An Introduction to PEGASAS, the FAA Center of Excellence for General Aviation

Presented by
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Goals for this Introduction

- A quick summary of PEGASAS – the Partnership to Enhance General Aviation Safety, Accessibility and Sustainability
  - Introduce concept of FAA Centers of Excellence
  - Give a better idea about our team and collaborators
  - Overview of research effort and size of COE
  - Big-picture view of selected projects

- Discuss opportunities for partnership
  - Opportunities to interact with PEGASAS
  - Thoughts about partnerships for PEGASAS in on-demand mobility domain
• Legislation from Congress allows the FAA to establish Centers of Excellence (COEs)
  – Generally, a consortium / partnership of several universities
  – Partnership between FAA and University consortiums that have a duration of 10 years
• “The Administrator of the FAA may make grants…”, “Government’s share of costs…”
  – Provide a unique funding combination
  – Cooperative Agreements (grants)
    • Matching requirement ($1 FAA : $1 non federal)
    • Substantial involvement by FAA
  – IDIQ Contract (can be added by FAA Program Office)
• Once COE is awarded, the competition is over
  – Allows PEGASAS to be an efficient “tool” available to FAA researchers
  – Allows PEGASAS project proposals to be crafted via iteration with FAA
    • Often multi-university teams
    • In some cases, industry and organizational partners involved
• Research requirements and funding from FAA technical organizations
  – Aviation Research Division is PEGASAS sponsor
  – Any organization in the FAA can use PEGASAS
• PEGASAS FAA program manager has zero defined budget for GA research
  – Coordinates any part of FAA with defined research requirements
  – Predominantly from Aviation Research Division
• PEGASAS not just for FAA
  – Can use our pre-existing relationships and expertise to perform research for NASA, companies, etc.
Quick Overview of PEGASAS
PEGASAS Vision in Three Themes

- **Safety**
  - Clearly, the most important theme for the Center of Excellence for General Aviation
  - Reduce the risk of injury or death to general aviation pilots, passengers and property

- **Accessibility**
  - Ensure general aviation is within reach of its users
  - Enable versatile and readily usable general aviation system - access for corporate, fractional operators as well as operators of Light Sport Aircraft

- **Sustainability**
  - Allow general aviation to serve the needs of future stakeholders
  - Continue providing societal benefits from general aviation
CORE UNIVERSITIES

- Purdue University
- The Ohio State University
- Georgia Institute of Technology
- Iowa State University
- Florida Institute of Technology
- Texas A&M University

AFFILIATE UNIVERSITIES

- Arizona State; Florida A&M; Hampton; Kent State; North Carolina A&T; Oklahoma State; Southern Illinois University, Carbondale; Tufts; University of Minnesota, Duluth; Western Michigan
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## Industry and Organizational Partners (as of Aug 2015)

<table>
<thead>
<tr>
<th>Category</th>
<th>Partner</th>
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<tbody>
<tr>
<td><strong>Industry</strong></td>
<td></td>
</tr>
<tr>
<td>Airframe</td>
<td>Cessna, Cirrus, Embraer, Gulfstream, Piper, Sikorsky</td>
</tr>
<tr>
<td>Propulsion</td>
<td>Continental Motors, GE Aviation, Rolls-Royce</td>
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<tr>
<td>Operators</td>
<td>Jet Aviva, NetJets</td>
</tr>
<tr>
<td>Flight Training Devices / Simulators</td>
<td>Frasca International</td>
</tr>
<tr>
<td>Aircraft / Aviation Systems</td>
<td>Alpha Systems AOA, Avidyne, CAPACG, Guardian Mobility, Harris Corporation, Raytheon, Rockwell Collins, Spirit Avionics</td>
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<tr>
<td><strong>Airports</strong></td>
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<tr>
<td>Operators</td>
<td>Columbus Regional Airports, South Bend Airport, Fort Wayne Airport, Kelly Field / Port San Antonio, Huntingburg Airport</td>
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<tr>
<td>Pavements</td>
<td>Indiana Chapter - American Concrete Pavement Association</td>
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<tr>
<td><strong>Government Agencies</strong></td>
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<td>Florida, Georgia, Indiana and Iowa Departments of Transportation, NASA Flight Deck Display Research Laboratory</td>
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<td><strong>Stakeholder Organizations</strong></td>
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<td>General Aviation Manufacturers Association (GAMA), Helicopter Association International (HAI), Take Flight Solutions, National Business Aviation Association (NBAA), National Intercollegiate Flying Association (NIFA), Ohio Aerospace Institute (OAI), Society of Aviation and Flight Educators (SAFE)</td>
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Research: Aircraft, Airports and Labs; Summary of COE Effort
• Core universities own nearly 90 aircraft
  – Many with glass cockpits, data recording
  – Turbine and IC; single and twin engine
  – Experimental aircraft available
  – Many affiliates have additional aircraft

• A broad spectrum of lab facilities
  – Flight training devices and simulators
  – Non-Destructive Evaluation (NDE)
  – Communication, navigation & surveillance
  – Human factors facilities
  – Pavement research labs
  – Engine test facilities
  – Fuels characterization and testing
  – Wind tunnels
  – Icing facilities
  – Many others...

