Baltimore/Washington Weather Forecast Office (WFO/LWX) Aviation Users Group Forum

December 17, 2020

Welcome and Roll Call

Jim Lee, Meteorologist-in-Charge, WFO LWX
Andrew Snyder, Aviation Program Leader, WFO LWX

AGENDA

- CWSU updates
  - Review of group's purpose and NWS mission
  - Aviation News Briefs
  - Updated NWS TAF directive
  - Case review: Tropical Storm Isaias (LLWS forecasting)
  - Review of action items from 2019 forum
  - Open Forum
  - Review new action items and close

CWSU Updates

Rick Winther, Meteorologist-in-Charge, ZDC

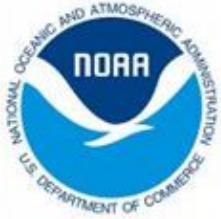
Purpose, Mission, and NWS Review

Forum Goals

- Enhance communication and strengthen partnerships between the National Weather Service (NWS) and the mid-Atlantic aviation community
- Discuss ways to improve NWS aviation forecast operations and services in the mid-Atlantic
- Identify issues and receive feedback from aviation core customers
- Establish best practices for mid-Atlantic aviation forecasts and services

Administrative Structure

Department of Commerce



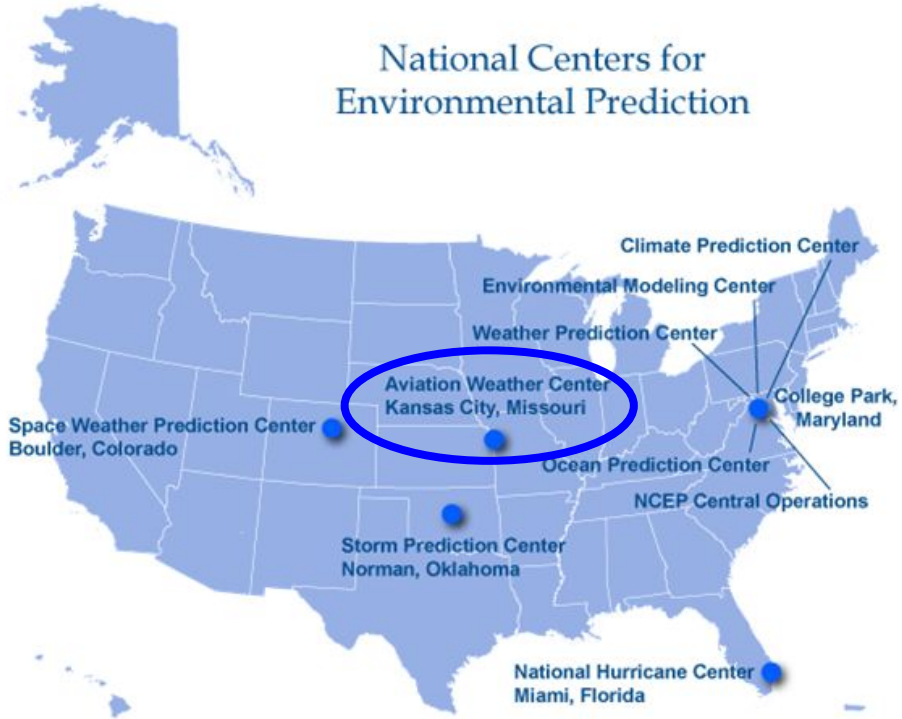
National Oceanic & Atmospheric Administration

National Weather Service (NWS)

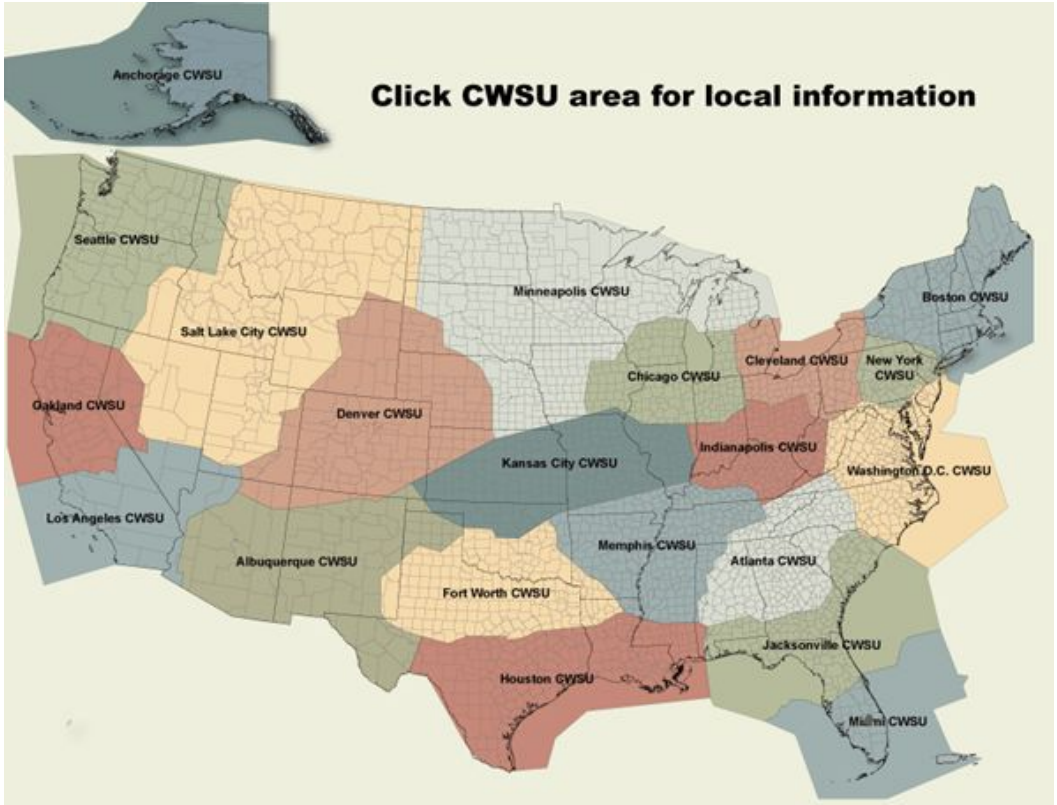
NWS Mission

- Provide climate, water, weather forecasts and warnings to protect life and property and the enhancement of the national economy
- Vision: A Weather-Ready Nation. Society is prepared for and responds to weather, water, and climate-dependent events.
- Maintain the national climate database
- Data and products are used by other government agencies, the private sector, the public and the global community

