NextGen Network Enabled Weather (NNEW)
Friends/Partners in Aviation Weather
NBAA Convention - Orlando

NNEW FY08 Demonstration
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Overview

• Program Overview: NNEW
• Wx Specific Standards
• NNEW Weather Data
• Data Access
• Backup Slides
  – Detailed Descriptions of Weather Data Available
Program Description

**NNEW**
Establish a network-enabled, virtual 4-Dimensional Weather Data Cube, which draws information from multi-agency sources, into a consolidated data cube for aviation users.

**Key Themes:**
- An integrated and nationally consistent, common weather picture for observation, analysis, and forecast data available to all users
- “Network Enabled”: Available, secured, real-time, useful information
- “Virtual”: Repository with no single physical database or computer
- Conceptually unified source distributed among multiple physical locations and suppliers
- Purpose: Provide a source of weather information for operational decision making processes
Wx Specific Services

• NNEW has been working with Open Geospatial Consortium (OGC) standards and with DoD’s JMBL
• NNEW has participated in OGC working groups to extend standards to meet our needs
• OGC Standards involved are:
  – Web Coverage Services (WCS); principally for gridded data
  – Web Features Services (WFS); principally for non-gridded data
NNEW Weather Data

• Capabilities are being developed over a multi-year period with IT demonstrations conducted yearly.
  – The capabilities developed during the Federal fiscal year 2008 (FY08) were demonstrated in September 2008

• The following standards were successfully incorporated during the demonstration:
  – OGC Web Coverage Service 1.0/1.1
  – OGC Web Feature Service 1.1
  – OGC Catalogue Service for Web
  – NetCDF 3 & 4 file format using the Climate and Forecast Convention
  – ebXML/ebRIM

• Data are currently available at three locations:
  – National Center for Atmospheric Research / Research Applications Laboratory (NCAR/RAL)
  – National Oceanic & Atmospheric Administration / Global Systems Division (NOAA/GSD)
  – Massachusetts Institute of Technology / Lincoln Laboratory (MIT/LL)
The following products are currently publicly available as OGC WCS 1.0/1.1 services:

- GTG2 Turbulence (NCAR/RAL)
- CIP Icing Probability and Severity (NCAR/RAL)
- RUC Temperature (NCAR/RAL)
- RUC Winds (NCAR/RAL)
- RUC Relative Humidity (NCAR/RAL)
- RSAS Surface Temperature (NOAA/GSD)
- RSAS Surface Dewpoint (NOAA/GSD)
- RSAS Surface Winds (NOAA/GSD)
- CIWS Vertically Integrated Liquid Water (MIT/LL)
- CIWS Echo Tops (MIT/LL)
NNEW Weather Data

- The following products are currently publicly available as OGC WFS 1.1 services:
  - METARs (NCAR/RAL & NOAA/GSD)
  - PIREPs (NCAR/RAL & NOAA/GSD)
  - TAFs (NCAR/RAL)
  - AIRMETs (NCAR/RAL)
  - SIGMETs (NCAR/RAL)
Data Access

- **NNEW Data Access Information**
  - Available at WIKI website
    - [https://wiki.ucar.edu/display/NNEWD/NNEW+Phase+2+Access+Information](https://wiki.ucar.edu/display/NNEWD/NNEW+Phase+2+Access+Information)

- **The website includes information all of the datasets**
  - Each of the datasets and their service endpoints have associated metadata in the registry/repository
    - The NNEW repository implements the coming ebXML 4.0 specification.
    - Location: [http://ngenww2.wx.ll.mit.edu/omar-server-4.1/query](http://ngenww2.wx.ll.mit.edu/omar-server-4.1/query)

  - More detailed information included on website such as:
    - WCS Datasets: Feature type id, WFS Access type, WFS URL
    - WFS Datasets: Coverage id(s), Range (field) id, WCS Access type, Returned, Data Format, WCS URL
    - And more…
Visualization of the data is also available in an NNEW Java Application

