Aviation Weather Human Factors Research Summit

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Mike Monroney Aeronautical Center
Civil Aerospace Medical Institute
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Summary Briefing

By Daniela Kratchounova, Ph.D.

Flight Deck Human Factors Research Laboratory

Civil Aerospace Medical Institute

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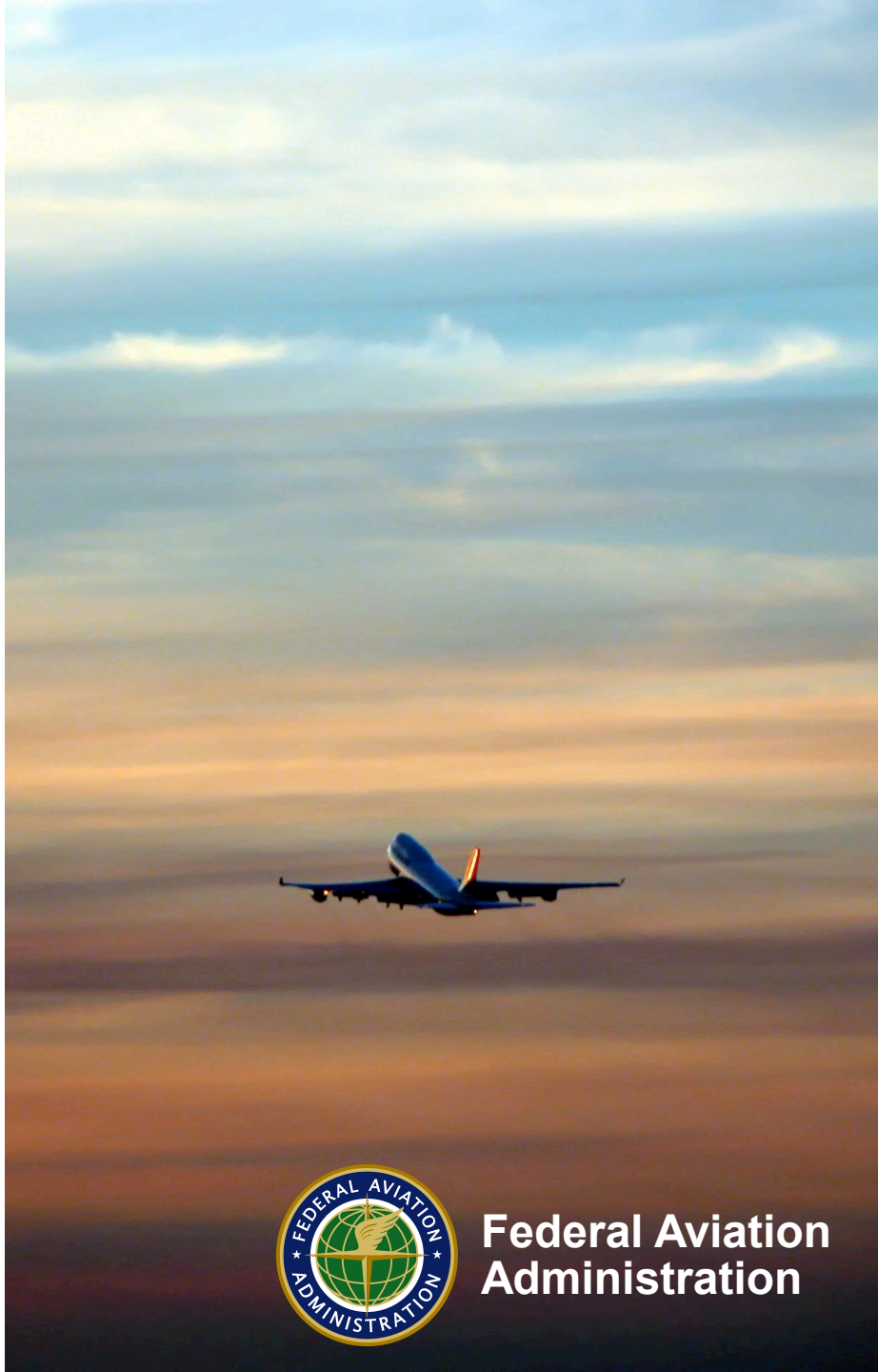

Summit Charter

- Address a wide spectrum of aviation weather human factors research topics
- Explore avenues for collaborative human factors research partnerships between the FAA, other government and non-government entities, industry, and academia