NWS Structure

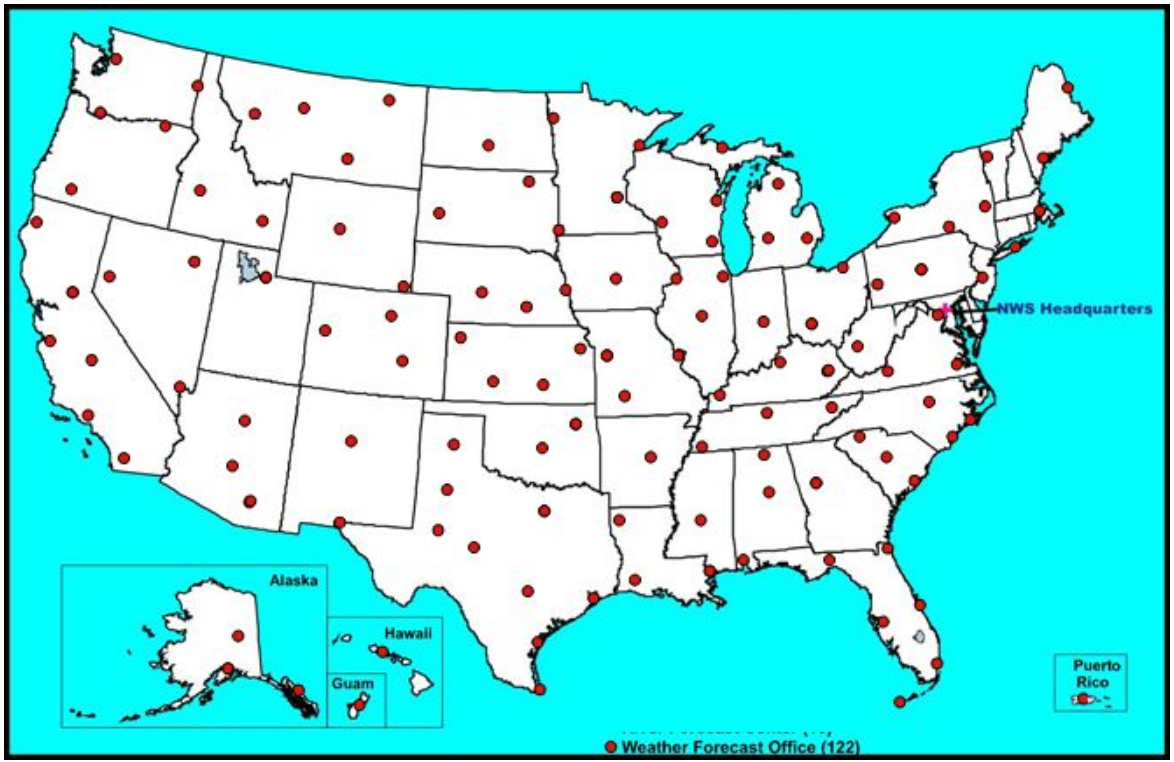


NWS Structure

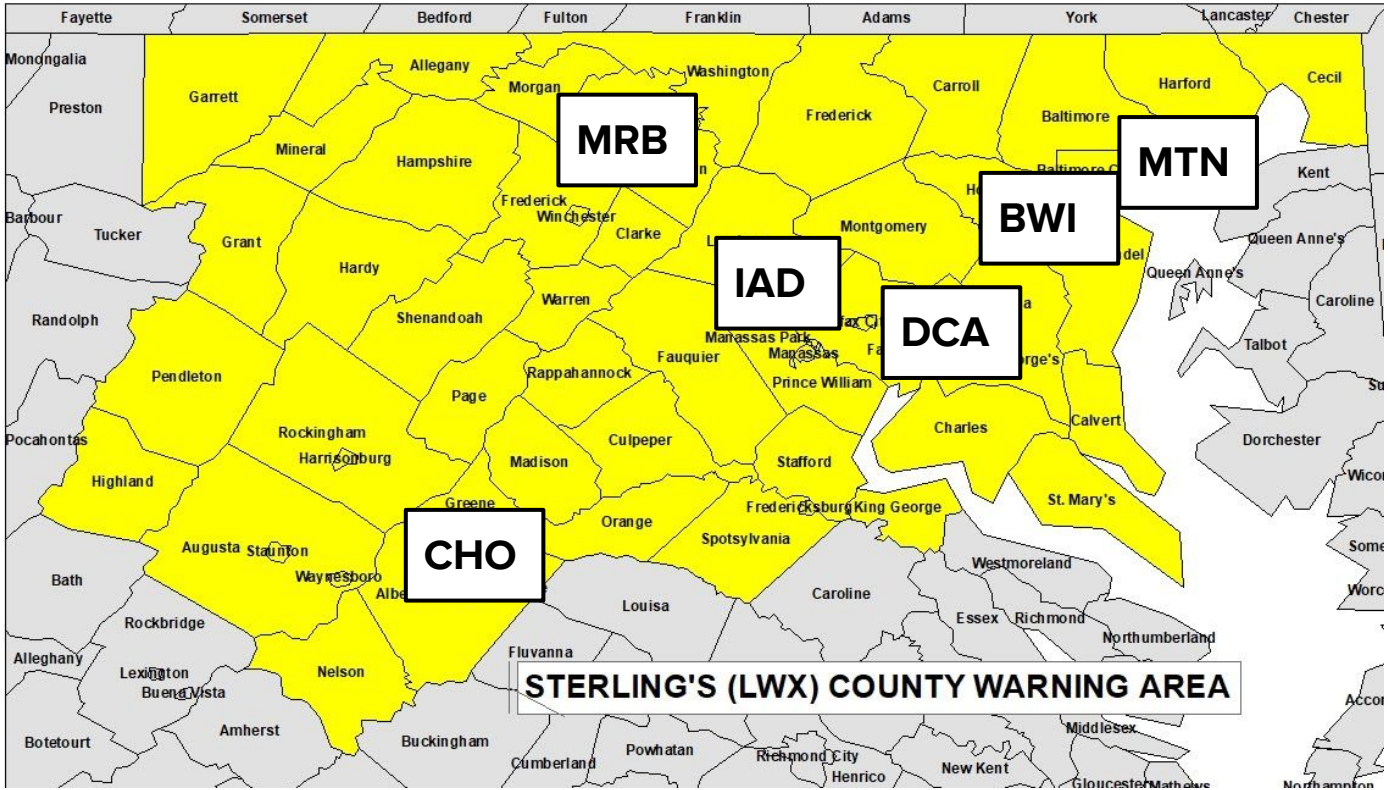


NWS Structure

122 Weather Forecast Offices

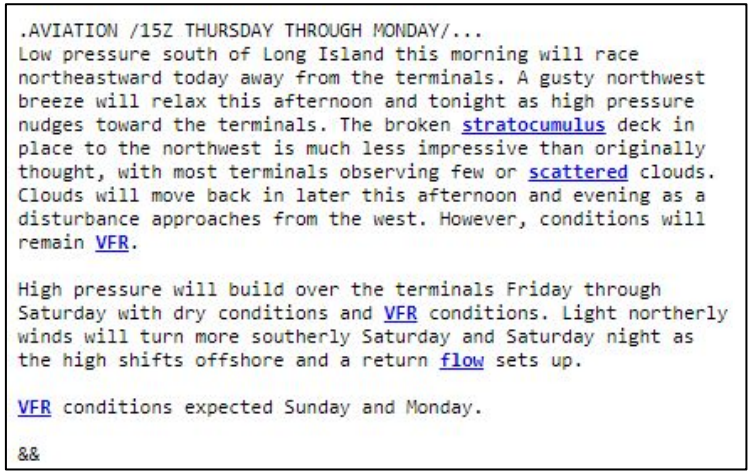


Terminal Aerodrome Forecasts



Area Forecast Discussion

- Discussion of conditions within the valid TAF period
  - Basic description of what is driving weather and expected flight conditions
  - Range of possible timing for changes in conditions
  - Confidence level / where the TAF might go wrong
  - Model guidance sources
  - Why TAF was written a certain way
- “Sound bites” of important weather through Day 5
- Updated around 4:00 AM, 10:30 AM, 3:00 PM, 9:30 PM



.AVIATION /15Z THURSDAY THROUGH MONDAY/...
Low pressure south of Long Island this morning will race northeastward today away from the terminals. A gusty northwest breeze will relax this afternoon and