Spring 2023 FPAW Meeting Summary

Note: This meeting recap, and all associated presentations, chat logs, meeting recordings and reference material, are available to everyone on the FPAW website at https://fpaw.aero/events/2023/fpaw-spring-2023.

Tuesday, May 16, 2023

Plenary Meeting

Sessions 1a and 1b: "New Observation Standards and Methods," 9:00 AM – 2:00 PM CDT

Session Co-leads: John Steventon (FAA) and Scott Landolt (NCAR)

The morning session focused on performance-based weather standards (PBWS) for analyzed weather, specifications for weather data performance and interfaces, and approval of 3rd-party weather information. Gordy Rother (FAA), with support from Tom Ryan (FAA) and Kevin Johnston (FAA), discussed the PBWS concept. Don Berchoff (TruWeather Solutions) reviewed the ASTM-F38 Specifications for weather data performance and interfaces, and weather information provider performance and interoperability with an emphasis on the impacts and needs for UAS operations. Tiffany McCoy (FAA) finished the session by going over the NextGen Operational Improvement (OI) approval of 3rd-party weather information providers and described the need for weather observations outside of the standard U.S. observing network to help meet the growing needs of meso- and micro-scale observations.

The afternoon session focused on advances in weather observations using UAS, upcoming changes to the Automated Surface Observing Systems (ASOS), and using X-band radars to fill in gaps in the existing National Weather Service (NWS) radar network. Gus de Azevedo (OSU) presented on the work developing new sensors (e.g., vertically pointing radars and drop size distribution sensors) that OSU is incorporating into their UAS platforms and a summary of some of their tests thus far. Ken Boutin (NWS) gave an update on the planned changes for ASOS over the next 10-years, which included upgrades to the central processing systems, replacement sensors, real-time access to one-minute observations, and changes to some of the algorithms. Finally, Apoorva Bajaj (Climavision), right, discussed plans to install a network of X-band radars across the country to fill in observation gaps where the current NWS radar network does not cover well, and the benefits this network will provide to rural airports, general aviation and UAS/AAM operations related to numerical modeling, warning coordination, and overall meteorological monitoring.

Session 2: "Weather Industry Perspective Survey Results," 2:15 PM – 3:00 PM CDT

Session Co-leads: Gary Pokodner (FAA) and Tenny Lindholm (NCAR)

This session presented the results of a Pilot Industry Survey that was developed and conducted by NCAR on behalf of the FAA's Weather Technology in the Cockpit (WTIC) Program Office.

Pilots represented by the Air Line Pilots Association (ALPA), the National Business Aviation Association (NBAA), and other Part 121 airline groups participated in the survey. The primary goal of the survey was to identify information and capability gaps that still need to be addressed for the WTIC Program minimum weather service (MinWxSvc) recommendations for cockpit weather information. Future areas of research were presented as derived from survey results.

Several FPAW attendees, including pilots and representatives from Part 121 airlines, said that the survey results adequately captured their thoughts on the positive impacts of inflight weather information updates. Areas of future research that were suggested addressed those gaps and issues that still negatively impact the capability. One industry member (weather radar manufacturer) asked for more information on limitations of airborne weather radars and adequacy of pilot training. Several other attendees representing flight safety and general aviation commented that, from their perspectives, access to full capabilities such as SIRIUS-XM is more important than full Internet access for GA. Other comments suggested that UAS needs for inflight weather updates and use need to be addressed. Finally, one comment suggested that meteorologists need to be trained to think like pilots, not the other way around. This comment just reinforces the theme that is a common one—the format and function of weather information and access should relate to the 4-dimensional flight profile to have the most rapid and effective impact on pilot decision-making.

