Summary of FPAW 2019 Spring Meeting

The 2019 FPAW Spring Meeting took place on 16–17 April 2019 in the NTSB Boardroom and Conference Center at L'Enfant Plaza in Washington, DC. NTSB Vice-Chairman Bruce Landsberg delivered opening keynote comments that emphasized the importance of weather to aviation safety, as sadly reflected in aircraft accident statistics.

During the Spring Meeting, the Consortium of Aviation Weather Users awarded its 2019 Weather Prize to Jim Evans/MIT Lincoln Laboratory for his lifelong work in aviation weather technology, including terminal doppler weather radar, the Integrated Terminal Weather System (ITWS) and the Corridor Integrated Weather System (CIWS), and recognized Rick Heuwinkel/FAA Manager – Aviation Weather Division (ret.) for his efforts that enabled many of the scientific/engineering advances in aviation weather to make their way to the users.

L-R: Captain Tim Miner/Allied Pilots Association (APA), Mark Phaneuf/Airline Pilots Association (ALPA), Dr. Jim Evans/MIT Lincoln Laboratory, John Kosak/National Business Aviation Association (NBAA), John Gordon/Airline Dispatchers Federation (ADF), Eric Avila/National Air Traffic Controllers Association (NATCA). Photo courtesy of NBAA.

The planning session for the 2019 FPAW Fall Meeting was conducted in the morning on 16 April 2019, prior to the start of the Spring Meeting that afternoon. The Spring Meeting covered three main topic areas: 1) Accounting for forecast uncertainty in decision making; 2) Next generation of the HEMS weather tool; and 3) Data-driven decision making under convective weather impacts on high congestion airspace. The highlights of the Spring Meeting are summarized below.

Summary of Topic #1 – Accounting for Weather Forecast Uncertainty in Decision-Making

Session Leads: Mike Robinson/MITRE, Dr. Colleen Reiche/Booz Allen Hamilton, Warren Qualley/Southwest Airlines, Steve Abelman/American Airlines

A panel convened to discuss the range of considerations and challenges associated with effective weather forecast uncertainty accountability in air traffic management decision-making. The panel was comprised of a diverse group with expertise in air traffic operations, aviation meteorology, weather forecast research and applications, and social science. Each panelist shared their perspectives on weather uncertainty management, forming the following, collective thoughts (developed in concert with meeting participants and open discussions):

- Probabilistic forecasts are meaningless *without known thresholds for action*, relative to specific air traffic decisions (decision-makers and applied weather researchers "doing this homework" is important); Probabilities *plus context* result in useful information;
- Probabilities must evolve towards informed statements of forecast confidence, risk, and tolerance and must be targeted towards operational interpretation;
- Significant value in forecast ensembles to support uncertainty-informed air traffic decision-making; We are just starting to scratch the surface here;
- The 'weather' and forecasts are only one component of uncertainty management – there are significant pitfalls to overcome / opportunities to leverage when weather information and decision support informed by and engineered with social science learned practices;
- More data and data-driven solutions, informed by social science learned practices, will lead to improved weather uncertainty accountability. However, the human forecaster still has (and will continue to have) a key role here, and how best to leverage the meteorologists supporting this evolving operation is an important area;
- Trust and reliability in weather data, solutions, expected outcomes discussed on several occasions – speaks to needs of forecasts, of forecast representation, interpretation and prioritization (cognitive engineering), of automation and decision support providing understood and justifiable guidance, and of the human forecasters supporting the air traffic operations;
- Measuring forecast performance satisfies specific needs for specific user groups (e.g., model developers vs. end users); Need to understand why and for what purposes performance validation is needed and support it in this manner;
- Weather uncertainty solutions will be best achieved through collaborative research accountable to forecast technology, end users and decisions, and appropriate cognitive engineering solutions.

The panel session concluded with the two recommendations:

1. Identify small, incremental test cases where advancements in weather uncertainty management, specific to air traffic operations, may be needed
2. Define experiments to evaluate potential solutions that incorporate the needs for weather forecast research and development, behavioral science, and operational decision-making

Summary of Topic #2 – Next Generation of the HEMS Weather Tool Panel Discussion Summary

Session Leads: Rex Alexander/Five-Alpha and Vertical Flight Society, Dr. Bruce Carmichael/NCAR (retired)

This session featured a six-member panel, comprised of a diverse group of representatives from the Federal Aviation Administration, Vertical Flight Society, U.S. Helicopter Safety Team, National Oceanic and Atmospheric Administration, and the Aviation Weather Center. The

discussion provided a glimpse into the extraordinary future possibilities of the Helicopter Emergency Management System (HEMS) Weather Tool.

Many of the identified improvements were viewed as likely to have positive impacts on several if not all the various lines of aviation weather business represented at this year's FPAW. The specific topics related to the HEMS Weather tool that were discussed included the following:

- Development of a HEMS Weather Tool smart phone application
- Ingestion and reporting of automated aircraft-based observations
- Integration of aircraft-based observations into cockpit weather reporting systems
- Incorporation of weather camera feed information into weather analyses
- Urban area turbulence and wind reporting
- Increased weather reporting station ingestion besides just AWOS
- Enhanced surface weather reporting capabilities for Drone and UAS operators
- HEMS Tool name change to encourage more aviation end users to use the tool

If these ideas were to be implemented, the panel and audience agreed that they would provide unparalleled value to aviation weather reporting and pilot decision-making in the low altitude flight operations arena for years to come.

If you have never seen or used the HEMS Weather Tool, it is freely accessible at https://www.aviationweather.gov/hemst .

Summary of Topic #3 – Improving ATM when Convection Impacts Congested Airspace

Session Leads: Dr. Jim Evans/MIT Lincoln Laboratory, John Kosak/NBAA

The panel discussed contemporary practices for convective weather ATM decision-making in two high congestion locations (the Northeast Corridor and Atlanta). A number of convective cases from these two locations were considered to determine which convective forecast product with lead times of two hours or greater was being used for key decisions. All the operational decision makers consulted with a meteorologist who in turn was considering many different forecasts.

The panel members had several suggestions for reducing "avoidable delay:"

1. Improving choice and usage of TMIs [especially airspace flow programs (AFPs)]
2. Improving decision support from CWSUs at ARTCCs as has been done at ZTL
3. Improving forecasts and processes for recovery at the end of convective impacts as is done at Atlanta
4. Objective quantitative translation of weather forecasts into capacity impact forecasts
5. Providing real time information to the cockpit on current and near-term capacity constraints (e.g., likely route blockages), and
6. Assessment of various elements of the overall decision-making process (e.g., convective weather forecasts, translation of the forecasts into capacity constraint forecasts, choice of TMIs) together with impact on the flying public (e.g., total delay minutes) as part of the post event review process