tonight as high pressure nudges toward the terminals. The broken stratocumulus deck in place to the northwest is much less impressive than originally thought, with most terminals observing few or scattered clouds. Clouds will move back in later this afternoon and evening as a disturbance approaches from the west. However, conditions will remain VFR.

High pressure will build over the terminals Friday through Saturday with dry conditions and VFR conditions. Light northerly winds will turn more southerly Saturday and Saturday night as the high shifts offshore and a return flow sets up.

VFR conditions expected Sunday and Monday.

&&

Local Aviation Website

https://www.weather.gov/lwx/aviation

or Forecasts drop down → Aviation

Aviation Forecast Discussion

Hourly weather details

Hourly TAF details/impacts

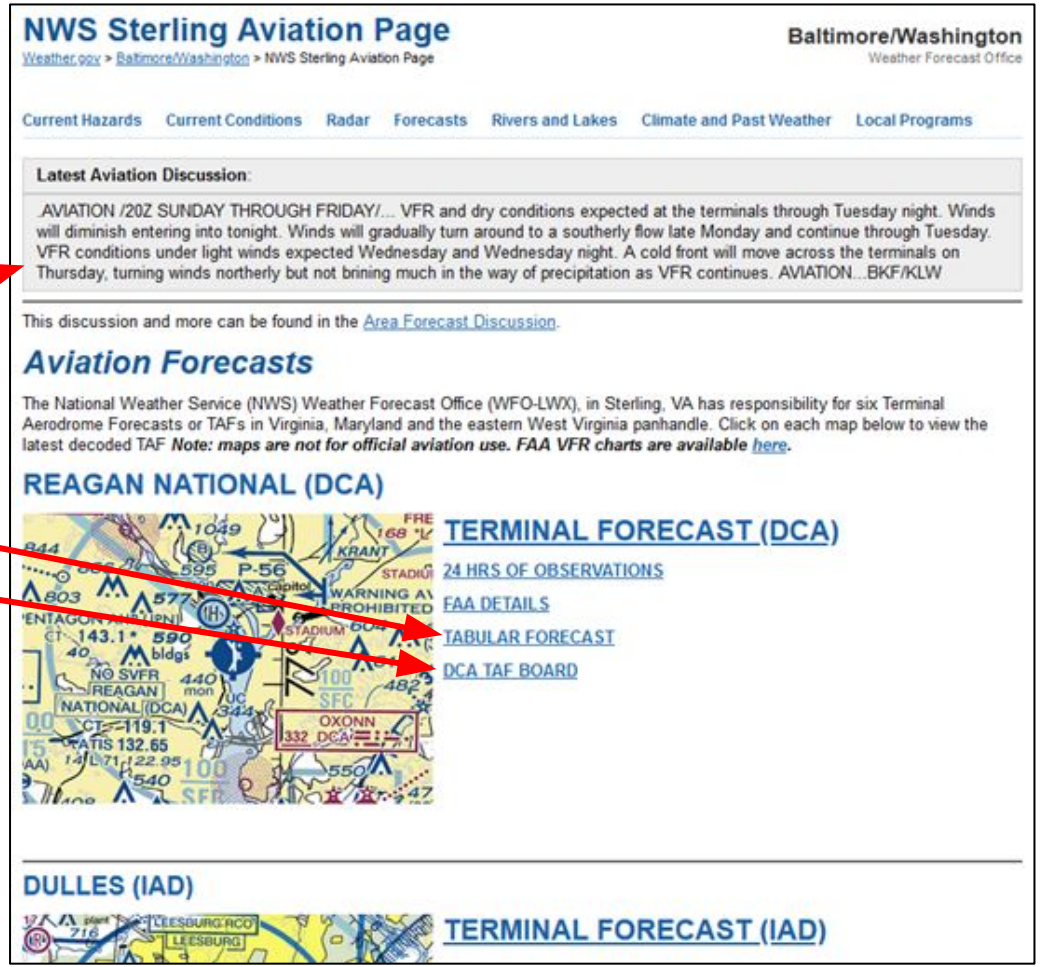
At the bottom:

