AGHME QUALITY CONTROL
AGHME Quality Control (QC) Process

- Two primary sources of ASE measurement error must be evaluated before the result can be considered valid
  - Aircraft true position and the modeled value of the pressure surface
- Accepted quality parameters are built into the ASE processing software to flag likely erroneous ASE values
- Experienced analysts review ASE results periodically to identify remaining large ASE values
- QC has an established watch list of large measurement
  - Subsequent large measures of a single aircraft on repeated assessments are reported to the operators via the FAA inspector
  - Comparison of multiple aircraft at the same time or by area are used to remove the likely faulted measurement
Altimetry System Error (ASE) Process

• ASE is determined by comparing the identified true height of the aircraft and the true height of the barometric pressure surface associated with the altimetry measurement
  ✪ The true altitude is currently measured by the Aircraft Geometric Height Element multilateration systems operated by ANG-E61
  ✪ Aircraft that require ASE monitoring that do not fly over one of the AGHME sites can utilize a GPS measurement unit to collect aircraft position as an input to the ASE process
  ✪ ADS-B provides a source of aircraft position data for use in ASE calculations
    • The quantity of data that will be provided by ADS-B will provide unprecedented ability to observe ASE
For ASE to be properly measured by the AHGME, the geometry of the flight path should be aligned with the identified performance area of the system. This assures that multiple elements of the AGHME station will measure the aircraft range for the altitude calculation.
AGMHE Coverage Area: Wichita, Kansas

https://www.faa.gov/air_traffic/separation_standards/aghme/locations/
Flight Quality - Dynamics

- ASE is only currently processed when the aircraft is flying straight and level
  - Maneuvers create uneven air flow over the aircraft
- A minimum flight segment of 180 seconds is required
  - Multiple measurements during that time are averaged
  - AGHME data is “geometrically limited” – the flight duration will only be as long as the flight distance over the system
  - ADS-B coverage provides continuous data allowing for multiple independent ASE samples to be collected and compared.
Meteorological Data Quality

- Pressure Surface variations that do not match the expected model results will translate into erroneous ASE assessment
- Data evaluation based on the expected values of each site’s performance can be used to detect bad MET fit
- A large standard deviation of the ensemble of site ASE measurement is used as a trigger for daily evaluation
  - The QC team can elect to fail all or some of the data
Daily Statistics from Atlantic City

Monitored daily ASE standard deviation in Atlantic City
April 24, 2017 to July 24, 2017

Elevated daily mean or standard deviation triggers QC data evaluation
Daily Comparison of Ensemble ASE

The outlier is responsible for elevated daily standard deviation.

Next we examine the outlier.
Aircraft is monitored regularly by AGHME systems. The outlier can be rejected as representative of its ASE.
Daily Statistics from Ottawa

Monitored daily ASE standard deviation in Ottawa
April 1, 2016 to July 1, 2016

04/01/2016 - 07/01/2016 = 60

Date

Daily ASE SD (ft)

AYOW
Upper Stability limit
May 22, shown in orange, had a significantly lower ensemble bias likely due to met data issues.
Improvement to Met Data
Recent AHGME Flight Inquiries

Atlantic City
ASE 259
SD 39

Wichita
ASE 210
SD 6

Atlantic City
ASE -14
SD 21
Atlantic City AGHME Flight

Aircraft flew far from the center

300 Second duration

Poor MET/Aircraft surface agreement due to the aircraft or the flight track?
Wichita AGHME Flight

Preferred track
1,000 Second Duration
Good MET/Aircraft surface agreement confirms 210 ASE
Atlantic City AGHME Flight

Aircraft flew twice through the center
2,500 Second duration
Good MET/Aircraft surface agreement confirms good ASE
Pressure Surface Alignment
Sample Case with ADS-B

Phoenix
ASE 70
SD 42
AGHME Aircraft Height and MET Alignment

Well-sampled flight
308 Second Duration
Moderate MET/Aircraft surface agreement
ADS-B Aircraft Height and MET Alignment

Continuous ADS-B data aligned with AGHME data

Improved MET/Aircraft surface dynamic agreement

Estimate of ASE

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<tr>
<th>AGHME</th>
<th>ADS-B</th>
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Conclusion

• Ensure high confidence in accurate ASE results
• Report only verified monitoring results to operators to decrease monitoring burden