• Three PEGASAS core universities own and operate an airport
  – Ohio State University (KOSU)
  – Purdue University (KLAF)
  – College Station / Easterwood Field (CLL)
Seventeen research projects awarded as of early Sep 2015
  – Aviation Research Division
    • Airport Technology R&D Branch
    • Software & Systems Branch
  – NextGen
    • Weather
$10.98 million FAA funds awarded for research, prototypes and services
  – $8.17 million via amendments to cooperative agreement
  – $2.81 million via IDIQ contract
Additional $8.17 million matching provided from non-federal sources on cooperative agreements
• Project 3: Angle of Attack Equipment in General Aviation Operations
  – Team: Purdue, Ohio State, Florida Tech
  – PEGASAS POC: Brian Dillman, Purdue
  – Aug 2013 start, Mar 2015 end
  – Proposed focus areas / tasks:
    • Analysis of best practices and development of educational materials
    • Attitude awareness enhancement
    • Stabilized approach analysis (main thrust of project)
  – In-kind contributions from AlphaSystems and CAPACG
Research Projects

• Project 4: Weather Technology in the Cockpit (WTIC)
  – Team: Texas A&M, Ohio State, Purdue (with subcontracts to affiliates Western Michigan, Southern Illinois, Kent State)
  – PEGASAS POC: Barrett Caldwell, Purdue
  – Jan 2014 start; now in Phase II

  — Effectively a “program” with four major, coordinated research topics
  • Quantify Causality
  • Transition from VFR to IMC
  • General Aviation Weather Alerting
  • General Aviation MET Information Optimization
• Project 5: National General Aviation Flight Information Database (NGAFID)
  – Team: Purdue, Georgia Tech, Ohio State
  – PEGASAS POC: Karen Marais, Purdue
  – Jan 2014 start; Phase II underway
  – Focus areas / Tasks:
    • Exceedence and aircraft performance modeling
    • Algorithms to predict “safety events”
    • Use case concepts for pilots
• Project 16: Characterization of Derived Angle of Attack and Flight Path Angle Algorithms
  – Team: Texas A&M, Ohio State
  – PEGASAS POC: John Valasek, Texas A&M
  – Awarded Aug 2015
  – Focus areas / Tasks:
    • Characterize limitations and uncertainties in derived AOA methods
    • Incorporate AHRS in a hardware-in-the-loop simulation
    • Potential comparison to sensed AOA measurements

Aspen Avionics AOA indicator in Evolution Flight Display System as an illustration
http://www.aspenavionics.com/assets/img/site/AOA_TOP.png

GRT Avionics derived AOA display on Horizon HX as illustration
http://www.grtavionics.com/wpimages/wp98c70ce5_06.png
Opportunities for Interaction with PEGASAS

• For FAA supported research, contact Pete Sparacino (peter.sparacino@faa.gov) at WJH Tech Center
• For other research-supporting organizations, contact Bill Crossley (crossley@purdue.edu), or any of the site directors (see slide 8)
• PEGASAS Annual Meeting
  – One day conference like presentations of projects, interaction with FAA technical monitors and sponsors, industry partners
  – 2016 Annual Meeting – planned for late May / early June at Iowa State University
  – Previous annual meeting presentations available online: https://www.pegasas.aero/meetings.php
• PEGASAS facilitated workshops
  – PEGASAS researchers discuss future research needs / topics with FAA
  – Help prompt thinking about future requirements, expand upon or add depth to efforts supporting current requirements
Thoughts about PEGASAS partnerships in the On-Demand Mobility domain

• PEGASAS provides an efficient research tool to FAA
  – Engagement mechanisms with FAA already in place
  – PEGASAS universities provide excellent capabilities in aviation and in engineering

• Potential for “transition research” for On-Demand Mobility
  – PEGASAS researchers could pursue technology maturation efforts in support of NASA
  – PEGASAS researchers could pursue technology assessment efforts in support of FAA certification framework
  – Lessons learned and expertise could facilitate transition between two types of efforts

• We want to make General Aviation safer, accessible and sustainable
www.pegasas.aero

Contains project summaries, news, and other information