CWSU links

Weather maps

Wind rose data

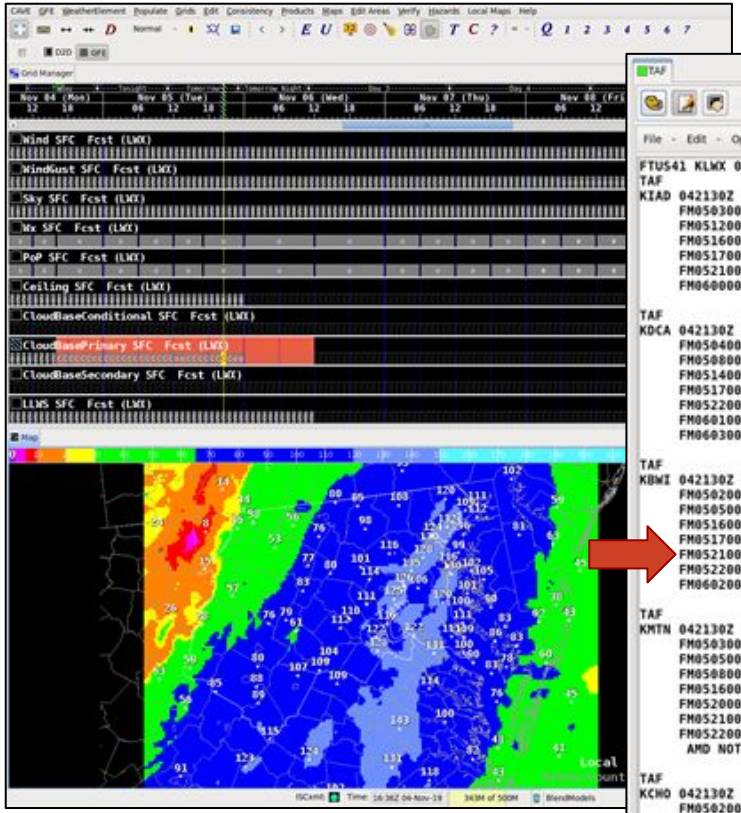
Other links

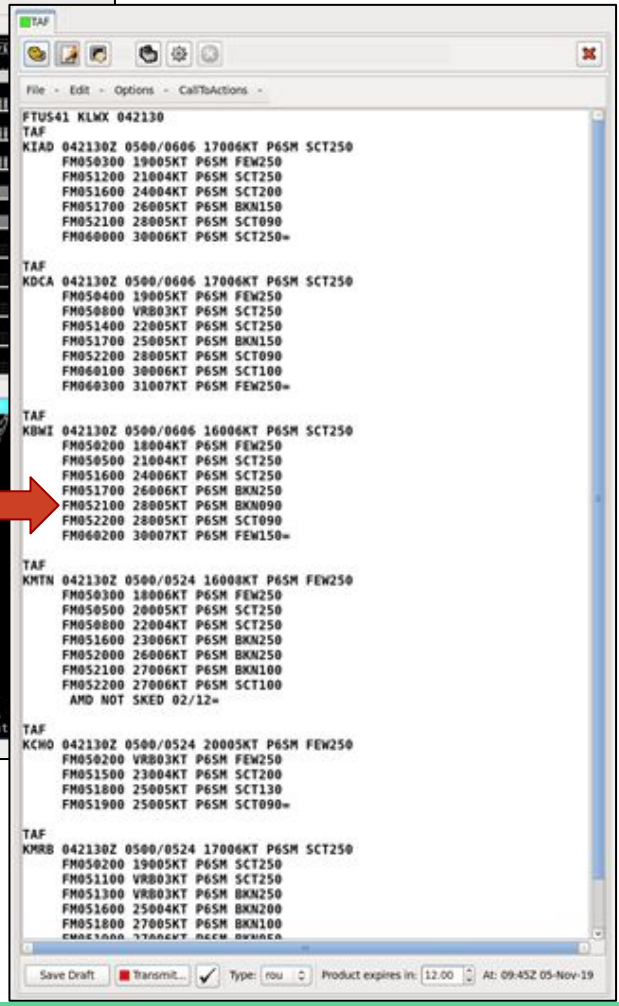


TAF Creation

Digital Aviation Services

- One common digital forecast database
- Formatter code samples database at TAF grid points, creates hourly forecast
- Code deletes lines through a “ranking system”
- Forecaster QC’s/ modifies before transmission





Aviation News Briefs

FY20 TAF Verification (IFR and below)

* Does not include amendments

Overall

	POD	FAR	CSI
Goal	0.65	0.38	
Nat'l	0.647	0.336	0.487
ER	0.682	0.322	0.515
LWX	0.714	0.286	0.555

POD = Probability of Detection, higher is better
FAR = False Alarm Ratio, lower is better
CSI = Critical Success Index, higher is better

$$CSI = \frac{1}{1/(1-FAR) + (1/POD) - 1}$$

Goal = National performance metric set as part of Government Performance and Results Act

FY20 TAF Verification (IFR and below)

* Does not include amendments

By Issuance Time

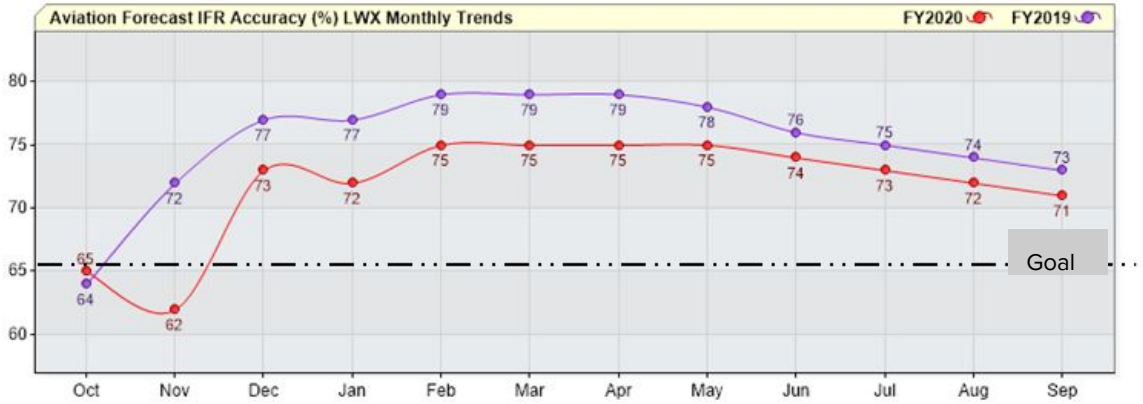
	POD	FAR	CSI
Goal	0.65	0.38	
00Z	0.697	0.297	0.539
06Z	0.732	0.325	0.541
12Z	0.711	0.225	0.589
18Z	0.70	0.289	0.545

