U.S. Aviation Meteorology
U.S. Aviation Meteorology

• FAA is U.S. Meteorological Authority for Aviation
  + FAA and NWS share costs and ownership of observation systems
    • ASOS/METAR
    • Weather Radar
    • ITWS

• NWS is U.S. Meteorological Provider for Aviation
  + Provides all forecast information

• Private contracts with FAA for some movement and display of Met Information
NWS Meteorological Service Provider for Aviation
• NOAA
  ✦ 2 Volcanic Ash Advisory Centers
  ✦ 1 Space Weather Center
  ✦ 2 Tropical Cyclone Advisory Centers
NWS

122 Weather Forecast Offices
- 675 TAFs
- 1500+ METARs

21 Center Weather Service Units
- Support to 21 Air Route Traffic Control Centers

3 Meteorological Watch Offices
- Aviation Weather Center
- Alaska Aviation Weather Unit
- WFO Honolulu

1 FAA Air Traffic Control System Command Center

1 World Area Forecast Center
- WAFC Washington
Weather Forecast Offices

- 122 Weather Forecast Offices
  - Local Watch/Warning
  - Public Forecasts
  - Marine
  - Fire Weather
  - Aviation
    - TAF
    - Airport Weather Warning
Center Weather Service Units

- 21 Center Weather Service Units
  - Implemented 1977
  - Support to ATC and Traffic Flow Management
- Products
  - Center Weather Advisory
  - Meteorological Impact Statement
  - CCFP/CAWS collaboration
  - Locally defined needs
Alaska Aviation Weather Unit

• Alaska Aviation Weather Unit
  ✦ One of 3 U.S. Meteorological Watch Offices
  ✦ Products issued:
    • AIRMET
    • SIGMET
    • Area Forecast
    • Low and Mid Level SIGWX
WFO Honolulu

- WFO Honolulu
  - Issues TAFS for Hawaii
  - One of 3 Meteorological Watch Offices
    - AIRMET
    - SIGMET
    - Area Forecast
    - Low and Mid level SIGWX
Aviation Weather Center

• 1 of 3 U.S. Met Watch Offices
  ✦ Areas of Responsibility
    • Contiguous United States
    • Northwestern Atlantic
    • Northeastern Pacific
    • Gulf of Mexico/Caribbean
  ✦ Products
    • AIRMET
    • SIGMET
    • Area Forecast
    • SIGWX
    • CAWS/CCFP

• WAFC Washington
Aviation Weather Center
One of Nine NCEP Centers

NCEP Center Locations

Aviation Weather Center
Space Environment Center
Storm Prediction Center
Tropical Prediction Center
NCEP Central Operations
Climate Prediction Center
Environmental Modeling Center
Hydrometeorological Prediction Center
Ocean Prediction Center
Typical Forecast Desk
## AWC Product Issuances

<table>
<thead>
<tr>
<th>Product</th>
<th>Approx #/Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convective SIGMET</td>
<td>30,000</td>
</tr>
<tr>
<td>AIRMETs</td>
<td>26,000</td>
</tr>
<tr>
<td>CCFP</td>
<td>25,000</td>
</tr>
<tr>
<td>Significant Weather High</td>
<td>18,890</td>
</tr>
<tr>
<td>Area Forecasts (FA)</td>
<td>6,570</td>
</tr>
<tr>
<td>Significant Weather Low</td>
<td>1,460</td>
</tr>
<tr>
<td>Non-Convective SIGMET</td>
<td>500</td>
</tr>
</tbody>
</table>
Domestic Products
SIGMETs (SIGnificant METeorological Information)

Weather potentially hazardous to all aircraft

- Tstorms, svr icing, svr turb
- Dust/sand storms with vis < 3 mi
- Volcanic ash

Area >= 3000 mi²

Conv. SIGMETs valid for 2 hrs

Non-conv. SIGMETs valid up to 4 hrs

WSUS1 KCHI 041621
CHIU WS 041615
SIGMET UNIFORM 2 VALID UNTIL 042015
SIGMET ND SD MN WI
FROM FAR TO RHI TO DLL TO ODI TO 30S
FSD TO 65NW ANW TO DPR TO 60S BIS TO FAR
OCNL SEV TURB BTN FL240 AND FL390.
RPRTD BY BE40 AND LJ25. THIS UPDATES
UNIFORM 1 AND EXTENDS AREA INTO WI.
COND S CONTG BYD 2015Z.
JNR
AIRMETs
(AIRmen’s METeorological Information)

- Extensive mtn obscuration
- IFR conditions
- Moderate Turbulence
- Moderate Icing
- Sustained sfc winds ≥ 30 kts
- Frz level data
- 3,000 mi²

WAUS43 KKCI 261445
CHIS WA 261445
AIRMET SIERRA UPDT 2 FOR IFR VALID UNTIL 262100
AIRMET IFR...NE KS IA MO WI LM MI LH IL IN
FROM MKG TO 30SE ECK TO FWA TO IRK TO 50E ICT TO 40NW ICT TO HLC
TO 50S ANW TO ONL TO MKG
CIG ELW 010/VIS BLW 33M PCPN/BR. CONDS CONTG BYD 21Z THRU 03Z.

