An Approach to Strategic Planning for Weather

“Integration with Air Traffic Management Decision Tools”

NBAA 62nd Annual Meeting & Convention
Friends and Partners of Aviation Weather

October 22nd 2009

John Huhn
Overview

- Currently there is a limited process/capability to support aviation strategic decision making beyond 6 hours

- **Processes** -
  - Developing a decision framework for managing weather events
    - Systematic (defined action and level of response)
    - Repeatable (possibly reduce risk aversion in planners)
    - Incremental (adapt to dynamics of weather and traffic)

- **Capabilities** -
  - Developing capabilities to translate weather forecast data into operational disruption for the NAS
    - Autonomous (no human augmentation)
    - Weather is transparent to the decision maker
    - “Aviation Centric” for longer range TFM decision making
TFM Weather Management Methodology

ATCSCC issues the “Statement” as an (ATCSCC Advisory)
TFM Weather Management Methodology

*ATCSCC issues the “Statement” as an (ATCSCC Advisory)*

<table>
<thead>
<tr>
<th>Event</th>
<th>Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead Time</td>
<td></td>
</tr>
<tr>
<td>&gt;T-12Hrs</td>
<td>&gt;T-8Hrs</td>
</tr>
</tbody>
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**Action**
- Indication strategic planning subsumed by tactical operations
- Modeling tactical scenario’s to protect arrival/departure flows
- Monitor flow dynamics and impact from weather

**Tac Ops**

**Wx Event**

**“Warning”**
TFM Weather Management Methodology

**ATCSCC issues the “Statement” as an (ATCSCC Advisory)**

- **Statement**
  - “Significant”
  - “Warning”

- **Lead Time**
  - >T-12Hrs
  - >T-8Hrs
  - T-6Hrs
  - T-4Hrs
  - Wx Event

- **Tac Ops**

- **Event Potential**

- **Action**
  - TMI’s implemented
  - Monitor planned flows and route outs
  - Adjust rates based on changing flow dynamics
  - Evaluate/Implement prior airspace coordination with NavCanada/Military
  - Indication strategic planning subsumed by tactical operations
  - Modeling tactical scenario’s to protect arrival/departure flows
  - Monitor flow dynamics and impact from weather
TFM Weather Management Methodology

**ATCSCC issues the “Statement” as an (ATCSCC Advisory)**

### Statement
- "Watch"
- "Significant"
- "Warning"

### Lead Time
- >T-12Hrs
- >T-8Hrs
- T-6Hrs
- T-4Hrs
- Wx Event

### Event Potential

### Action

**TFM Weather Management Methodology**

**ATCSCC** issues the "Statement" as an (ATCSCC Advisory)

**Tac Ops**

- TFM initiatives likely in specified region of interest
- Modeling specific flow rates for various TMI’s
- TMI plans shared not implemented
- No traffic is moved

- TMI’s implemented
- Monitor planned flows and route outs
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## TFM Weather Management Methodology

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### Event Potential

### Action

- **TFM Weather Management Methodology**
  - **ATCSCC issues the “Statement” as an (ATCSCC Advisory)**
  - **TFM initiatives likely in specified region of interest**
  - **Modeling specific flow rates for various TMI’s**
  - **TMI plans shared not implemented**
  - **No traffic is moved**
  - **TFM programs possible in ROI**
  - **Scenario modeling**
  - **Review potential capacity/demand issues**

- **TMI’s implemented**
  - **Monitor planned flows and route outs**
  - **Adjust rates based on changing flow dynamics**
  - **Evaluate/Implement prior airspace coordination with NavCanada/Military**

- **Indication strategic planning subsumed by tactical operations**
  - **Modeling tactical scenario’s to protect arrival/departure flows**
  - **Monitor flow dynamics and impact from weather**

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TFM Long Range Strategic Planning

SPC SREF (Wx model data) ↔ Historical Air Traffic

Equates to probability of convection and % time aircraft are in the same grid

All Flight Levels

FL≥250

FL≤100
1. NAS impact “All” Flight Levels (66hrs)
2. NAS impact “All” Flight Levels (30hrs)
3. NAS impact “All” Flight Levels (18hrs)
4. CIWS at 21z August 22\textsuperscript{nd} 2009
Forecasted (top) and Post Analysis (bottom) of Thunderstorm Impact for all Jet Routes in ZDC

- Translation technique to visualize impact
- View an ARTCC’s potential weather impact to its demand values
- Quantify weather/impact relationships
- Enhance system optimization
Translated Graphical Maps for TFM Automation

Forecasted (top) and Post Analysis (bottom) of Thunderstorm Impact for all Jet Routes in ZDC

- Translation technique to visualize impact
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**Forecasted Enroute Impact for ZDC issued at 09z June 03 (Red Line)**

**Actual Enroute Impact for ZDC June 03 (Blue Line)**

*Enroute Impact Score by Select ARTCC and Hour*
Summary

• Framework for strategic TFM decision making. Why?
  ➢ Utilization of weather data beyond 6 hours is limited in scope
  ➢ No formalized process for developing long-range strategic plans
  ➢ To promote common situational awareness among stakeholders

• Proof of concept for translating weather data for TFM long range strategic planning. Why?
  ➢ CDM Sub-Group Flow Evaluation Team working on Collaborative Strategic Planning concept for TFM
  ➢ Limited “aviation centric” convective forecasts for long-range strategic TFM planning
  ➢ Autonomous translation and transparency of weather forecast data into operational disruption to the NAS
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