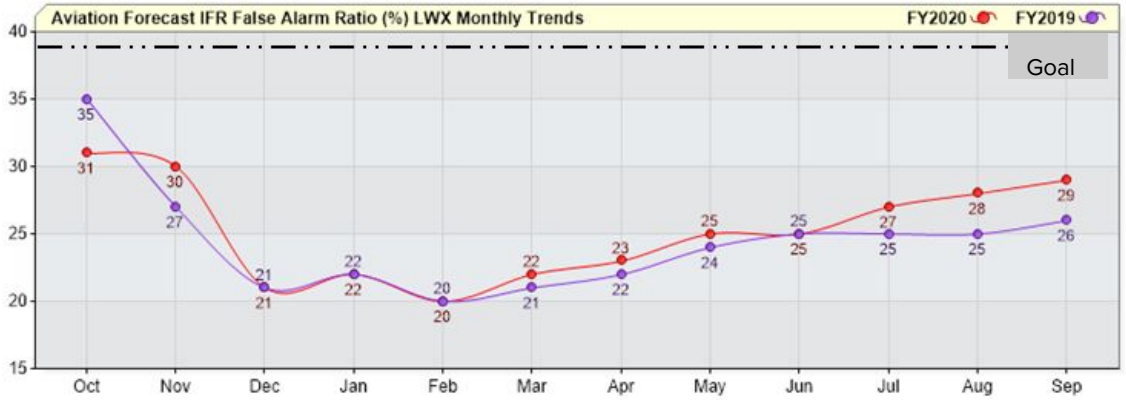
Green is best performer
Orange is worst performer

By Airport

	POD	FAR	CSI
Goal	0.65	0.38	
BWI	0.749	0.239	0.606
CHO	0.677	0.290	0.531
DCA	0.762	0.346	0.543
IAD	0.733	0.269	0.577
MRB	0.672	0.377	0.478
MTN	0.705	0.21	0.594

2020 vs. 2019 Monthly Verification Trends





Annual Verification Trends

Status of NWS Baltimore/Washington TAF Service

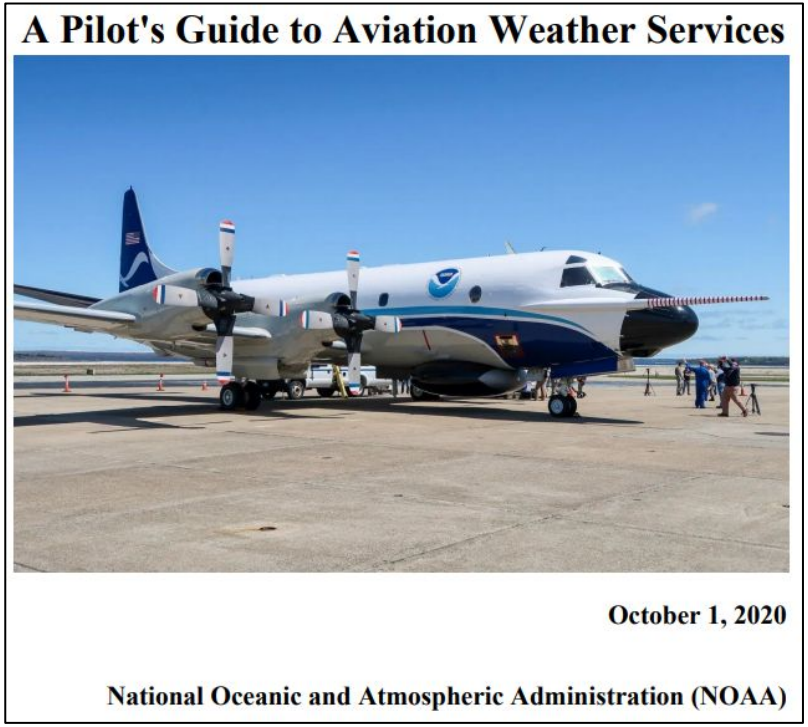
- After review by NWS and FAA leaders, our 6 current TAF locations will remain the same.
- KHEF submitted request to add TAF service. It is under review.
- New opportunities for aviation forecast services as DAS expands.

Pilot Help Guide Released

A Pilot's Guide to Aviation Weather Services

Revival of an early 1990s pamphlet.

Please share!



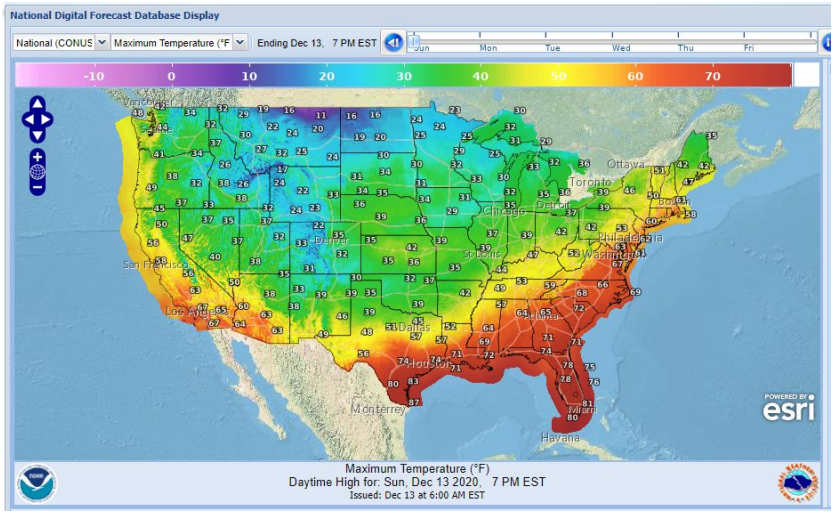
National Blend of Models v4.0

- Cloud base/Visibility:
  - Hours 1-36: GLAMP (Graphical Local Aviation MOS Program)
  - Hours 37-78: MAV/MET (GFS/NAM MOS) blend using LAMP technique
- Probabilistic ceiling & visibility tuned to URMA (Unrestricted Mesoscale Analysis -- which now incorporates satellite)
- Winds trained to METARs
- LLWS: which models have scalar difference of 30 kt? ➔ compute speed and direction at 2kft
  - Potential to over-forecast (one model blend)
- HRRR v4 (High Resolution Rapid Refresh model) sky cover is promising (goes into NBM)

https://www.weather.gov/mdl/nbm_home

DAS Availability on NDFD (National Digital Forecast Database)

