PEGASAS Project 4
General Aviation Weather Technology in the Cockpit (WTIC)
User Information Needs Assessment

2018 FPAW Meeting @ NBAA
Orlando, Oct 17 2018
1. Summary of WTIC info needs and past work
2. Connections to FPAW regarding usefulness of conclusions presented
3. Feedback regarding paths to implementation / dissemination

• Why we’re doing it
• What we’re doing
• Where we hope to end up
### Investigating Gaps

<table>
<thead>
<tr>
<th>GAP</th>
<th>Description</th>
<th>4A</th>
<th>4B</th>
<th>4C</th>
<th>4D</th>
<th>Status</th>
<th>Next Step</th>
<th>Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Lack of training/adequate instruction on weather information sources, procedures/displays in the range of available tools (including mobile devices and software applications), influence point interaction at hand, use of weather information in deteriorating weather conditions. (Source: Survey/Focus Groups)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>IN PROGRESS; CONTINUE TO PHASE 3 (internal)</td>
<td>REVISE FOR PHASE 3 (internal)</td>
<td>Despite classroom and on-air instruction, limited effect was seen on pilot decision making in adverse weather; new latency demonstrator may provide additional capability.</td>
</tr>
<tr>
<td>1</td>
<td>Lack of understanding of how FAR-authorized weather information sources, and processes/displays vary in the range of available tools (including mobile devices and software applications), influence point interaction at hand, use of weather information in deteriorating weather conditions. (Source: Survey/Focus Groups)</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>IN PROGRESS; CONTINUE TO PHASE 3 (internal)</td>
<td>NEW CAPABILITY TO CLOSE IN PHASE 3</td>
<td>Skills-based exposure needed, proposed WMU immersive decision task demonstration</td>
</tr>
<tr>
<td>2</td>
<td>There is a perceived gap in ability to use FAR-authorized weather information sources, and processes/displays in the range of available tools (including mobile devices and software applications), influence point interaction at hand, use of weather information in deteriorating weather conditions. (Source: Survey/Focus Groups)</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>IN PROGRESS; CONTINUE TO PHASE 3 (internal)</td>
<td>NEW CAPABILITY TO CLOSE IN PHASE 3</td>
<td>Skills-based exposure needed, proposed WMU immersive decision task demonstration</td>
</tr>
<tr>
<td>3</td>
<td>Lack of Situational Awareness related to VFR/UFR-IRC Weather. (Source: Survey/Focus Groups)</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>UNABLE TO CLOSE</td>
<td>UNABLE TO CLOSE</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Lack of Situational Awareness related to VFR/UFR-IRC Weather. (Source: Survey/Focus Groups)</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>UNABLE TO CLOSE</td>
<td>UNABLE TO CLOSE</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Lack of ability of pilots to correlate, interpret, and apply weather information related to VFR/UFR-IRC Weather. (Source: Survey/Focus Groups)</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>IN PROGRESS; CONTINUE TO PHASE 3 (internal)</td>
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<tr>
<td>6</td>
<td>Lack of ability of pilots to correlate, interpret, and apply weather information related to VFR/UFR-IRC Weather. (Source: Survey/Focus Groups)</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>IN PROGRESS; CONTINUE TO PHASE 3 (internal)</td>
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<td>7</td>
<td>Lack of ability of pilots to correlate, interpret, and apply weather information related to VFR/UFR-IRC Weather. (Source: Survey/Focus Groups)</td>
<td>X</td>
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<td></td>
<td>IN PROGRESS; CONTINUE TO PHASE 3 (internal)</td>
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<tr>
<td>8</td>
<td>Lack of ability of pilots to correlate, interpret, and apply weather information related to VFR/UFR-IRC Weather. (Source: Survey/Focus Groups)</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>IN PROGRESS; CONTINUE TO PHASE 3 (internal)</td>
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<td>9</td>
<td>Lack of ability of pilots to correlate, interpret, and apply weather information related to VFR/UFR-IRC Weather. (Source: Survey/Focus Groups)</td>
<td>X</td>
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<tr>
<td>10</td>
<td>Lack of ability of pilots to correlate, interpret, and apply weather information related to VFR/UFR-IRC Weather. (Source: Survey/Focus Groups)</td>
<td>X</td>
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<tr>
<td>11</td>
<td>Lack of ability of pilots to correlate, interpret, and apply weather information related to VFR/UFR-IRC Weather. (Source: Survey/Focus Groups)</td>
<td>X</td>
<td>X</td>
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</tbody>
</table>

**Notes:**
- **4A, 4B, 4C, 4D:** Levels of information availability and use.
- **Status:** Progress and next steps.
- **Finding:** Highlights of findings and potential solutions.
**Gaps Investigation and Resolution**