Attendees

- FAA
- NOAA
- NTSB
- AOPA
- Alaska Airmen
- Honeywell
- Rockwell Collins
- Elbit Systems
- University of Oklahoma
- MIT Lincoln Labs
- Embry-Riddle Aeronautical University
- Florida Institute of Technology

Topics Covered

- Weather applications of advanced vision systems (ground based and airborne/flight deck)
- Aviation weather sensors
- Aviation weather training/education
- Unmanned Aerial Systems
- Aviation weather information presentation and dissemination
- Cloud-based aviation weather computing and research (mobile and web applications)
- Physical and computer simulation of weather phenomena

Weather Applications of Advanced Vision Systems – Example 1: EFVS VA iOS app

- The concept of Visual Advantage
- Purpose of research
  - Support data-driven decisions in policy making/updates

Enhanced Vision System (EVS)

Enhanced Flight Vision System (EFVS)

Weather Applications of Advanced Vision Systems – Example 1: EFVS VA EFB app

- EFVS Visual Advantage EFB app:
  - Available from CAMI's cloud-based research platform at https://cbtopsatcami.faa.gov
  - Airport ID auto-filled
  - Approach plate available for visibility minima reference
  - Weather (METAR) info auto-filled
    - Manual update option available

Aviation Weather Sensors

- Work with aviation weather sensors is centered around improving pilots' awareness of weather status and accuracy of weather data
- Low-light sensors are being tested for improving weather camera effectiveness under low lighting conditions
- Improving sensor technology will also improve the ability to detect and forecast adverse weather conditions that impact aviation systems

Aviation Weather Training/Education

- Efforts are being made to train pilots and dispatchers to be able to better understand and interpret weather data
- The complexity of weather information makes integrating it into the flight deck a challenge due to:
  - The amount of information already presented in the flight deck
  - The varied and non-standardized training that pilots and dispatchers receive make it difficult to define where knowledge gaps exist

Unmanned Aerial Systems

- Fixed-wing UAS (fwUAS) and Rotary-wing UAS (rwUAS)
  - fwUAS used for 20+ years
    - Advantages:
      - Inherited instrumentation advances from manned aircraft
      - Reliable thermodynamic measurements
    - Disadvantages:
      - Risks when operating close to ground
      - Requires suitable takeoff mechanism and landing surface
  - rwUAS very promising
    - Autopilot technology rapidly improving - commercially accessible
    - Instrumentation also undergoing miniaturization
    - Capable of unattended takeoff/landing and vertical profiling
- Only in the past couple of years are rwUAS being realized as a viable supplement to fwUAS

Aviation Weather Information Presentation and Dissemination

- Presentation and communication of weather-related information still a challenge
  - Weather information must not distract pilots from mission-critical tasks or negatively impact pilot workload
- Current research requirements include the potential for standardizing weather information between pilots, dispatchers, observers, and weather briefers

Cloud-based Aviation Weather Research

- Research studies can be conducted entirely in the cloud
  - Examples include:
    - EFVS VA app
    - Image-based Visibility Study
- Research questions:
  - Is deriving image-based visibility from the AK aviation weather cameras a viable solution for providing weather observations to Alaska's widely dispersed airfields where essential weather data sets, such as METARs and TAFs, are not available?
  - What is the "behavior" of the different image-based visibility estimates/models across different weather conditions at airfields where traditional weather sensors are collocated with aviation weather cameras and expert observers?

Cloud-based Aviation Weather Research

- Research is ongoing: 2018 “dry run” ends Dec 21
  - https://cbtopsatcami.faa.gov/visibility-study
- Lessons learned so far:
  - Research needs to be longitudinal
    - Participant recruitment is a challenge
  - Know your baselines
    - Was the visibility reported in a METAR augmented by a human observer or not
  - Vision/image based estimates
    - Human observers
    - Computer vision
  - Non-vision/image based estimates
  - Logistics

Physical and Computer Simulation of Weather Phenomena

- National Environmental Simulation and Testing (NEST) Facility:
- Full-scale physical simulation including winds, precipitation, lightning, airborne debris, and vortex flows
- Research, design, testing, and certification of aviation products and systems in a controlled and replicable manner

Next Steps

- Proceedings of the summit will be published at https://cbtopsatcami.faa.gov/
- Start planning for the second annual summit in 2019