- Data available from offices who send it, but not in any “viewer”
- Timeline has slipped for making data viewable nationally
- Desire to have ceiling/visibility/LLWS to 36 hr



Aviation Services

- Nationwide consistency of TAF generation and components like VCTS are on radar of national program leaders
- IWXXM TAFs now being issued in background
- TAFs will be sent out as a collective instead of individual products

NWS TAF Directive Update

- 10-813 Terminal Aerodrome Forecasts
- ***10-813 Terminal Aerodrome Forecasts*** **, *effective date November 18, 2020***

Changes that influence TAF structure

- TEMPO groups allowed beyond first 9 hours
- 8 lines explicitly allowable (only 6 mentioned previously); encouraged in 30 hour TAFs as needed

Points of Emphasis / Encouraged

- More detail for/importance of low wind speeds
- Definition of vicinity (5-10SM) addressed “specifically”
- Use three frozen precipitation types judiciously
- Adds AWC/NAMs to collaboration in addition to CWSU
- Updates instructions to ensure TAFs are consistent with TCF
    - Mention thunderstorms (prevailing or TEMPO) when coverage is at least medium

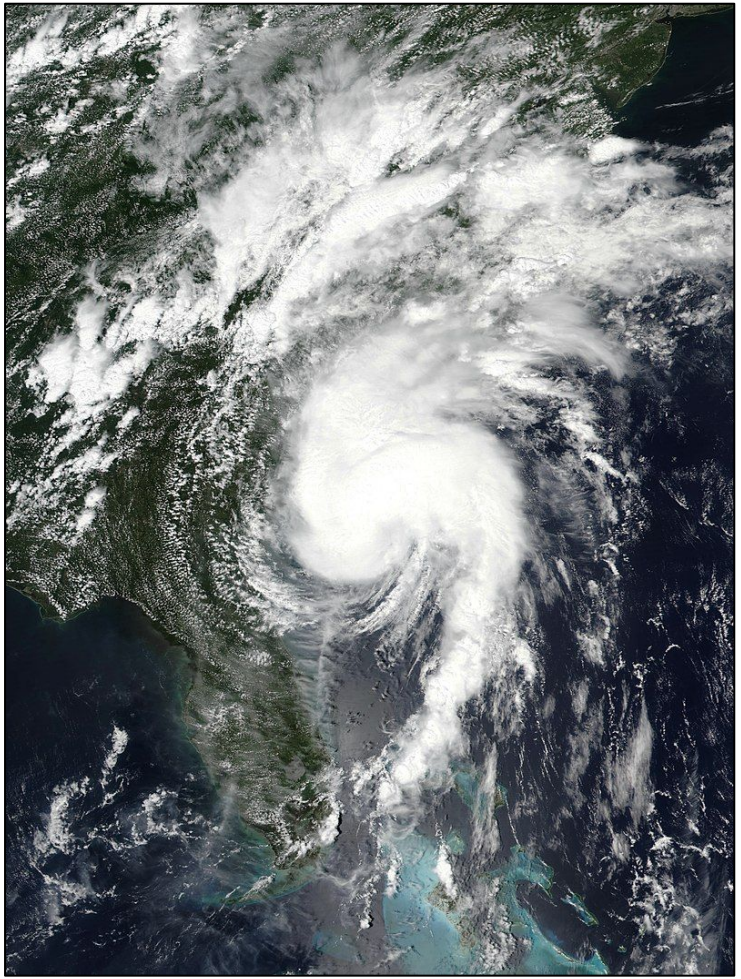
Etc.

- More clarity in LLWS section
- More specific examples of when new FM group should be used
- Does not specifically address how to handle thunderstorms yet