Matt Strahan Tribute, 3:15 PM – 3:30 PM CDT

Speakers: Joshua Scheck (NWS AWC) and Brian Pettegrew (MITRE)

To honor our friend, colleague and inaugural FPAW Steering Committee member, Matt Strahan, Joshua Scheck (NWS AWC), below left, and Brian Pettegrew (MITRE), below right, each spoke. Joshua talked about Matt's sense of humor and humility, his contributions to the international aviation weather community, and his resilience and determination over the last months of his life.

Brian reminisced about his relationship with Matt, as an AWC colleague and friend. He shared news of an effort he led to set up a scholarship fund in Matt's name at their alma mater, the University of Missouri.

Scholarship Fund Update: As of Friday, June 23, 2023, 42 FPAW members have contributed or pledged more than $6,350.00 to the Matt Strahan Gift Fund, and there's still a long way to go until this scholarship fund reaches endowment level!

FPAW Steering Committee (SC) Meeting, 3:45 PM – 5:00 PM CDT

Session Co-leads: Matt Fronzak (MITRE) and Matthias Steiner (NCAR)

Attending in person were Eric Avila, Matt Fronzak, Ian Johnson, Nathan Polderman, Matthias Steiner, Jennifer Stroozas and Elizabeth Wilson. Attending remotely were Rex Alexander, Jim Evans, John Kosak, Heather Reeves and John Steventon. David Bieger, Marilyn Pearson and Joel Siegel were unable to attend.

The committee's wide-ranging discussions included the following:

- Introductions of new members: John Kosak (effective 4-14-23) and Jennifer Stroozas (effective 5-12-23)
- Preparing for the next day's Planning Meeting
  - Possible Spring 2024 FPAW Meeting dates and locations
  - Google may be willing to host the Spring 2024 FPAW Meeting
  - Think about airline hubs, with nearby AOCs and pilot crew bases, other relevant stakeholders in area
  - Possible short aviation weather handbook update (30 min)?
- Regarding the Pilot Survey briefing delivered earlier in the afternoon, the FPAW SC should consider providing recommendations on what research and development to further pursue
- Should FPAW attend, and present seminars or briefings at, relevant industry meetings, e.g.,
  - 2023 EAA AirVenture Oshkosh, July 24-30, 2023, Oshkosh, WI: https://www.eaa.org/airventure
  - Sun 'n Fun Aerospace Expo, April 9-14, 2024, Lakeland, FL: https://flysnf.org/
  - Vertical Flight Society 17th Annual Electric Aircraft Symposium, July 22-23, 2023 Oshkosh, WI: https://vtol.org/events/2023-electric-aircraft-symposium
  - Vertical Flight Society 7th AAM Infrastructure Workshop, Sept. 26-28: https://vtol.org/events/2023-7th-workshop-on-aam-infrastructure
- FPAW should enhance its links to WMO aviation weather, including in the area of aircraft-based observations (ABOs)

FPAW Steering Committee Dinner

The seven in-person members of the FPAW SC met up for a wonderful dinner at the Trezo Mare Restaurant and Lounge in Kansas City. Temperatures were just warm enough to allow the group to sit outside. Thank you to the newest FPAW SC member, Jennifer Stroozas, for the recommendation. The highlight of the dinner was watching Elizabeth Wilson struggle to finish her dessert (thank you, Matt Fronzak, for taking one for the team), while the highlight of the commute for several of us was warp-speeding in Matthias Steiner's rental Tesla (thank you, Hertz) to and from the restaurant.

