North Atlantic Traffic Forecast
(1 October 2016)
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Description of New Forecast Methodology

• The new twenty year forecast is composed of two parts
  • Near-term projection for the first five years
  • Long-term portion that forecasts 5 to 20 years into the future

• The near-term portion (first five years) of the forecast is
  • Based on carrier fleet order books
  • Reflects decisions about network and fleet changes by 48 air carriers
  • Reflects input from operators and key stakeholders
  • Built at detail level of carrier, equipment type, city pair, and FIR crossings
  • Includes airport capacity constraints (i.e., this is not an unconstrained forecast)

• The long-term portion of the forecast
  • Reflects traffic growth for the following 15 years
  • References economic based growth-rates published by IATA, ICAO, Boeing, and Airbus
  • Consists of a central, low, and high growth rate

• The composite forecast appends the long-term forecast to the last year of the near-term forecast
Near-Term Five-Year Forecast Methodology: Data

- **FIR Set:**
  - All NAT FIRs (except Bodø oceanic)

- **Carrier Set:**
  - Forty-eight carriers (combination of the top 80% of traffic in each FIR)
  - This includes four major Middle Eastern carriers and low cost carriers with significant growth potential (study commissioned by FAA)
  - About 10% of all NAT traffic are operated by LCCs

- **Fleet Information**
  - Sources for equipment inventory, orders, and retirement plans
    - Carrier websites
    - Publicly available financial documents
    - Public news announcements
    - Ch-Aviation.com
    - Planespotters.com
    - Boeing and Airbus order books

- **Fleet Utilization**
  - Flight data obtained from ANSPs used to determine utilization per carrier/equipment/FIR
  - Focused on ANSP provided data for July 15-21, 2015
Five-Year Forecast Methodology: Simplified Fratar Algorithm

Mathematical formulation for the Simplified Fratar Algorithm:

\[
\text{Min } \sum_{ij} (X_{ijkl} - Y_{ijk})^2 \text{ for each } kl \text{ combination}
\]

Subject to the carrier-level growth projection constraint:

\[
D_{kl} = \sum_{ij} X_{ijkl}, \text{ for each } kl \text{ combination}
\]

where,

- \(i\) identifies the \(i^{th}\) departure airport
- \(j\) identifies the \(j^{th}\) arrival airport,
- \(k\) identifies the \(k^{th}\) carrier
- \(l\) identifies the year

\(X_{ijkl}\) is the number of projected NAT flights from airport \(i\) to airport \(j\) by carrier \(k\) in year \(l\)

\(Y_{ijk}\) is the number of NAT flights from airport \(i\) to airport \(j\) by carrier \(k\) in the base year data set provided by the ANSPs

The carrier-level growth projection constraint requires that each carrier match its yearly growth projections that were determined in the fleet analysis.
An annual growth of **3.6%** is projected for total Trans-Atlantic operations between 2016 and 2020.

### Average Yearly Growth Rates by FIR

<table>
<thead>
<tr>
<th>FIR</th>
<th>2013 – 2015 (actual growth rate)</th>
<th>5-Yr Projected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shanwick</td>
<td>5.4%</td>
<td>3.6%</td>
</tr>
<tr>
<td>Gander</td>
<td>6.9%</td>
<td>3.3%</td>
</tr>
<tr>
<td>New York</td>
<td>-1.8%</td>
<td>2.6%</td>
</tr>
<tr>
<td>Reykjavik</td>
<td>12.0%</td>
<td>5.1%</td>
</tr>
<tr>
<td>Santa Maria</td>
<td>-0.2%</td>
<td>4.0%</td>
</tr>
</tbody>
</table>

Note that summing across FIRs does not provide total NAT operations for the carrier since a single flight can cross multiple FIRs.
Near-Term Five-Year North Atlantic LCC Analysis

Current and Prospective Pre-Clearance European Airports Would Allow Access to U.S. Secondary Airports without Federal Inspection Services (FIS) Facilities

Istanbul’s Ataturk Airport (not on map) is also being considered for Pre-Clearance
Near-Term Five-Year Middle East Carrier Analysis

Current and Prospective US markets to be served by Middle East carriers

<table>
<thead>
<tr>
<th>Airlines</th>
<th>New Ops per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>EK Emirates</td>
<td>196</td>
</tr>
<tr>
<td>TK Turkish Airlines</td>
<td>130</td>
</tr>
<tr>
<td>EY Etihad Airways</td>
<td>120</td>
</tr>
<tr>
<td>QR Qatar Airways</td>
<td>102</td>
</tr>
</tbody>
</table>
The long-term forecast branches into high, central and low forecasts from the end of the near-term forecast (Average Annual Growth Rate (AAGR))

<table>
<thead>
<tr>
<th>Sources</th>
<th>AAGR from 2014 to 2034</th>
<th>AAGR from 2020 to 2030</th>
<th>AAGR from 2010 to 2030</th>
<th>AAGR from 2020 to 2035</th>
</tr>
</thead>
<tbody>
<tr>
<td>IATA</td>
<td>2.6%</td>
<td>2.0%</td>
<td>3.0%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Boeing</td>
<td>3.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Airbus</td>
<td>2.8%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICAO (FESG CAEP/9) High Scenario</td>
<td></td>
<td>4.7%</td>
<td>4.7%</td>
<td></td>
</tr>
<tr>
<td>ICAO (FESG CAEP/9) Central forecast</td>
<td></td>
<td>3.8%</td>
<td>3.9%</td>
<td></td>
</tr>
<tr>
<td>ICAO (FESG CAEP/9) Low Scenario</td>
<td></td>
<td>3.0%</td>
<td>3.1%</td>
<td></td>
</tr>
</tbody>
</table>

Summary of Long-Range (2020-2035) North Atlantic Passenger Growth Forecast

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>High</td>
<td>4.7%</td>
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<tr>
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</tr>
<tr>
<td>Low</td>
<td>2.0%</td>
</tr>
</tbody>
</table>
20 Year NAT Traffic Forecast (2015 – 2035)

### Composite Growth Rates (2015 - 2035)

<p>| | |</p>
<table>
<thead>
<tr>
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<th></th>
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<tbody>
<tr>
<td>High</td>
<td>4.4%</td>
</tr>
<tr>
<td>Central</td>
<td>3.2%</td>
</tr>
<tr>
<td>Low</td>
<td>2.4%</td>
</tr>
</tbody>
</table>
Conclusions

• The 2015 – 2020 traffic forecast, based on airline fleet analysis and business plans, is projected to grow 3.6% annually

• Contributing factors to first five years in the forecast
  – Rapid growth in New York due to Norwegian Air, Air Europa, and jetBlue
  – Gander and Shanwick operations will grow at a rate of 3.5%.
  – Santa Maria will grow due to Air Europa which has a large order book
  – Reykjavik will grow due to Icelandair, Norwegian Air, and WestJet

• Large orders by middle east carriers will significantly grow NAT traffic

• LCCs will add significant growth in the North Atlantic

• Growth by legacy carriers will remain fairly flat

• The 20 year NAT traffic forecast (2015 – 2035) is projected to grow at a 3.2% average annual rate