<table>
<thead>
<tr>
<th>GAP</th>
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<th>Status</th>
<th>Next Step?</th>
<th>Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>There is a limited understanding of how FAA-authorized weather information sources, as presented/displayed in a range of available modes (including mobile devices and software applications), influence pilots interaction with and usage of weather information to detect weather conditions.</td>
<td>X</td>
<td></td>
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<tr>
<td>1</td>
<td>GA pilots often do not understand the limitations of the technology in the cockpit.  (Source: Survey/Focus Groups)</td>
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<tr>
<td>2</td>
<td>There is a perceived gap in skills related to VFR--into--IMC decision-- making.  (Source: Survey/Focus Groups)</td>
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<tr>
<td>3</td>
<td>Lack of Situational Awareness relating to VFR--into--IMC.  (Source: Survey/Focus Groups).</td>
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<tr>
<td>4</td>
<td>Retention of weather knowledge was identified as a gap.  (Sources: Survey/Focus Groups).</td>
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<tr>
<td>5</td>
<td>Lack of ability of pilots to correlate, interpret, and apply weather information related to VFR--into--IMC Web Factors, specifically convective, icy, snow, and turbulence.  (Source: Survey/Focus Groups).</td>
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<tr>
<td>6</td>
<td>Existing pilot training activities do not provide pilots with adequate exposure to the impact of adverse weather events, information latency, or information resolution on the hazards of flying VFR--into--IMC or adverse weather conditions.  (Source: Survey/Focus Groups).</td>
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<tr>
<td>7</td>
<td>Existing pilot training activities do not sufficiently develop or improve KSAs regarding adverse weather events, information latency, or information resolution on the hazards of flying VFR--into--IMC or adverse weather conditions.  (Source: Survey/Focus Groups).</td>
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<tr>
<td>8</td>
<td>No specific guidance on weather knowledge assessment in Flight Review FAR 91.55.  (Source: Survey/Focus Groups).</td>
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</tbody>
</table>

**Summary**

- GA pilots often do not understand the limitations of the technology in the cockpit.
- There is a perceived gap in skills related to VFR--into--IMC decision-- making.
- Lack of Situational Awareness relating to VFR--into--IMC.
- Retention of weather knowledge was identified as a gap.
- Existing pilot training activities do not provide pilots with adequate exposure to the impact of adverse weather events, information latency, or information resolution on the hazards of flying VFR--into--IMC or adverse weather conditions.
WTIC Info Needs Assessment

• Needs Assessment and Translation
  – The PEGASAS WTIC team has been generating lots of different types of information for dissemination to the GA public
    • GA pilots
    • Flight instructors
    • Aviation researchers
    • Human performance / human factors researchers

• What Do You Need, and How?
  – Types of information
  – Organization (card sort)
4.2 Long-term retention of immersive skills experiential education
4.4. Develop and evaluate augmented reality tools to improve weather information presentation.
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*WeatherXplore*
4.6. Explore and assess capability of automated PIREP generation / reporting tools in GA flight
Project 4 – Task Area 4.7

WHY:
To facilitate transfer of research outcomes to industry / practice.

Project Area 4.7: Design information architecture and permissions for Project 4 HUB data repository.
WTIC Info Needs Assessment

• Qualtrics Survey: We Want YOUR Feedback
  – What is your (primary) role in GA?
  – What Wx Products do you want, and what are your goals for having them?
    – We have several types of products: how would you organize them?
    – What would you call those groupings?

• https://purdue.ca1.qualtrics.com/jfe/form/SV_2sO0ms48md
  GJJ7T
INDUSTRY PARTNERS WELCOME

• New efforts with Webmanuals.aero, and other potential partners to transfer information repository architecture responsibility, funding, and/or development to industry partners for maintenance beyond PEGASAS.

• Outline of sponsorship opportunities, press releases and other outreach information for increasing partnerships. Presentation at AOPA (Oct 10) and NAFI (TBD).

• “Deeper” incorporation with Mindstar Aviation LLC and others into EAA’s Pilot Proficiency Center and EAA partnerships beyond AirVenture and other airshows (i.e. latency features developed into simulator software, etc.)

• Ongoing Partnerships
  – FAA Alaska
  – AOPA HQ
  – Mindstar Aviation
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BSCaldwell@Purdue.edu

Much appreciation to PEGASAS/WTIC leads:

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• Ian Johnson (FAA HF Lead, WTIC Program)
  – Ian.Johnson@FAA.gov

• William Crossley (PEGASAS Director)
  – Crossley@Purdue.edu
What is PEGASAS?

• A FAA Center of Excellence: Partnership to Enhance General Aviation Safety, Accessibility, and Sustainability (PEGASAS)

• Mission: To enhance general aviation safety, accessibility, and sustainability by partnering the FAA with a national network of world-class researchers, educators and industry leaders.

• [www.PEGASAS.aero](http://www.PEGASAS.aero)
FAA Technical Points of Contact (POC)
• Ian Johnson, HF Lead
• Gary Pokodner, WTIC Program Mgr

Research Team
• **Purdue University:** Drs. Barrett Caldwell, Mary Johnson and Brandon Pitts, PhD students Megan Nyre-Yu, Chenyu Huang, Gaojian Huang, Yue Gu, Yilin Feng and Xun Zhao, and contractor Prof. Mel Futrell of Glendale College
• **The Ohio State University:** Prof. Seth Young, Shawn Pruchnicki, and Dr. Arjun Rao
• **Texas A&M University:** Dr. Thomas Ferris, and PhD students Trey Roady, Carolina Rodriguez Paras, and Johnathan McKenzie
• **Western Michigan University:** Dr. Geoff Whitehurst; Prof. Lori Brown, Dr. William Rantz, and Dominic Nicolai