Terminal Ceiling & Visibility PDT
AWRP Program Management Review
19 November 2002

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Terminal C&V Project Areas

• SFO Marine Stratus Forecast System
  - 2002 Activities
  - Continued development

• NYC Winter Weather C&V
  - Scope
  - Initial Efforts
Stratus Impact on SFO Approach

San Francisco Bay Area Bay Approach
Major Jet Arrival and Departure Routes

Arrivals

Departures
System Sensing Network

- Surface Weather Observation
- SODAR (Acoustic Sounder)
- Pyranometer (SW Radiation)
- Sonic Anemometer
- Radiosonde (Weather Balloon)
2002 Highlights

• Major effort over winter to automate model development process
  - Allows testing of many more predictors and “paths”
  - Facilitates development at other airports (e.g. NYC)
• Upgraded SODARs prior to start of demonstration
• 2002 Demonstration June through October
  - Excellent SODAR performance
  - Two versions of models were implemented
2002 SODAR Upgrade

- Issue: Control of audio signal based on aging technology; longterm maintainability problem. Poor signal quality at SFO
- Solution: Replace with PC sound card technology

SFO SODAR 2001

SFO SODAR 2002
COBEL – Physical Column Model
• Key Inputs: High resolution temp, humidity, wind, solar radiation

Regional Statistical Forecast Model
• Key Inputs: Regional hourly surface observations, 12Z Oakland sounding

Consensus Forecast

Local Statistical Forecast Model
• Key Inputs: Local measurements of cloud base and inversion height, wind, pressure

Satellite Statistical Forecast Model
• Key Input: GOES visible satellite
Statistical Model Development Process

Data

Re-scale Predictors

- Select potential predictors (up to several hundred). Re-scale nonlinearly based on correlation with predictand (side-by-time).

Predictor Nulling

- Examine correlations and redundancies to reduce establish pool of best candidate predictors. (20 predictors)

All-Paths Testing

- Fit all combinations of 20 best predictors (~1 million forecast equations). For each models size (# of predictors, 1-20), order by best fit. Select best 200 of each size. (4000 equations)

Cross-validation

- Cross-validate (10 samples). Sort, eliminate all fits worse than 1-minute error from best fit. Rank remaining equations by error and stability. (10-100 equations)

Final Selection

- Select from candidates based on preferred predictors (e.g. based on predictor availability, etc.)
2002 Forecast Models

- Version 2002A models implemented in June
  - Prototype version from “automated” processing
  - Some inadequacies were revealed
- New models (2002B) implemented mid-August
  - Improvements to correct model over fitting
  - Case selection during development process
  - Reduction in overestimate of forecast confidence
    (impacts model weighting)
  - 1st overnight forecasts (RSFM at 09z & 11z)
## Model Development Historical Performance

### Consensus Forecast, 2002 Data

Median Absolute Error (hours)

<table>
<thead>
<tr>
<th></th>
<th>13z</th>
<th>14z</th>
<th>15z</th>
<th>16z</th>
<th>17z</th>
<th>18z</th>
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<td>0.43</td>
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Intermodel Comparison

2002 Data, Model Version 2002B

Median Absolute Error (hours)

<table>
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<tr>
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<th>11z</th>
<th>13z</th>
<th>14z</th>
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<tbody>
<tr>
<td>Consensus</td>
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<td>----</td>
<td>0.81</td>
<td>0.76</td>
<td>0.62</td>
<td>0.43</td>
<td>0.67</td>
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<td>COBEL</td>
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<tr>
<td>Regional SFM</td>
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<td>Satellite SFM</td>
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<td>0.63</td>
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Objectives for Forecast Upgrades

- Extension of some products to overnight hours
  - Zi algorithm
  - COBEL and Local SFM

- Investigate improvements to Satellite & Regional SFMs

- Objective Identification of pro-active decision opportunities

Display Modification Concept
Northeast Winter C&V Prediction

- Joint effort with National C&V and Winter Wx PDTs
- NYC area to act as testbed
- Initial user meeting held on Long Island in March
  - Air Traffic Managers
  - NWS Forecasters (CWSU, FO, and Region)
  - Airlines: forecasting and dispatch
  - Researchers
Northeast C&V – Initial efforts

- Winter 2002-03 to survey needs to steer development
  - Web-based Discussion Board: Air traffic managers, forecasters, product developers
  - Investigate application of NCEP model data
- Sensor testbed deployments at Brookhaven & Rutgers
- Initial product development
  - Precipitation visibility nowcast based on WSSDM technology
  - Regional SFM based on SFO technology
Summary

• Completion of 2002 Demonstration at SFO
  • SODAR upgrades
  • Statistical model development automation
  • Two versions of models tested

• Continuing work at SFO
  • Final model changes
  • Extension of products to overnight hours
  • Development of proactive decision aid

• Initial efforts beginning on Winter Weather C&V (NYC)