Terminal Weather Forecasts and Traffic Flow Management (TFM) Decisions

National Weather Service Activities

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November 1, 2012
Terminal Weather Forecasts and Traffic Flow Management (TFM) Decisions

- Weather Requirements for TFM
- Current Capabilities and New Initiatives
- New Verification Procedures
- Summary
Weather Requirements for TFM

• Joint FAA-NWS TFM Weather Requirements Working Group (TRWG)
  – Developed performance-based requirements linked to Traffic Management Initiative decisions
  – Accuracy of weather forecast information at key decision points (lead time) prior to onset/cessation of high impact weather events affecting the NAS

Example:

• Forecast Time of Onset of IFR Conditions
  – With a 4-hour lead time with an accuracy of ± 30 minutes

• Verify Forecast of Time of Onset of IFR Conditions
  – Probability of detection ≥ 75 percent
  – False alarm ration ≤ 25 percent
  – Timing error ≤ 30 minutes
Current Capabilities and New Initiatives

New Lead Time Accuracy Assessment Tools

- **TAF – NWSH Performance Branch**
  - Completed Cig/Vis Assessment Capability
  - Wind Direction Change Assessment Ongoing

- **NDFD – ESRL/GSD**
  - Completed Thunderstorm Probability Forecast Study
  - Follow-on Assessment Tool Development Ongoing
New Verification Procedures

Paradigm shift on forecast assessment

- Traditional POD, FAR metrics – compare forecast to observation every 5 minutes, if match, forecast hit
  - During 24-hour TAF period, 288 opportunities

- New lead time accuracy assessment, if forecast the correct time of onset/cessation, forecast hit, if missed the time, missed the event
  - Typically, very few opportunities during TAF period
New Verification Procedures

Example: Cig/Vis Event 4-Hour Lead Time

MVFR Forecast Onset 0500Z
VFR Forecast Cessation 0500Z

MVFR Onset 0536Z
VFR Cessation 0536Z
New Verification Procedures

TAF Cig/Vis Lead Time Accuracy Preliminary Results

<table>
<thead>
<tr>
<th>Element</th>
<th>Flight Category</th>
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<tbody>
<tr>
<td>Date Range</td>
<td>01/01/2012 00:00 TO 10/15/2012 23:59</td>
</tr>
<tr>
<td>Area</td>
<td>National</td>
</tr>
<tr>
<td>Projection (TEW)</td>
<td>1 Hour(15 Min), 2 Hours(15 Min), 4 Hours(30 Min), 6 Hours(45 Min), 8 Hours(60 Min)</td>
</tr>
</tbody>
</table>

**POD**

<table>
<thead>
<tr>
<th>Condition</th>
<th>1 Hour (± 15 Min)</th>
<th>2 Hours (± 15 Min)</th>
<th>4 Hours (± 30 Min)</th>
<th>6 Hours (± 45 Min)</th>
<th>8 Hours (± 60 Min)</th>
<th>Event Counts</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFR onset</td>
<td>0.030</td>
<td>0.025</td>
<td>0.038</td>
<td>0.055</td>
<td>0.071</td>
<td>4,566</td>
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<tr>
<td>IFR cessation</td>
<td>0.063</td>
<td>0.046</td>
<td>0.053</td>
<td>0.065</td>
<td>0.085</td>
<td>4,572</td>
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</tbody>
</table>

**False Alarm Ration (FAR)**

<table>
<thead>
<tr>
<th>Condition</th>
<th>&lt;= 1 Hour (± 15 Min)</th>
<th>&gt; 1 to &lt;= 2 Hours (± 15 Min)</th>
<th>&gt; 2 to &lt;= 4 Hours (± 30 Min)</th>
<th>&gt; 4 to &lt;= 6 Hours (± 45 Min)</th>
<th>&gt; 6 to &lt;= 8 Hours (± 60 Min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFR onset</td>
<td>0.796</td>
<td>0.888</td>
<td>0.839</td>
<td>0.803</td>
<td>0.783</td>
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<tr>
<td>IFR cessation</td>
<td>0.797</td>
<td>0.867</td>
<td>0.816</td>
<td>0.775</td>
<td>0.691</td>
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</table>
Summary

• TFM Weather Lead Time Accuracy Requirements
  – New way of thinking for forecast assessment
  – Current hour-scale product suite not well-suited to meet the minute-scale accuracy needs
  – Guidance tools, training on new assessment logic will only get us so far, not likely to bridge the significant gap
  – Raises question on use of probabilistic forecasts with range of potential outcomes and confidence factors

• FAA and NWS leadership recently agreed to expand TRWG weather requirements activity beyond TFM
  – Address requirements for all weather forecast information NWS provides in support of air traffic operations
  – Improve and prioritize products/services to meet FAA’s weather information needs