Case Study: Tropical Storm Isaias

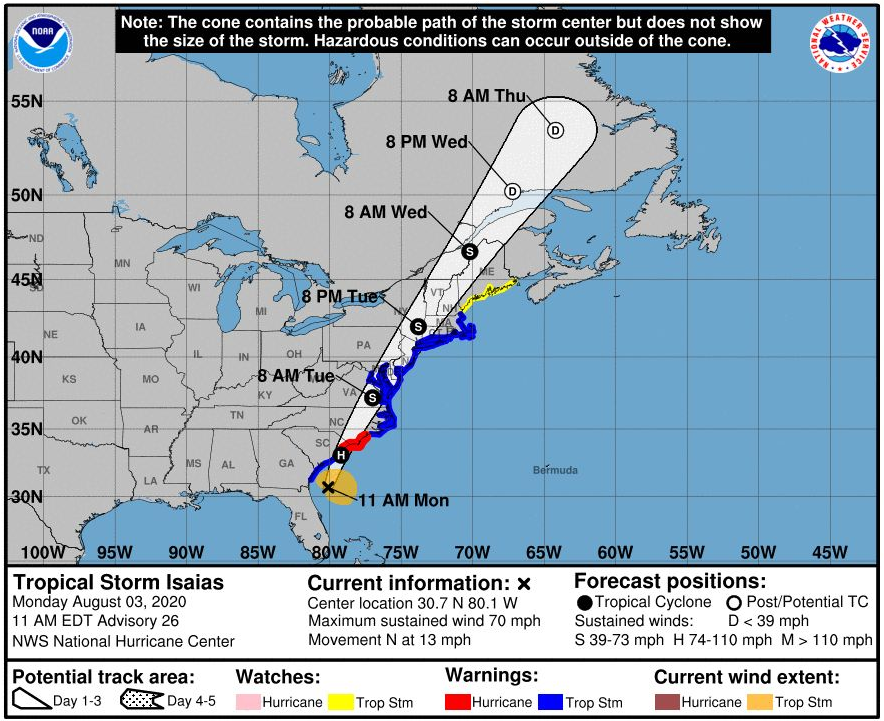
Overview

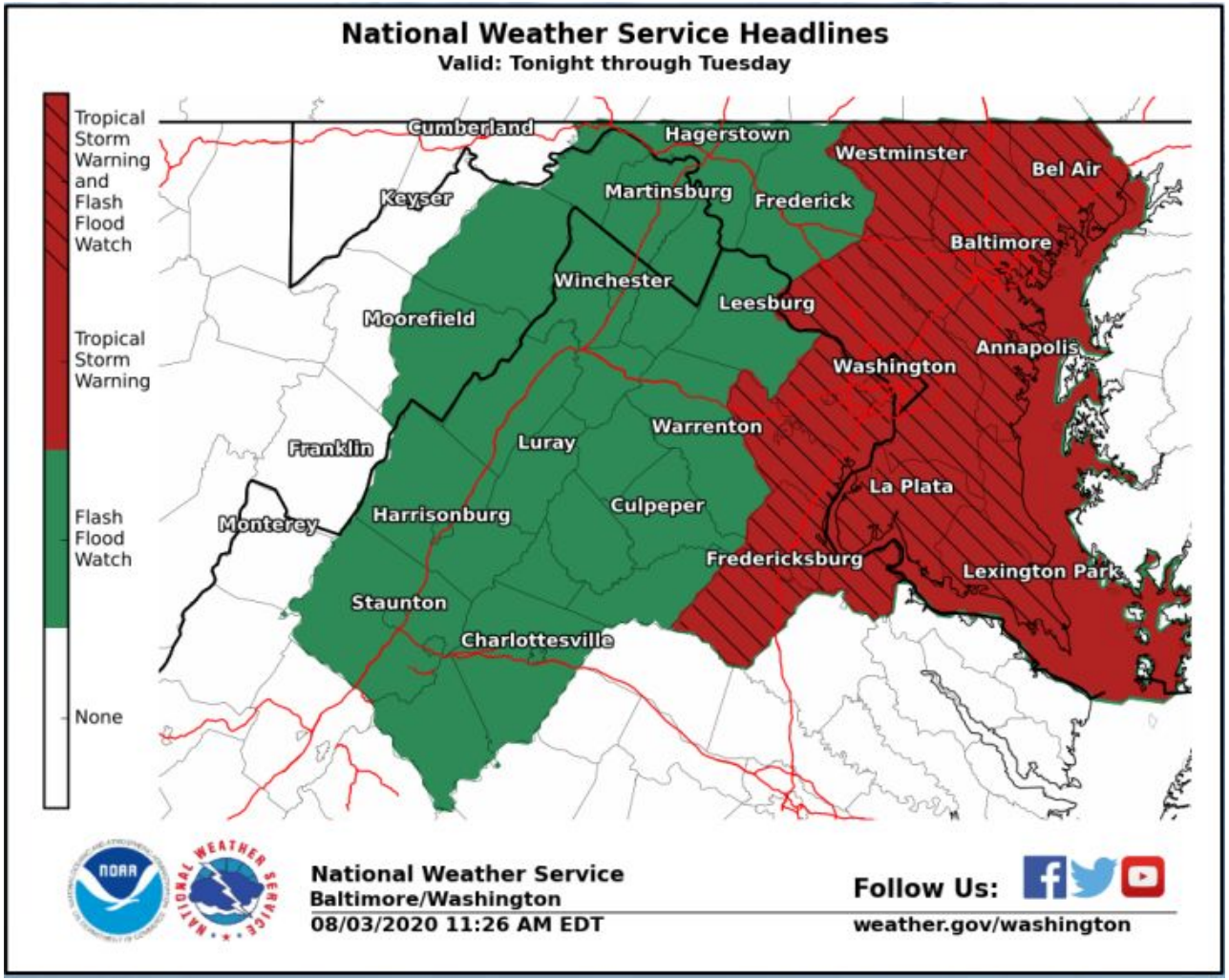
- July 30-August 6
- Peaked at Category 1 hurricane
- Impacted Bahamas
- Made landfall in SE NC
- 46 total tornadoes, 8 EF2+
- 2.7 million power outages
- Estimated $4.5 billion in damage



Local impacts

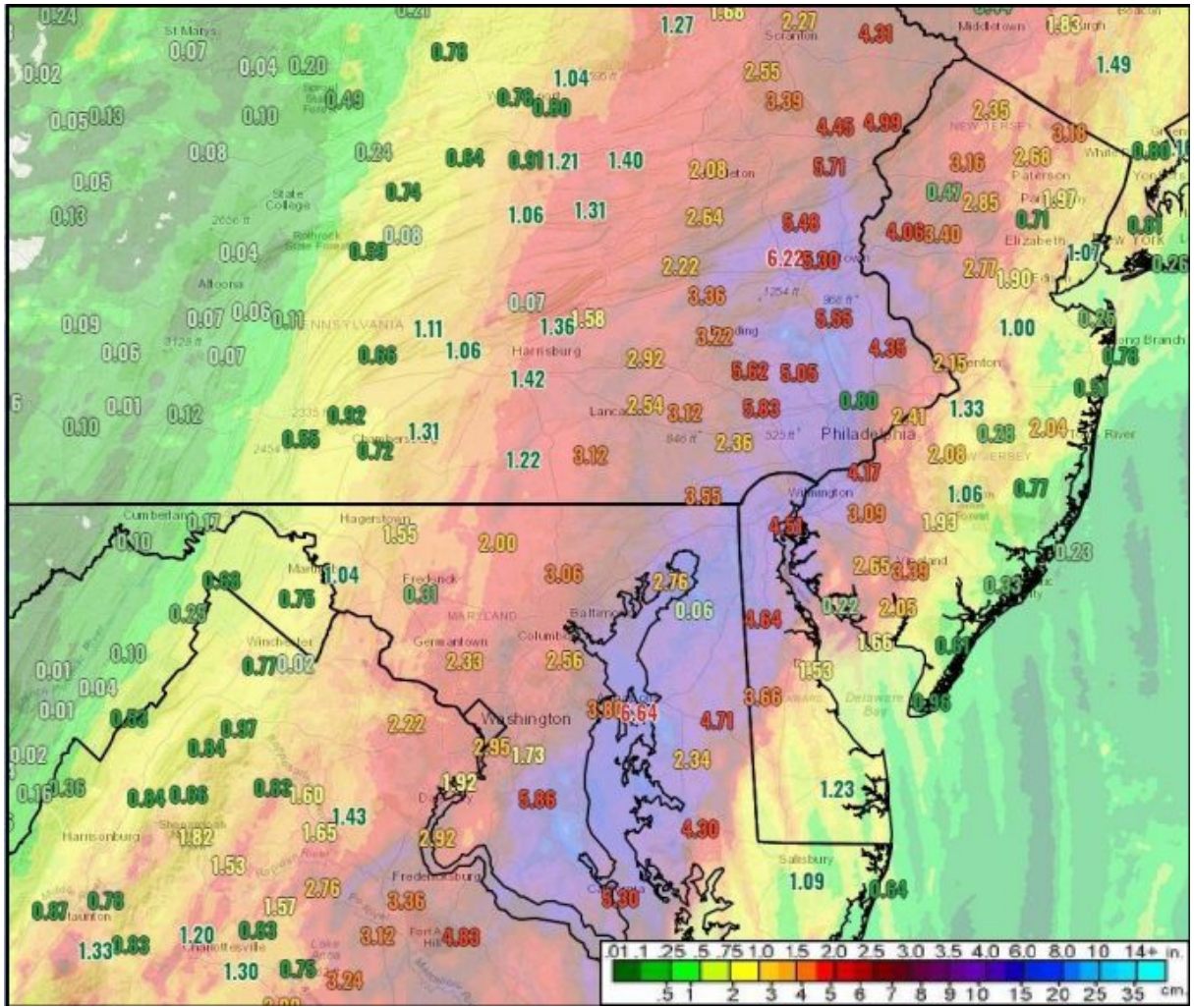
- 3 tornadoes in southern MD
- Heavy rain resulting in flash flooding, southern MD hard hit
- Strong winds resulting in tree damage, worst closest to the Chesapeake Bay
- Estimated $22 million damages in Maryland



