Approach Stability from FDM Data

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Introduction

The Embry-Riddle Aeronautical University Prescott campus maintains a fleet of twenty aircraft, with a Cessna 172S and four Diamond DA42s, which are all equipped with flight data monitoring (FDM) capability. The data can be used to detect and assess deviations compared with company operational guidelines, providing a means for identifying operational deviations with an emphasis on safety and adherence to established policies and regulations to improve safety. These deviations are characterized by deviations in pitch, airspeed, and all parameters by the FDM system during flight.

Hypotheses

1. Approach not meeting the 95% condition requirements results in a go-around in 50% of the occurrences.
2. Approach not meeting the 95% condition requirement is not as frequent during the day as during the night.
3. Approaches conducted at a different airport than the pilot’s home base (PRC) are not as frequent during the day as compared to at PRC.

Method

System

- Flight data was recorded on an SD card within the multi-function display of the Garmin G1000 system.
- Capable of recording 64 parameters at a 1 Hz frequency.
- Data is extracted from the multi-function display at intervals employing every two weeks at night time.

- Analyzed by software that has been developed by Garrett at Embry Riddle Aeronautical University.

Definition of Stable Approach

- The ERMU Flight Operations Manual defines the stability of an approach with regards to:
  - Constant final approach path attitude
  - Airplane trimmed to maintain final approach path attitude
  - Airspeed within 5% of approach airspeed (CAS)
  - Landing distance not exceeded
  - Airplane on proper approach path to desired aiming point
  - Approach properly aligned with runway centerline

- For stability of the approach, deviations must be less than 100 ft above the ground.

- Project Details

  - Data encompasses all of the Prescott campus’ Cessna 172S New Flight hours between August 1, 2011, and December 31, 2013.
  - Approximately 2055 flight hours, and 15,000 landings were recorded during the period evaluated.
  - The airports not included in the study were used because of the frequency of Prescott training flights that fly to or at the airports. Included are PRC, PSE, KJW, EAC, FLG, KJW, KKL, KJW, and KFL.

Conclusions

1. Hypothesis 1 is not statistically significant. Of the flights that were determined to be unstable, approximately 30% went around and approximately 70% continued to a landing.
2. Hypothesis 2 may be true. During the day, unstable approaches are more frequent than unstable approaches. At night, the frequency of stable and unstable approaches are approximately equal.
3. Hypothesis 3 was not statistically significant. At an airport other than PRC, a stable approach is more frequent than an unstable approach. The deviation between an approach to PRC and an approach to another airport is no more than 5%.

Findings, Problems, and Future Directions

- Approximately 22% of approaches were unstable, and unstable had more than one cause for the deviation. Approximately 5% of unstable approaches were related to pitch. There are airlines that do not train to control the pitch, and this might have a correlation to the unstable approach. There should be a concern for this type of approach, and more attention should be given to this type of approach.
- Approximately 22% of unstable approaches were related to airspeed. Airspeed might have caused a stable approach to be measured as an unstable approach because control over the elevator might not be achieved. The elevator might not be measured as it should be by the technician. Further research into this would be beneficial.
- A future extension of this project could correct speed calculations for wind and atmospherically disturbed winds. Another factor to consider adding is the level of combined instructor/student experience.