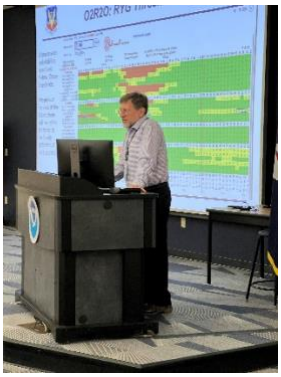
Wednesday, May 17, 2022

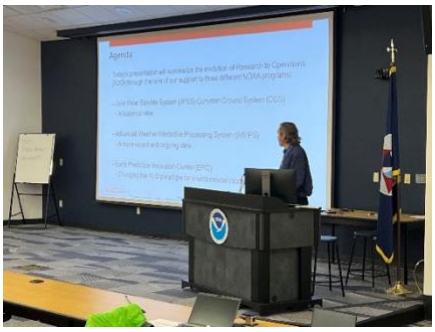
Plenary Meeting

Sessions 3a and 3b: "Research to Operations (R20)," 9:00 AM – 2:15 PM CDT

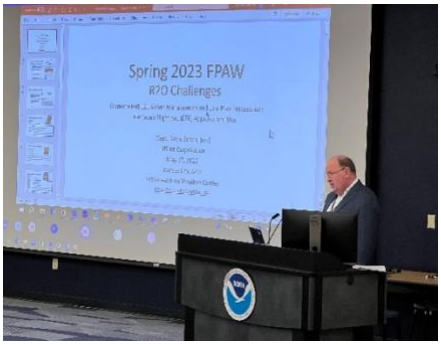
Session Co-Leads: Apoorva Bajaj (Climavision) and Danny Sims (FAA)

It is estimated that millions of dollars are spent annually in the U.S. on R2O and new product development efforts in the aviation weather enterprise. Given the size and diversity of the aviation weather enterprise, it is natural to ask how are we doing in our effectiveness in the R2O process? Are we seeing the expected return on investment? Are we organized as a community for success? This multi-part session focused on understanding the R2O process across the aviation weather enterprise, case studies, a perspective from another industry, and listening to end users.





Danny Sims provided an overview of the FAA to NWS R2O process for FAA-developed products to be maintained and operated by the NWS. Gordon Brooks (USAF), left, presented his perspective from one involved with several R2O projects over several years. Brandon Smith (FAA and USN Reserves) related lessons learned from U.S Navy meteorological efforts, including the need for connection with customers, a common theme in many of the presentations. Kevin Garrett (NWS) provided a remote presentation on R2O in the Unified Forecast System that is upgrading the NWS suite of numerical weather prediction models. This is a multi-year process that must look at impacts on downstream applications and consider the retirement of legacy capabilities. Shawn Miller (Raytheon), above right, presented three separate case studies of industry efforts supporting government projects. Existing users, new users, and unforeseen users must be considered. Retired commercial airline management and line pilot David Strand (MITRE), left, presented his perspectives including the lack of integration of weather information with navigation systems and vice versa, along with the nuances of integrating new technologies in the cockpit.



After lunch, Michael Splitt (Florida Institute of Technology), right, presented a perspective from a university engaged in FAA- and government-funded research efforts. He described the process by which universities identify basic and applied research challenges to address. Jim Evans (MIT Lincoln Laboratory) remotely presented a case study of microburst decision support, a successful R2O effort that included work with multiple locations and users, iterative processes, and real-time operational testing to achieve success.

Steps of the R2O process can be assumed to be no different than what takes place in any other industry or enterprise. To provide a perspective outside of aviation weather, Jose Guzman (FortMedTix MedTech Consultants LLC) gave a virtual presentation on lessons learned from the medical devices industry. Many parallels were demonstrated between the medical devices industry and aviation weather including the role of regulatory bodies, the importance of engaging stakeholders very early in the product development process and the move towards automation. Parallels were also drawn between the role of a surgeon planning and conducting an operation and a pilot planning and executing a mission. User involvement is an essential part of the process.

The last part of the R2O session was a panel comprised of Nathan Polderman (United Airlines), David Dillahunt (Southwest Airlines), Randy Bass (FAA), Eric Avila (NATCA), and William Bauman (MITRE). Each panel participant provided their thoughts that were gleaned from the various session presentations. There is a need to have better industry engagement, earlier user engagement, a better understanding of user needs before research is conducted, and effective feedback throughout the R2O process.