WAUS43 KKCI 261445
CHIT WA 261445
AIRMET TANGO UPDT 2 FOR TURB VALID UNTIL 262100
AIRMET TURB...ND SD NE MN IA WI LM LS MI LH IL IN
FROM 30N INL TO YQT TO SSM TO YVV TO 30SE ECK TO FWA TO FOD TO
LBF TO BFF TO 70SW RAP TO DIK TO 30N INL
MOD TURB BTN FL270 AND FL410. CONDS CONTG BYD 21Z ENDG 00-03Z.

WAUS43 KKCI 261445
CHIZ WA 261445
AIRMET ZULU UPDT 2 FOR ICE AND FRZLVL VALID UNTIL 262100
AIRMET NO SGFNT ICE EXP OUTSIDE OF CNVTV ACT.
Graphical AIRMET (G-AIRMET)

- Series of graphics depicting en-route AIRMET hazards valid at 00, 03, 06, 09, and 12 hours from issuance.

- Identifies hazardous weather in space and time more precisely than text products.

- A picture’s worth a thousand contractions.
Area Forecast (FA)

- Issued 3 times per day
- 18-hr synopsis
- 12-hr forecast for visible en-route wx < FL450
- 6-hr categorical outlook
- One text product per region (SFO, SLC, CHI, DFW, BOS, MIA, AK, HI, Gulf, Carrib)
- VMCs including clouds, and general weather conditions

SYNOPSIS...AT 02Z LOW PRES NWRN MN WITH CDFNT BJI-PIR-DDY LN AND WRMFNT BJI-EAU-PMM LN. TROF FSD-TBE LN. BY 20Z LOW PRES CNTRL WI WITH CDFNT DLL-PWE-GLD LN AND WRMFNT DLL-ECK LN. ...DARRAH...

ND SCT100. OCNL BKN080 TOP FL180. ISOLD -SHRA. OTLK...VFR. .

SD WRN 1/3...SCT060 SCT120 TOP FL180. TIL 06-08Z OCNL CIG BKN050. WDLY SCT -SHRA/-TSRA. TS TOPS FL400. OTLK...VFR.

CNTRL 1/3...SCT080. OCNL BKN060. WDLY SCT -SHRA ISOLD -TSRA. TS TOPS FL400. OTLK...VFR.

ERN 1/3...SCT100. BY 05-07Z OCNL BKN080 TOP 160. OTLK...VFR SHRA. .

NE PNHNDL...AGL SCT050. TIL 04-06Z ISOLD -SHRA/-TSRA. TS TOPS FL400.

OTLK...VFR.

CNTRL AND E...AGL SCT040 BKN080 TOPS LYRD FL180. OCNL CIG OVC030. WDLY SCT -SHRA/-TSRA. TS TOPS FL450. TS POSS SEV.

CNTRL BY 06-08Z SCT030 OCNL CIG BKN020. CONDS SPRDG ACRS RMNDR BY 11-13Z. OTLK...VFR. .
Low Level Significant Wx

- Graphics product issued four times per day (00, 06, 12, 18Z)
- Frz levels, turb, low ceilings, and MVFR/IFR condition
- Surface forecasts of fronts and precipitation
- Intended for briefing the VFR pilot

- Covers the 48 contiguous states, southern Canada and the coastal waters for altitudes below 24 kft
- Each 4 panel chart is divided on the left and right into 12 and 24 hr forecasts
CDM Convective Forecast Product (CCFP)

- Automated graphical forecast of convection at 2/4/6/8 hours
- Convection is defined as a polygon of at least 3,000 mi²
- Coverage of at least 25% with echoes of at least 40 dbZ and at least one ET > 25 kft
- “Collaborated” with Canada
Collaborated Aviation Weather Statement (CAWS)

- Event Driven Convective Forecast
- Focused on ‘Impact’ to TFM
- Collaborated by government and industry Meteorologists
- Used with CCFP
  - CCFP scheduled, ‘big picture’, Automated
    - Supports longer range (4-8 hours) and 2 hourly SPO call
  - CAWS unscheduled, impact-based
    - Supports decision making (0-4 hours)
International Products
World Area Forecast System

World Area Forecast System (WAFS)
- Developed by ICAO and the WMO
- To improve the quality and consistency of enroute guidance provided for international aircraft operations.

