Approach Stability from FDM Data

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Introduction

The Embry-Riddle Aeronautical University Prescott campus maintains a fleet of ten aircraft, which are used in the RT-222 and two Isso, T-133s, which are all equipped with flight data recording (FDR) capability. The data can be used to detect and analyze deviations from company operational policies, procedures, and regulations. It is available to operations with an emphasis on safety and to crashes and other incidents that require any analysis. The data can be accessed by authorized personnel and all parameters by the FDR system have access.

Hypotheses

1. Approaches not meeting the SI criteria are more deviations within 50% of the deviations.
2. Approaches that landed at night are not as frequently stable as those evaluated during the day.
3. Approaches evaluated at a different airport than the pilot's home base (PRC) are not as frequently stable as those evaluated at PRC.

Method

System

- Flight data is recorded on an SD card within the multi-function display (MFD) of the Garmin G1000 system.
- Capable of recording 64 parameters at a 2 Hz frequency.
- Data is extracted from the multi-function display at intervals corresponding to two weeks at eight time.
- Analyzed by software that has been developed by Garrett at Embry-Riddle Aeronautical University.

Definition of Stable Approach:

- The FAA Flight Operations Manual defines the stability of an approach with regard to:
  - Constant final approach path attitude
  - Airplane trimmed to maintain final approach path attitude
  - Airspeed within 5% of approach speed
  - Swing
  - Landing configuration standard
  - Airplane on proper approach path to descend, lining up, point
  - Airplane properly aligned with runway centerline

- The stability of the approach is determined to be within 50% above the given parameter.

Project Details

- Data encompasses all of the Prescott campus’ Convair 222s’ flight hours between July 01, 2011, and December 31, 2013.
- Approximately 2000 flights, 2100 flight hours, and 15,000 landings were reviewed during the period studied.
- The results in this study were used because of the frequency of flight-hour flights that fly to or at the airports included are KPRC, KPAZ, KTVX, KPHO, KEGE, KEGE, KEGG, KEGE, and KEGE.

Conclusions

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

Findings, Problems, and Future Directions

- Approximately 20% of approaches classifiable as unstable had more than one cause for the classification. Approximately 50% of unstable approaches were related to pitch. There are airplanes that are not always correctly in terms of pitch. They might have a correct stable approach to be considered to be an unstable approach. They should have different metrics or multiple metrics than more than one cause.
- Approximately 20% of unstable approaches were related to speed. Airspeed might have caused a stable approach to be considered to be an unstable approach because the speed was less than the minimum or because the speed was greater than the maximum. Difference in speed could account for what is occurring or not. The speed should be modified.
- A future version of this program could correct an approach for speed; wind, and proximity to different runways. Another factor to consider adding to the level of continued instructor/student experience.