FPAW Planning Meeting

2:30 PM – 4:30 PM CDT

Session Co-Leads: Matt Fronzak (MITRE) and Matthias Steiner (NCAR)

The group discussed dates, locations and main session topics of the upcoming Fall 2023 and Spring 2024 FPAW meetings. The Fall 2023 meeting will take place on TUE-THU, November 14-16, 2023. However, due to construction at the original planned location, we have changed the location of this meeting to the DC area, at The MITRE Corporation in McLean, VA. Look for more information to be published on the FPAW web site in the coming weeks. For the Spring 2024 meeting, the week of April 29 through May 3, 2024, appears to be the most likely timeframe, with the location still to be determined.

The main session topics for the 2023 FPAW Fall meeting will include 1) *Climate Change and Aviation,* 2) *User Engagement in the Research to Operations Process,* and 3) *Review of Inputs to the FAA's Aviation Weather (ANG-C6) Portal*. In addition, we will have updates on prior/ongoing topics and FPAW organizational matters. In keeping with the last two meetings, we hope to be able to offer tours of the MITRE IDEA lab as part of the overall FPAW schedule.

A major theme emerging for the 2024 FPAW Spring meeting is *Aviation Weather Information Gaps,* divided into 1) *Perspectives from Legacy Operators* and 2) *Perspectives from Emerging Operators*. Another major theme will be centered around the *Wealth and Beneficial Use of Weather Data*. We are looking to identify a location that will make it easy to engage operators into the FPAW discussions.

FPAW Dinner

In a classic Monty Python "…and now for something new and completely different" move, we decided to organize and execute an FPAW dinner. Given the lack of recent precedent for this type of event, the process of putting it together was a bit, hmmm, adventuresome. However, everything turned out well.

At the end of the day, just shy of 40 FPAW participants gathered at the Granite City Food and Brewery in Zona Rosa. The restaurant graciously seated us in the private dining room, allowing

folks to get up and mingle without disturbing any of the other patrons. The food, and the service, were both very good, and the camaraderie and conversations even better, as shown below.







Thursday, May 18, 20232

Tours of the National Weather Service Aviation Weather Center

8:30 AM – 9:00 AM CDT, 9:00 AM – 9:30 AM CDT

Two 30-minute tours of the NWS AWC were conducted by AWC Warning Coordination Meteorologist and FPAW SC member Jennifer Stroozas. After an introductory presentation, participants were escorted to the AWC forecast floor, where they observed "aviation weather forecast sausage-making" in real time.

Plenary Meeting

Sessions 4a and 4b: "Aviation Weather Testbed Activity: User Engagement in the R2O Process," 9:30 AM – 2:00 PM CDT

Session Co-Leads: Stephanie Avey (NWS AWC) and Ian Johnson (FAA)

This session took advantage of the fact that the 2023 Aviation Weather Testbed (AWT) Summer Experiment and the FPAW Meeting were both taking place at the AWC at the same time. The overall goal was to get feedback from FPAW users on their understanding and the usability of various non-deterministic guidance-based products being evaluated and explored by the AWT.

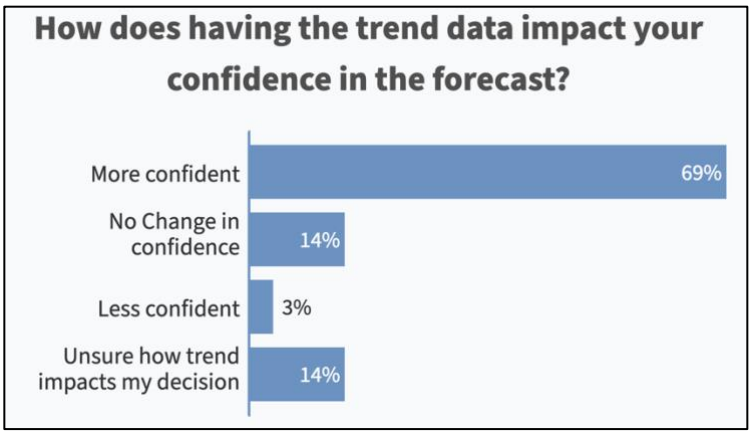
To begin the session, AWT co-lead Austin Cross (NWS AWC) gave an overview of recent AWT activities, including those that were ongoing concurrently with the May AWT Experiment. Chad Gravelle, NWS Southern Region and acting National Science and Operations Officer, then gave a presentation highlighting Forecasting a Continuation of Environmental Threats (FACETS) and the role probabilistic guidance plays in this NWS framework for future operations. In addition, Chad gave examples of how probabilistic guidance has been used to help message threats to aviation. The final talk of the morning was given by Craig Hartsough from the NOAA Global Systems Laboratory (GSL), who gave a brief update on the development of the Rapid Refresh Forecast System (RRFS), which is slated to replace the current suite of NOAA Convective Allowing Models (CAMs) in the Fall of 2024.

