Using Electronic Flight Data to Enhance Safety in General Aviation

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Introduction

- Jim Higgins
- University of North Dakota
  - Operate over 120 aircraft
  - Accumulate over 115,000 flight hours annually
  - Over 1,500 flight students and 175 instructors

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Safety Programs in Place at UND

- SMS program is classified as “Active Participant”
  - Formerly known as Level 3
  - Scheduled for advancement to “Active Conformance” (level 4) end of October, 2015
- Includes a Safety Reporting and a Flight Data Monitoring (FDM) program

What is Flight Data Monitoring (FDM)?

1. The systematic collection of data from onboard flight recording devices
2. The aggregation of all data into a central data repository
3. The rigorous analysis of the data to proactively identify hazards currently undetected
4. The adaption of policies and/or procedures to mitigate or eliminate the risks of all identified hazards

- Flight data can be used to answer specific safety questions
  - Examples
    - Turn-to-Final (TTF) Analysis with and without AoA
    - Stabilized approach with and without vertical guidance
    - Duration of safety mitigations

The data we analyzed…

- 11,324 TTFs and Approach Paths (over 100,000 available)
- 63 different aircraft (Cessna 172s)
- 8 airports and 20 different runways
  - Long (over 7,500’), Short (Under 3,000’)
  - With and without IAPs
  - With and without VASIs/PAPIs
  - With and without ATC
  - Various markings

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Turn To Final (TTF) Analysis Tool

- The following data was collected from the start of TTF to the completion and alignment with the landing runway:

Airport/Runway	Date
OAT	Time
Light Conditions	Turn Direction
Time in Turn	Altitude*
IAS*	VSI*
Pitch*	Roll*
RPM*	Gs

*Start, Stop, Max and Min

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Angle of Attack (AoA) Analysis

- UND has equipped three of its aircraft with different AoA systems
  - BendixKing KLR 10 – Installed March 18, 2014
  - Safe Flight SCx – Installed April 17, 2014
  - Garmin GI 260 – Installed May 28, 2014

After AoA systems were installed, the aircraft were flown differently

- During the TTF, AoA-equipped aircraft dropped the nose about .7° more than when it was not AoA-equipped
- The AoA-equipped aircraft also experienced a wider G envelope than non AoA-equipped aircraft
- Training curricula and best practices need to be identified

Dynamic Approach Analysis (DAA) Tool

- The following data was collected from 200 feet AGL to 4 seconds prior to touchdown at 1 Hz:

Airport/Runway	Date
OAT	Time
Light Conditions	Time spent on final
HAT Differential*	IAS Differential*
Cross Track Error*	Wind Component*

*Mean, Max, and Min

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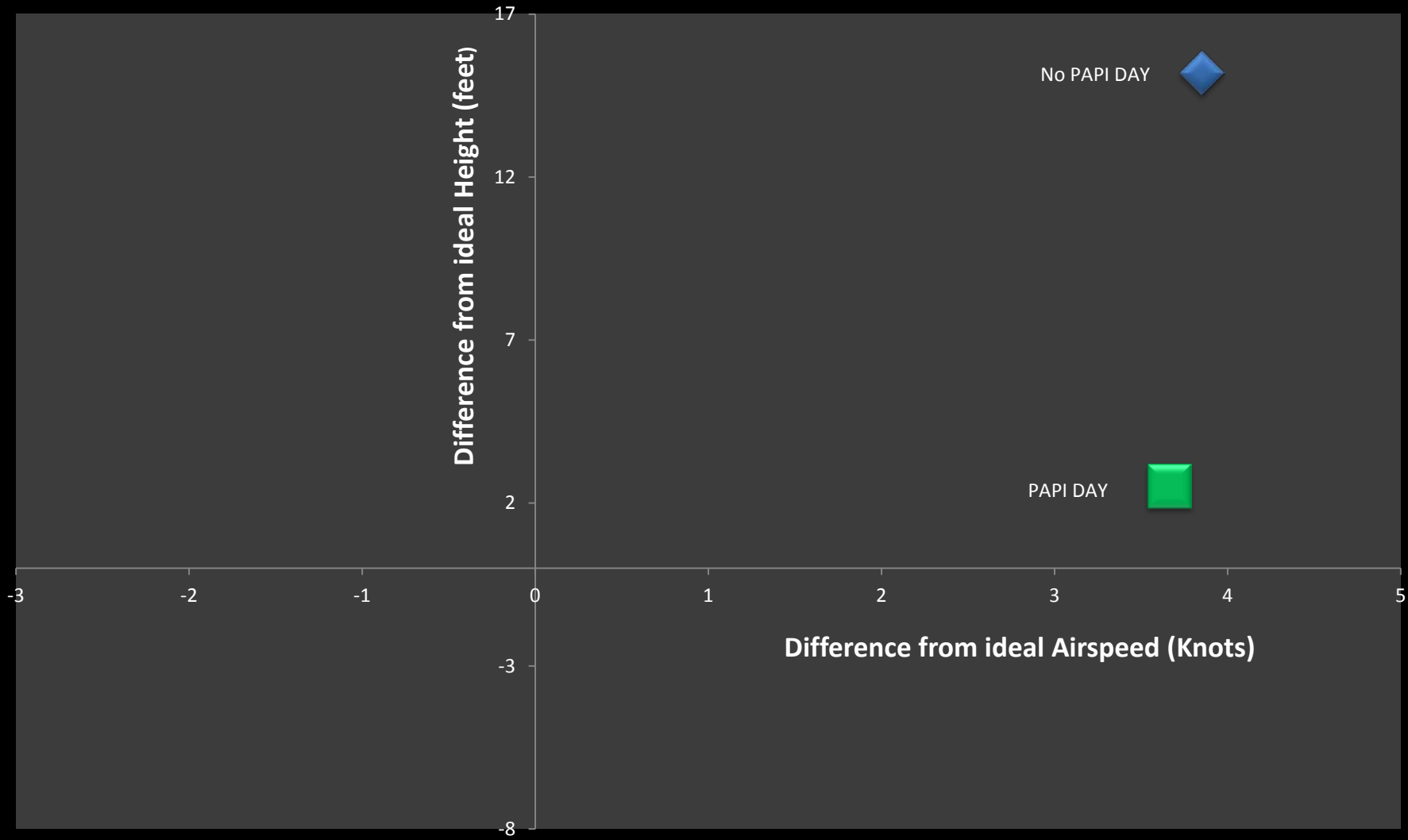
Stabilized Approach With and Without PAPI Guidance -- Day Conditions (n=610)



