PEGASAS Project 4: General Aviation Weather Technology in the Cockpit (WTIC) Phase II Coordination

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• Team 4A – Quantify Causality
  – Expand accident/incident causal research
• Team 4B – Inadvertent Flight from Visual Flight Rules (VFR) to Instrument Meteorological Conditions (IMC)
  – Address unexpected transitions from VFR to IMC
• Team 4C – GA Weather Alerting
  – Assess feasibility and benefits of agile, low latency cockpit weather alerts
• Team 4D – GA MET Information Optimization
  – Evaluate utility of selected MET products to support pilot decision making
Phase I → II - New Emphases for 2015

• Phase I and Comment Matrix Revelations
  – GAP RESOLUTION!
• GAP: Identifiable “delta” between desired and actual that our activities are intended to resolve
  – How was this GAP identified / Why is this a GAP?
  – What is causing this GAP?
  – What are you doing to resolve (“close”) this GAP?
  – How / when are you going to “close” this GAP?
• Recognition of FAA WTIC Use of Project 4 Results
Out the Window vs On the Screen

Credit: Shawn Pruchnicki, Team 4A
Out the Window vs On the Screen

Credit: Shawn Pruchnicki, Team 4A
Identified Gaps for Phase II Work

Affecting Pilot SA and Thought → Decision → Plan → Action Links

- Knowledge Gaps
  - Acquisition through Skill / Training
- Skill Gaps
  - Application of Knowledge through Training and experience
- Ability Gaps
  - Natural or acquired ability to perform Skills
- Training Gaps
  - structured activities to inform, instill, and enhance KSA
Identified Gaps for Phase II Work

Affecting Pilot SA and Thought → Decision → Plan → Action Links

• Assessment Gaps
  – Formal evaluations to determine current capabilities in KSA areas

• Technology Gaps
  – Available software or hardware tools to support actual flight or training activities, including pilot KSA

• Information Presentation Gaps
  – Capability of available software or hardware tools to provide information suitable to enhance or expand pilot KSA during flight
Training Scenarios for Cockpit Weather Technologies

1. Decision Making (VFR cross-country – experienced pilot)
2. Convective weather avoidance (IFR cross-country)
3. Using weather sources not intended for aviation (VFR local – student pilot)
4. Risk taking (VFR cross-country – inexperienced pilot)
5. Wind Conditions (VFR cross-country – pilot recently transitioned to new aircraft)
6. Icing Conditions (IFR cross-country – unplanned flight into icing conditions)
7. Turbulence Encounter (VFR cross-country – clear air turbulence)
8. Distraction using WX system (VFR local flight)
Lesson 2: Convective Weather Avoidance

Relying solely on cockpit weather technologies to avoid areas of convective weather or extreme precipitation.

Synopsis:
- Pilot departs on an IFR cross country flight with thunderstorms along the route.
- The pilot sees a gap in the weather using cockpit weather, and requests a heading. ATC advises that the requested heading does not appear to avoid the weather. Finally the pilot’s radar image updates and he no longer sees the gap that was present 7 minutes ago.
- The aircraft still encounters severe turbulence and heavy precipitation.

Lessons:
- Cockpit based weather is different than on-board weather radar. The time between updates can create a misleading picture of the weather situation.
- ATC can be helpful in weather avoidance. Pilots with cockpit weather should avoid any areas with thunderstorms they cannot visually avoid.
Lesson 2: Convective Weather Avoidance

South Bend International Airport

KSBN 121753Z 25015G22KT 10SM SCT075 OVC085 17/01 A2983

Muskegon County Airport

KMKG 121754Z 32010KT 10SM FEW026 SCT055 BKN080 11/02 A2898
Summer 2015 Research Integration at WJHTC

- Participation by Purdue, TAMU, WMU Team Members
- Technology “Shakedowns”; two weeks of data collection
  - Volunteer GA pilot participants
  - Tests of education and training modules; vibrating alerts; alerting modes
  - Realistic scenarios (real events): AK (Juneau-Skagway); NM (Santa Fe-Albuquerque)
- Data analysis still underway: initial indicators…
  - Possible age and experience effects
  - Technology familiarity vs. integration in pilot tasks and decisions
  - Feasibility of vibrating bands in cockpit?
Summer 2015 Research Integration at WJHTC
Developing a Controllable Latency Training Device / Demo

- Looping “NEXRAD” with 5-20 minute delays in display
- No commercially available ATD displays realistic weather information delays
- WMU initial prototype development
- PU replication / enhancement
- Experimenter / Instructor controllable delays
  - Out the window is “current”
  - Radar display has latency
- Feasible for under $5000 with multiple scenarios
Developing a Controllable Latency Training Device / Demo
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Prepar3D images at 11500ft. The WX image is delayed and shows no cloud cover. The out-the-window shows two distinct layers of clouds.
Additional Developments and Opportunities

• Data collection and collaboration with Frasca International
  – Additional partnering with industry: DeLorme, Foreflight, Lockheed Martin, etc.
• Training scenarios for broader dissemination
• Possible 2016 efforts
  – Workshops and engagement (Sun N Fun, AirVenture)
  – Additional GAP resolution based on results and review
  – Implementation of additional scenarios in latency training
• Your input here?
Conclusion

• Phase II activity focusing on resolving multiple Gap areas
• Sentinel scenario issues, new training device capabilities
• Research at FAA (WJHTC), partnering with Frasca and others
• Looking towards additional Gap resolution in 2016

Any Questions?