The remaining components of this session were interactive, utilizing a quick response polling system and group discussion with both in-person and online attendees. The AWT staff shared three different products and asked a variety of questions of the FPAW attendees to gauge their understanding, and get feedback on the usability, of the information presented. The FAA's Aviation Weather Demonstration and Evaluation (AWDE) team was also on hand to collect, organize and, ultimately, analyze the input from the FPAW participants.

The first product examined was the Aviation Winter Weather Dashboard, one of the few explicitly probabilistic products currently available from the Aviation Weather Center via its website at https://aviationweather.gov. The dashboard was primarily developed for TFM planning and to form a common operating picture for those working with the national Air Traffic Control Command Center, where it is still used today. The capability was evaluated as a general framework for evaluating the display and understanding of probabilistic forecast information.

FPAW participants generally agreed that dashboards are effective. Those in disagreement expressed desire to have more information readily available. Participants cited knowing whether the models are finding the same solution or converging upon it as indicating increasing

likelihood that the forecast is correct. They also noted that having trend information available increases confidence in the forecast (see graphic right).



Interpretations of some elements varied widely. One participant noted the value 50% of a specific icing intensity could be taken to mean the other 50% was either above or below that threshold. Others implied the meaning to be that specific intensity or less, thus simply lighter. Regardless, some operators require zero icing conditions.

The next session focused on graphics that had been developed by participants in the AWT earlier in the week, with a focus on how to present non-deterministic information to communicate potential aviation hazards beyond Day One. For this session, the virtual FPAW attendees were separated from those in-person but were given the same presentation and polling questions.

The various graphics messaged the probability of IFR conditions, severe turbulence, and icing, utilizing a variety of designs and accompanying text. While some graphics highlighted areas of probabilities (i.e., 40%, 70%) on a map, others used words (high, med, low) to convey the potential of the hazard occurring. One graphic provided forecaster confidence, while another portrayed "worst case" and "most likely" scenarios, utilizing ensemble data output.

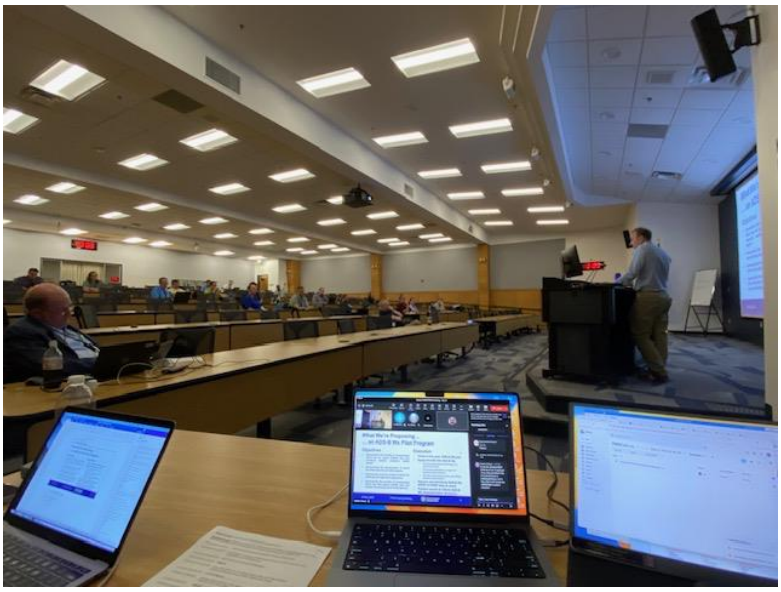
While the feedback is still being analyzed by the AWT team, a few major points are clear. Not all hazards can be treated the same. A 50% probability of icing is not the same as 50% potential for IFR conditions. Additionally, each user may have their own thresholds that will cause them to take action. When graphics use colors to discern probabilities, the colors need to be consistent across the entirety of the graphic. For example, if the graphic includes a map with drawn probability areas and a table with specific probability values, the colors need to match to alleviate any confusion.