WAFS Supported by Two World Area Forecast Centers (WAFCs)
- WAFC – Washington
- WAFC – London
International Operations Branch

 lança Global graphics

 → High level graphics - FL250 – FL630
 → Mid level graphics – FL100 – FL180

 lança Oceanic SIGMETs

 → Turbulence
 → Icing
 → Thunderstorms
 → Volcanic ash
 → Tropical cyclones

 lança Area Forecasts for the Gulf of Mexico and the Caribbean
Significant Weather Forecasts
High Level Graphic

- Covers FL250 - FL630
- Worldwide forecast
- 24 hour forecast for:
  Jet Streams
  Thunderstorms
  Turbulence
  Tropopause Heights
  Active Volcanoes
  Tropical Cyclones
Mid Level Significant Weather Graphic

- Covers FL100 – FL450 over the North Atlantic region

- Jet Streams
- Thunderstorms
- Turbulence
- Trop Hts
- Volcanoes
- Tropical Cyclones
- Icing
Oceanic SIGMETs

- Thunderstorms
- Tropical Cyclones
- Severe Icing & Turbulence
- Dust & Sand Storms
- Volcanic Ash

WSNT10 KKCI 051409
SIGA0J
TJZS SIGMET JULIETT 1 VALID 051405/052005
KKCI- SAN JUAN FIR VOLCANIC ASH FROM SOUFRIERE HILLS WI 20 NM EITHER SIDE OF LINE 1618N06300W 1550N06345W. TOPS TO FL070. ASH MOV SW 25KT. NC. BASED ON SATELLITE OBS AND LATEST ADVISRY. OUTLOOK 06/0205..NC.
Gulf of Mexico & Caribbean Area Forecasts

- To Support Helicopter Operations
  - Clouds
  - Visibility
  - Thunderstorms
  - Rain/Fog
  - Wind
- 4,000 Operating Oil Platforms
- 30,000 personnel living on oil platforms
- 600 Helicopters
- 1.3 Million flights annually
International Flight Folder Program

• Since 10/1/98 the AWC has provided meteorological information to operators and flight crews for:
  ✷ Dispatch planning
  ✷ Pre-flight briefing
  ✷ En-route guidance

• Wind/temp forecasts, SIGWX, TAFs, METARs, AIRMETs, and much more all available by fax and/or internet

• Became digital internet service 2011

• AWC shares about 40,000 charts per month!
Aviation Digital Data Service (ADDS)

- www.aviationweather.gov
- Free publicly accessible web site
- Full range of meteorological data products tailored to aviation needs.
  - TAFs and METARs in both text and graphical format
  - Winds/Temps
  - Satellite
  - Radar
  - Model forecasts
  - Interactive Java Tools
  - International Flight Folder data
  - Much more!
Collaborative Decision Making
Collaborative Decision Making

- Weather Evaluation Team (WET)
- CDM sub-team
- Developing tools and procedures to enhance Traffic Flow Management Strategic Planning
Collaborative Aviation Weather Statement 003
NWS Aviation Weather Center Kansas City MO
1312 UTC Mon 25 Jul 2016

Weather: Thunderstorms
Valid: 1900-2100Z

ARTCCs affected: ZBW, ZDC, ZID, ZNY, ZOB, ZTL
Terminals affected: KBWI, KDCA, KIAD

CCFP: 13Z Issuance - Coverage/confidence too low, location adjustment

SUMMARY: High confidence areas of thunderstorms over ZBW/ZDC/ZNY/ZOB/ZTL/ZID at 19Z & 21Z.

DISCUSSION: High confidence area of thunderstorms over ZBW/ZDC/ZNY/ZOB at 19Z & 21Z with tops FL450+ ((over ZNY/ZOB/ZBW), tops FL350 (over ZDC/ZNY), tops FL350 (over ZTL/ZID).

Operations Note - CCFP areas that are not displayed in the CAWS graphic for the valid times posted are deemed to be accurate unless otherwise stated.
ICAO Weather Exchange Model (IWXXM)
Key IWXXM Issues

- November 2016 - ICAO Annex 3 amended to make the exchange of XML products a **recommended** practice.
- November 2018 - ICAO Annex 3 amended to make the exchange of XML products a **mandatory** practice.
  - MIE recommend to METP to push back to 2020 amendment 80
- MIE Leaning toward providing the actual measured value in IWXXM messages
  - Will not affect current FAA or ICAO regulations
  - Human-readable conversions can display “binned” or “rounded” values as desired
  - Provides higher resolution data for higher end users or more sophisticated decision makers
  - Higher resolution observed data will enable improved precision in forecasts and more efficient use of airspace
Key IWXXM Issues

- Many states will not be able to provide IWXXM messages even by 2020
- MIE developing guidance for ICAO regions to transition and implement
  - Bilateral agreements
  - ROC as translation center