- Data Included in the NNEW Phase II Java Application:
  - AIR/SIGMETs
  - TAFs
  - Current Icing Potential
  - Current Icing Severity
  - DOD Model Air Temperature
  - Echo Tops
  - GOES Satellite Imagery
  - Lightning
  - METARs
  - PIREPs
  - Radar Base Reflectivity
  - Radar Composite Reflectivity
  - Rapid-Refresh Model Data
  - RUC Model Data
  - Surface Air Temperature
  - Surface Dewpoint Temperature
  - Surface Wind
  - Turbulence
  - Vertically Integrated Liquid

http://weather.aero/nnew/phase2/
Backup Slides
Data Access Website

NextGen Network Enabled Weather (NNEW)

October 9, 2008
Weather Observations

- **Aviation Routine Weather Report (METAR)**
  - **Definition**
    - Predominantly used by pilots in fulfillment of a part of a pre-flight weather briefing, and by meteorologists, who use aggregated METAR information to assist in weather forecasting.
  - **Description of Data**
    - Text/Point data
    - Updated Hourly
  - **Domain**
    - North America
  - **Sample**
    - KDCA 111252Z 07005KT 10SM BKN050 OVC080 22/14 A3034 RMK AO2 SLP272 BINOVC T02170144
Weather Observations

- Aviation Routine Weather Report (METAR)
  - Coverage
Weather Observations

- **Pilot Reports (PIREPs)**
  - **Definition**
    - A report of in-flight weather by an aircraft pilot or crew member. A complete report includes the following information in this order: location and/or extent of reported weather phenomena; time of observation; description of phenomena; altitude of phenomena; type of aircraft (only with reports of turbulence or icing).
  
  - **Description of Data**
    - Text/Point data
    - Updated Hourly
  
  - **Domain**
    - Continental United States (CONUS)
  
  - **Sample**
    - T47 UA /OV SPS130010 /TM 1249 /FL240 /TP PC12 /SK OVC-TOP230/ SKC /TA M19 /WV 20311KT /TB OCNL LGT CHOP
Weather Observations

Pilot Reports (PIREPs) of Turbulence

1500z – 1542z 09/15/08

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Weather Analysis

• **CIWS** – Corridor Integrate Weather System
  – **Definition**
    • VIL – Vertically Integrated Liquid – A measure of precipitation intensity. VIL can be thought of as an amount of liquid (water) observed in a vertical column extending from ground level to the upper extent of radar coverage.
    • Echo Tops - Provides a measure of storm height, as observed by radar systems. Echo Tops are expressed in units of height above a reference altitude, typically kilo feet above Mean Sea Level.
  – **Description of Data**
    • 2-D & 3-D Grid
  – **Domain**
    • Continental United States (CONUS)
Weather Advisories

- **AIRMET & SIGMET**
  - **Definition**
    - **AIRMET** - A weather advisory issued by a meteorological watch office for aircraft that is potentially hazardous to low-level aircraft /aircraft with limited capability.
    - **SIGMET** - A weather advisory that contains meteorological information concerning the safety of all aircraft.
  - **Description of Data**
    - **Area**
    - **Sample**
      - KDCA 111252Z 07005KT 10SM BKN050 OVC080 22/14 A3034 RMK AO2 SLP272 BINOVC T02170144
Weather Forecasts & Analysis

• **TAFs (Terminal Area Forecast)**
  – **Definition**
    • A format for reporting weather forecast information, particularly as it relates to aviation. Generally a TAF is a 9- or 12-hour forecast, though some TAFs can cover an 18- or 24-hour period.
  – **Description of Data**
    • Text/Point data
    • Updated every 6 hours (typically)
  – **Domain**
    • North America
  – **Sample**
    • KIAD 151400Z 151412 30015G24KT P6SM FEW040 SCT070
      – FM2200 33007KT P6SM SCT250
      – FM0400 VRB03KT P6SM SCT080 BKN250
Weather Forecasts & Analysis