The final interactive activity during the session examined prototype outlook graphics that were developed during the previous year's AWT Experiment. The overall intent of the outlook graphics was to provide a "quick glance" overview of what hazards are expected for Days One, Two, and Three, to provide more information in the extended range for general aviation fliers. The graphic contained representations of all potential impactful hazards across a 24-hour period, using polygons of various colors.

The overall consensus by the FPAW attendees was that a graphic like this would be of value to the GA community. However, it was noted that as presented the graphic looks a little cluttered. Similar to the current Graphical Forecasts for Aviation (GFA) products, a toggle capability to highlight specific hazards could alleviate this. When it came to what denoted a weather hazard of sufficient impact to include in the graphic, the audience agreed that the act of putting a polygon on the map implies a level of forecaster confidence of the hazard occurring. In addition, attendees believe that some accompanying information on timing, location, and confidence or uncertainty would be desired in a text format.

Session 5: "Review of Prior FPAW Topics," 2:15 PM – 3:15 PM CDT

Session Lead: Steve Darr (Dynamic Aerospace)



Steve Darr, right, opened the session with an update on the status of ADS-B Weather capabilities. Progress on this effort to date has been primarily due to "pushes" by a variety of institutions, such as the FAA, RTCA and EUROCAE. For these capabilities to become ubiquitous, however, Steve asserted that there is the need for "pull" by airspace users and their organizations. As such, he requested that the FPAW SC produce a white paper that includes a strong statement of support for ADS-B Weather.

Randy Bass (FAA) followed with an FAA Weather Community of Interest (Wx COI) update. After reviewing Wx COI activities that have taken place since the last FPAW meeting, he put out the idea of establishing a formal relationship between FPAW and the Wx COI, like the one that currently exists between the bi-annual Aeronautical Charting Meeting (ACM) and the FAA Aeronautical Information Products and Services (AIPS) COI. Several ways that this relationship might be executed were presented; the FPAW SC will take up this question at future meetings.

Session 6: "FPAW Organizational Update," 3:30 PM – 4:15 PM CDT

Session Co-Leads: Matt Fronzak (MITRE) and Matthias Steiner (NCAR)

The FPAW Co-Chairs brought the Spring 2023 FPAW Plenary meeting to a close with an FPAW organizational update. After a review of some historical background FPAW information, they went over the FPAW Steering Committee (SC).

Formed in late 2022, the FPAW SC is comprised of 15 members: four representing Aviation Weather Users, four representing the Aviation Weather Research, Engineering and Development (RED) and Academic community, three representing Aviation Weather Producers, two representing Aviation Weather Regulators and the FPAW Co-Chairs. The FPAW SC terms were explained, and upcoming (effective 10-1-23) FPAW SC openings were advertised. Note: at least three expressions of interest in those openings have already been received!

Finally, information concerning the role of the FPAW SC was shared, to include the development of position papers and representation of each of the four core Aviation Weather communities.