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Aviation Weather Products in General Aviation: Interpretability and Usability Research Trends

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Aviation Weather Products in General Aviation: Interpretability and Usability Research Trends

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Presentation given at the 21st International Conference on Human-Computer Interaction, Orlando, Florida, July 2019
Agenda

- Introduction
- Current Study
- Trends
- Summary
- Conclusion

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Introduction

- General Aviation (GA) pilots have access to a wealth of aviation weather information
  - Pre-flight weather planning
  - In-cockpit weather displays
- Limited research addressing the interpretability of these weather displays
Current Study

• Study conducted by Blickensderfer et al. (2018) tested pilots' aviation weather knowledge and product interpretability
  • 5 separate tests with different products were distributed to the AOPA
  • 837 pilots fully completed the tests

• Trends found in this study will be presented
Trend 1
Flight experience has a limited effect on GA pilots' ability to interpret weather displays

- Student and private pilots scored lowest
- More experienced pilots still scored lower than 80% on average
- Weather product learnability may be low

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Trend 1
Flight experience has a limited effect on GA pilots' ability to interpret weather displays.

Average Weather Product Interpretability Score

- Private: 64.7, 65%
- Private with Instrument: 67.3, 67%
- Commercial: 70, 70%
- CFI: 72.7, 73%
- ATP: 72.6, 73%
- 80%

Commercial, CFI, and ATP pilots all held instrument ratings.

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Trend 2

GA pilots do not understand Weather Radar displays

- Pilots exhibit more hazardous behavior while using enhanced radar displays (Beringer and Ball, 2004)

- Radar display questions had some of the lowest performance scores

- May provide insight into VFR to IMC incidents

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Trend 2

GA pilots do not understand Weather Radar displays

Radar Interpretability Scores

- Private: 54%
- Private with Instrument: 61%
- Commercial: 67%
- CFI: 66.5%
- ATP: 61%

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Trend 3

Some categories of aviation weather products yielded higher scores than others

- Winds Aloft scores were high (m = 86%)
- Many scores were low:
  - Satellite (m = 58%)
  - TAF (m = 57%)
  - METAR (m = 55%)
  - Station Plots (m = 39%)

- Many of these low scoring products are featured in new overlay displays

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Trend 3
Some categories of aviation weather products yielded higher scores than others

Comparison of Interpretability Scores

<table>
<thead>
<tr>
<th>Category</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winds Aloft</td>
<td>85.5</td>
</tr>
<tr>
<td>TAF</td>
<td>56.9</td>
</tr>
<tr>
<td>Satellite</td>
<td>58.1</td>
</tr>
<tr>
<td>METAR</td>
<td>54.5</td>
</tr>
<tr>
<td>Station Plot</td>
<td>39</td>
</tr>
</tbody>
</table>

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Trend 4

The interpretability scores align with results from external usability assessments

- Remy (2017) used a modified System Usability Scale to evaluate the Aviation Weather Center website

- Usability scores in this study trended in the same direction as interpretability scores from Blickensderfer et. al (2017) study

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Trend 4
The interpretability scores align with results from external usability assessments
Summary

Trends reveal the following:

1. Flight experience has a limited effect on interpretability
2. Pilots do not understand Weather Radar displays
3. Some categories of aviation weather products yielded higher scores
4. Interpretation scores align with external usability assessments
Conclusion

Pilots struggle to interpret aviation weather displays

- Can lead to inadequate understanding of current and forecasted weather
- GA flights that encounter hazardous weather typically end in fatalities

Imperative that new displays are created with the user at the forefront

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Thank You!
References

Beringer, D. B., & Ball, J. D. (2004). *The effects of NEXRAD graphical data resolution and direct weather viewing on pilots' judgments of weather severity and their willingness to continue a flight* (No. DOT/FAA/AM-04/5). FEDERAL AVIATION ADMINISTRATION OKLAHOMA CITY OK CIVIL AEROMEDICAL INST.