• **RUC** – Rapid Update Cycle
  – **Definition**
    • The RUC is a NOAA/ NCEP operational weather prediction system comprised primarily of a numerical forecast model and an analysis/assimilation system to initialize that model. It was developed to serve users needing frequently updated short-range weather forecasts, including those in the US aviation community and US severe weather forecasting community.
  – **Description of Data**
    • Gridded (GRIB1)
    • Updated Hourly
    • Temperature, Wind Speed/Direction, and Relative Humidity
  – **Domain**
    • North America
Weather Forecasts & Analysis

- RUC-RTMA – Real Time Mesoscale Analysis
  - Definition
    - The RTMA is a “quick look” analysis designed to meet the immediate need of those requiring a real time gridded analysis. Surface data that provides a 5-km gridded estimate of current surface and near-surface conditions
  - Description of Data
    - Gridded (GRIB1)
    - Updated Hourly
    - Produces analyses of 2 m temperature, 2m dew-point and 10 m wind
  - Domain
    - CONUS
Weather Forecasts & Analysis

- **RUC-HRRR** – High Resolution Rapid Refresh
  - **Definition**
    - The HRRR is a 3-km resolution, hourly updated, cloud-resolving atmospheric model, initialized by DFI-fields from the 13km radar-enhanced RUC run at NOAA/ESRL/GSD
  - **Description of Data**
    - Gridded Binary Data (GRIB1)
    - Updated Hourly
  - **Domain**
    - Northeast Corridor domain from Missouri-Minnesota on the western boundary to the Atlantic Ocean on the east boundary.
Weather Forecasts & Analysis

- RUC-HRRR
Weather Forecasts & Analysis

• **GTG** – Graphic Turbulence Guidance
  – **Definition**
    • An automatically-generated turbulence product that predicts the location and intensity of turbulence.
  – **Description of Data**
    • 3-D Grid
    • Updated Hourly
  – **Domain**
    • CONUS
Weather Forecasts & Analysis

- GTG

The GTG is an automatically-generated turbulence forecast product that supplements AIRMETs and SIGMETs by identifying areas of turbulence. The GTG is not a substitute for turbulence information contained in AIRMETs and SIGMETs. It is authorized for operational use by meteorologists and dispatchers.

**Maximum turbulence potential (FL200-FL450)**

Analysis valid 2000 UTC Sun 07 Sep 2008

[Map showing turbulence potential across the United States]
Probabilistic Forecasts

• NCWD/NCWF
  – Definition
    • The NCWF system produces 30-, 60-, 90- and 120-minute probabilistic forecasts are every 5 minutes. The frequent update cycle is used to reflect the rapidly changing nature of thunderstorms which evolve over very short time scales (order 30 min).
  
  – Description of Data
    • Point or Grid
  
  – Domain
    • CONUS
Probabilistic Forecasts

- NCWD/NCWF
Probabilistic Forecasts

• **CIP** – Current Icing Product
  – **Definition**
    • Provides current information via icing severity graphics and icing probability graphics.
    • Severity is also included and is a supplementary weather product (for increased situational awareness) that provides a graphical view of the current icing environment. CIP products are not forecasts, but presentations of current conditions at the time of the analysis.
  – **Description of Data**
    • NetCDF 4 (CF convention)
  – **Domain**
    • CONUS
Weather Data Compilation

- **MADIS** - Meteorological Assimilation Data Ingest System
  - **Definition**
    - Originally from the National Oceanic and Atmospheric Administration's (NOAA) Earth System Research Laboratory (ESRL) Global Systems Division (GSD)
    - (MADIS) is dedicated toward making value-added data available for the purpose of improving weather forecasting, by providing support for data assimilation, numerical weather prediction, and other hydrometeorological applications
  - **Description of Data**
    - Text, Point, and Gridded data
    - Originally NetCDF
  - **Domain**
    - Global, observations with the highest spatial and temporal density exit in North America