomplishment/Issues

- Research results and recommendations will inform:
  - Modifications to update and improve FAA Orders in the 8260 series, FAA Order 8900.1, AC 120-76 and others
  - Minimum requirements and operational limitations for electronic chart displays and inclusion of selected chart data on various flight deck displays
  - Human factors guidance for design characteristics influencing perceived instrument procedure complexity for NextGen operations

Out Year Funding Requirements

FY 13	FY 14	FY 15	FY 16	FY 17
$ 515	$ 1,300	$ 1,300	TBD	TBD

Note: Funding for outyears (FY14+) is for planning purposes only.

NextGen: Human Factors Guidelines for Advanced Instrument Procedure Design and Use

	FY 2013	FY 2014	FY 2015	FY 2016
Chart Format and Usability Studies	◆	◆		
RNAV Airways			◆	◆
Electronic Charts	◆	◆		
Air-Ground Human Factors Considerations for RNAV/RNP Operations		◆	◆	◆
Human Factors Considerations for Procedure Designers	◆	◆	◆	◆
Design and Evaluation of Flight Crew Procedures for PBN Operations		◆	◆	◆

NextGen: Procedures, Tasks, Skills and Training for NextGen Air Carrier Pilots and Dispatchers

Research Requirement

- Existing FAA regulatory and guidance material does not address the new skill sets and modified task requirements pilots and dispatch personnel will need to safely transition to each incremental implementation of NextGen technology.
- Research is needed to help the FAA generate the knowledge required to establish the new standards and issue the new training and checking guidelines for pilots and dispatchers as their jobs change in phased implementation of NextGen
- Sponsor: Doug Farrow (AFS-230)

Execution of the Requirement

- Performer(s)
  - NASA-Ames
  - Design Research (grant in process)
- Start Date: Research ongoing from FY 11
- Current status: **Green**

FY 2013 Accomplishment/Issues

- Detailed recommendations from which the FAA can establish rules and guidance for training and checking pilots and dispatchers operating in the NextGen NAS.
- Strategic recommendations to the FAA for integrating this new guidance into existing guidance as well as into operator training programs.

Out Year Funding Requirements

FY 13	FY 14	FY 15	FY 16	FY 17
$ 1,075	$ 1,000	$ 1,000	TBD	TBD

Note: Funding for outyears (FY14+) is for planning purposes only.

NextGen: Procedures, Tasks, Skills and Training for NextGen Air Carrier Pilots and Dispatchers

	FY 2013	FY 2014	FY 2015	FY 2016
Examine alerting issues philosophies related to the representative set of non-normal situations for two aircraft types	◆	◆		
Conduct analysis of proposed internal and external non-normal checklist content and design factors with respect to NextGen non-normal situation demands	◆	◆		
Conduct review of NextGen literature and research studies that speak to changed competencies for pilots and dispatchers required to operate in the NextGen environment			◆	◆
Conduct full instructional requirements analysis of all relevant job tasks for pilots and dispatchers, to include individual, crew and team tasks			◆	◆
Develop recommended training and checking requirements for flight crew in NextGen			◆	◆

NextGen: Procedures, Tasks, Skills and Training for NextGen Air Carrier Pilots and Dispatchers

Procedures

	FY 2013	FY 2014	FY 2015	FY 2016
Review scientific, technical, and regulatory literature on procedures and procedure development; conduct data analyses	◆	◆		
Produce general systems approach for developing procedures		◆		
Develop approaches for data collection, analysis, reporting, and evaluation related to procedure design		◆		
Develop methods for training and implementing procedures, and for assessing the training and implementation of these procedures			◆	

NextGen: Flight deck systems: flightcrew interfaces, installation, integration and operations

Research Requirement

- Existing policy does not address proliferation of new functions, equipment, and procedures required to implement NextGen (e.g., EVS/SVS, ADS-B, TCAS integrated with ADS-B, EFB, surface movement technologies, low visibility operations)
- Common HF issues include system integration, interdependence, and interconnectedness; risk/error management; usability; color; symbology; displays; controls; workload; and attention management
- Sponsors: Cathy Swider (AIR-120), Loran Haworth (ANM-111), Terry Stubblefield/King (AFS-410), Wes Ryan & Lowell Foster (ACE-114)

