Lifeflight of Maine
Data Analysis Update

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Rotorcraft Mission Segments

- Air Tour
- External Load
- Airborne Law Enforcement
- Aerial Firefighting
- Search and Rescue
- Helicopter Air Ambulance
- Training
- Offshore
- Corporate/VIP Transport
ANOMALY DETECTION (KNOWLEDGE DISCOVERY) USING ADS-B DATA
Anomaly Detection in Flight Data Records

- Traditionally, anomaly detection in flight data records is based on **exceedance analysis**
  - Define parameter thresholds not to be exceeded
  - Combine parameters into safety events
  - Thresholds may depend on mission, helicopter make/mode, operator, event severity, etc.

- With large amounts of data, anomalies can be detected by observing patterns in the data

- Group data based on take-off and landing airports

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Flight grouping using data features (such as take-off and landing airports, time of flight, surface area covered, etc.)

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365 flight trajectories after data cleaning and preparation
Anomaly Detection in Flight Data Records

- **Goal**: identify clusters in set of flights from Airport A to Airport B

**ADS-B altitude data**

**FPCA**

**Flights are dissimilar in terms of distance in FPC space**

- **FPCA**
Takeoff/Landing Site Locations
ADS-B Flight Trajectory Data
LoM ADS-B Dataset

• N901CM – 460 flights/703.5hrs
  – Apr. 2018-Dec. 2019

• N901EM – 406 flights/841.3hrs
  – June 2018-Dec. 2019

• N710SB – 36 flights/67.8hrs
  – Nov. 2019-Dec. 2019

• TOTAL: 900 flights/1612.6 flight hours
Data Quality Issues with ADS-B Data

![Bar chart showing various data quality issues with ADS-B data, including large time gaps, short duration, very low altitude operation, incomplete flight - starting high, etc., with useable data highlighted.]
LoM Flight Routes (Top 10)
Route: 68ME – ? = 68 Flights
Route: ME02 – ? = 35 Flights
Route: ? – ? = 34 Flights
Route: ? – ME02 = 29 Flights
Route: ME29 – ME02 = 20 Flights
Route: ME02 – ME52 = 18 Flights
Route: ME52 – ME02 = 16 Flights
Route: 68ME – ME02 = 14 Flights
Route: HLAND – ME02 = 14 Flights
Route: ME29 – ME02 = 13 Flights
N901EM

• Visuals of the routes flown in 2021
January 2021
February 2021
February 2021
June 2021
July 2021
July 2021
August 2021
August 2021
September 2021
FUTURE AREAS OF WORK
Instrument Approach Procedures and Airports

- Airport
- Approach Type
- Runway number
- Normal CAT Visibility (sm)
- Helicopter Visibility (sm)
- Limitations on Helicopter Visibility Reduction
- Limitations on Night Visibility
- Class of Airspace
- Towered Airports
Total number of Maine IAPs: 96
Observations: Most of Maine IAPs have limited reductions on helicopter visibility minima
Most of the RNAV and VOR approaches have limited reductions on helicopter visibility minima

Helicopter Visibility Reduction Limits

Helicopter Visibility Reduction Limited (YES/NO)

Helicopter Visibility Reduction Limited (YES/NO)

Helicopter Visibility Reduction Limited (YES/NO)

Approach Type

Federal Aviation Administration
Aviation Research Division, ANG-E
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Total number of Maine IAPs: 96
Observations: Most of Maine IAPs have night visibility limits (e.g. procedure NA at night)
Most of the RNAV and VOR approaches have night visibility limits
Total number of Maine IAPs: 96
Observations: Most of Maine airports are class of airspace G
Total number of Maine IAPs: 96
Observations: Most of Maine airports are not towered
Most of the RNAV approaches are done in not towered airports
Questions?