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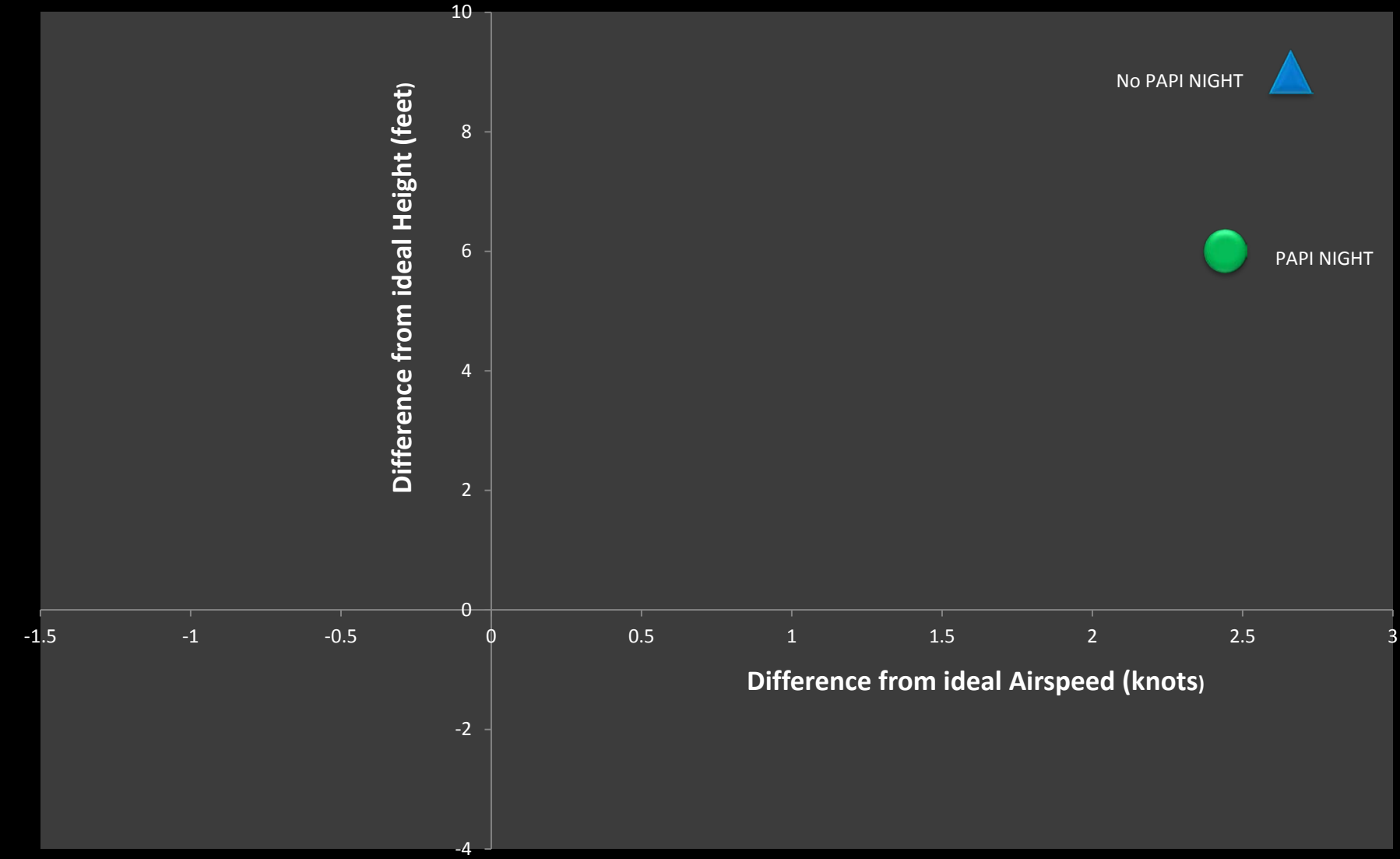
Stabilized Approach With and Without PAPI Guidance -- Night Conditions (n=705)



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Future Projects

- Overshoot TTF analysis
- Time-Before-Solo project

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