Execution of the Requirement

- Performer(s)
  - Honeywell
  - MITRE
  - NASA-Ames
  - US DOT Volpe Center
- Start Date: Research ongoing from FY XX
- Current status: **Green**

FY 2013 Accomplishment/Issues

- Draft report addressing human factors issues associated with temporary securing solutions for portable electronic devices
- Symbol study to identify key stereotypes for charts for low visibility operations
- Report documenting human factors issues associated with use of EFBs and PEDs in NextGen based on ASIAS data

Out Year Funding Requirements

FY 13	FY 14	FY 15	FY 16	FY 17
$ 4,682	$ 2,800	$ 2,800	TBD	TBD

Note: Funding for outyears (FY14+) is for planning purposes only.

NextGen: Flight Deck Systems: Flightcrew Interfaces, Installation, Integration and Operations

Airport Surface Moving Maps, ADS-B/CDTI, EFBs for NextGen

	FY2012	FY2013	FY 2014	FY 2015	FY 2016
Develop Frequently Asked Questions (FAQs) for approval and authorization of EFBs in NextGen	◆	◆			
Develop survey for airline operators to gather information regarding EFBs and portable technologies		◆	◆		
Identify human factors issues associated with temporary securing solutions		◆	◆		
Develop human factors criteria for authorization of taxi charts on portable electronic devices			◆	◆	
Human-in-loop studies and data analysis that evaluate integration of ADS-B/CDTI alerting and traffic situation awareness for airborne/ground					◆
Perform gap analysis of current guidance and draft research plan for operational issues related to advanced control systems					◆

NextGen: Flight Deck Systems: Flightcrew Interfaces, Installation, Integration and Operations

Low visibility operations

	FY2012	FY2013	FY 2014	FY 2015	FY 2016
Examine display locations for presentation of EVS/SVS	◆	◆			
Identify best practices for design of LVO/SMGCS charts for paper and electronic presentation	◆	◆	◆		
Develop symbol recommendations for use on LVO/SMGCS charts	◆	◆	◆		
Evaluate low visibility procedures for approach, landing, and takeoff			◆	◆	
Develop methods for operational issues and identification of HF performance issues				◆	◆

NextGen: DataComm Human Factors R&D

Research Requirement

- Conduct R&D to identify and mitigate human factors to enable DataComm implementation. Provide technical data to address avionics safety and usability, and support international coordination and enhancement of the CPDLC message set.
- R&D efforts address flight crew procedures and performance, levels of automation, avionics requirements, message set, and air/ground aspects.
- Provide technical data supporting AVS updates to regulatory guidance for certification of datacomm avionics, and operational approval of procedures and training.
- Sponsors: Matt Wade, Christophe Hamel (AIR-130)

Execution of the Requirement

- Performer(s)
  - Honeywell
  - MITRE
  - NASA-Ames
  - US DOT Volpe Center
  - George Mason University
  - Wright State University
- Start Date: Research ongoing from FY 09
- Current status: **Green**

FY 2013 Accomplishment/Issues

- Recommendation for message set revisions for ICAO Operational Datalink Panel (OPLINK-P)
- Recommendations to address human factors aspects of flightcrew procedures and avionics capabilities that could limit DataComm implementation and NextGen operations
- Recommendations for minimum requirements for new and modified flight deck avionics to support data communications and NextGen operations such as 4D trajectories

Out Year Funding Requirements

FY 13	FY 14	FY 15	FY 16	FY 17
$ 250	$ 800	$ 1,100	TBD	TBD

Note: Funding for outyears (FY14+) is for planning purposes only.

NextGen: DataComm Human Factors R&D

	FY 2013	FY 2014	FY 2015	FY 2016
Human factors support for DataComm standards and international harmonization	◆	◆	◆	◆
Reqts for Alternative Displays and Controls for Datacomm	◆			
Integrated air/ground research to identify and address NextGen applications using DataComm: Interval Management, Dynamic RNP, and winds data.	◆	◆		
DataComm in single pilot and low visibility operations			◆	
Operating limitations and standard operating procedures for DataComm			◆	◆
DataComm integration with flight deck avionics				◆