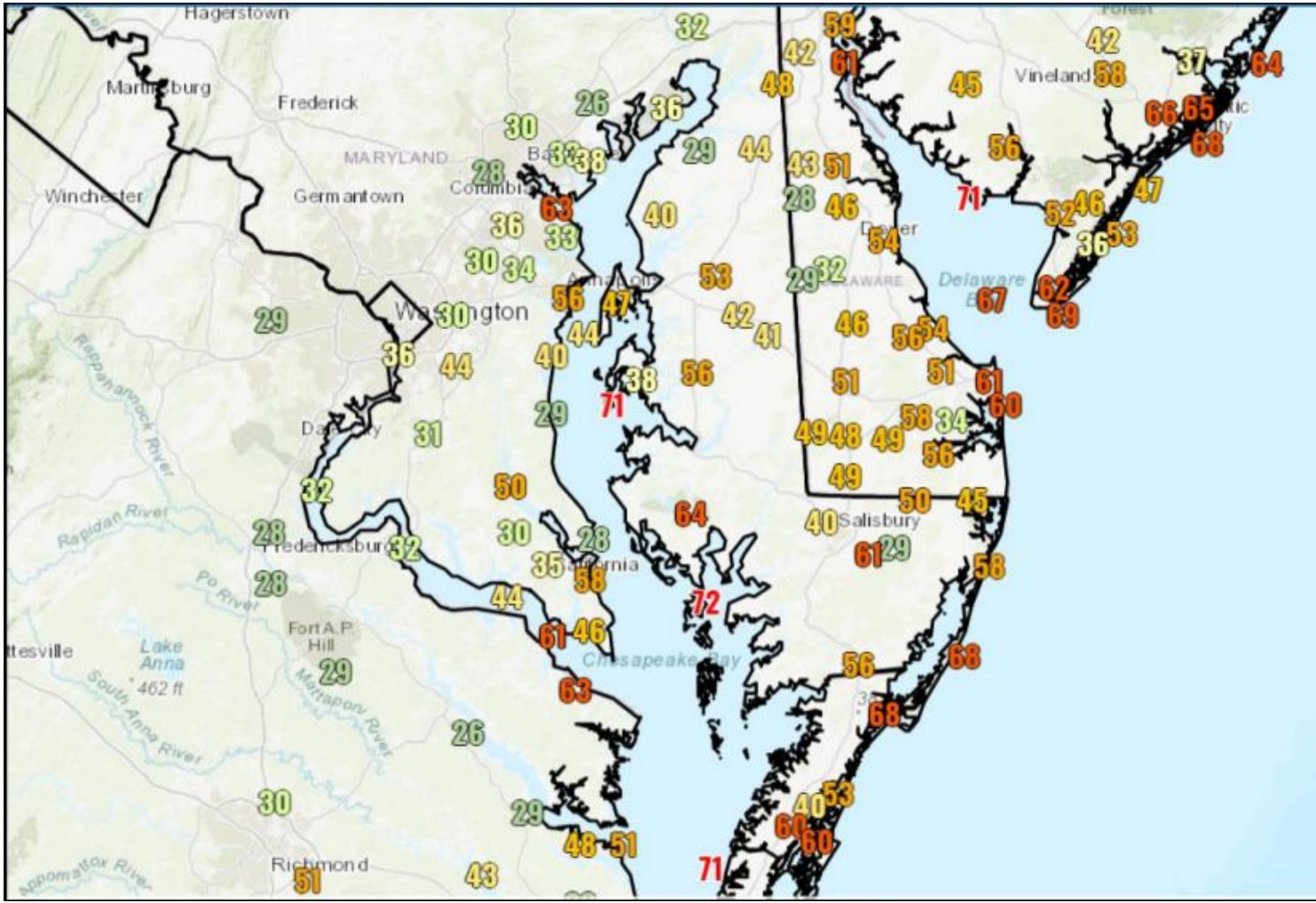

National Weather Service Headlines
Valid: Tonight through Tuesday
Tropical Storm Warning and Flash Flood Watch
Tropical Storm Warning
Flash Flood Watch
None
Cumberland
Hagerstown
Westminster
Bel Air
Keyser
Martinsburg
Frederick
Baltimore
Winchester
Leesburg
Moorefield
Annapolis
Washington
Warrenton
Franklin
Luray
La Plata
Culpeper
Monterey
Harrisonburg
Fredericksburg
Lexington Park
Staunton
Charlottesville
National Weather Service
Baltimore/Washington
08/03/2020 11:26 AM EDT
Follow Us:
weather.gov/washington

Estimated Rainfall

Chaptico Creek



Wind Gusts


Hagerstown
Martinsburg
Frederick
MARYLAND
Winchester
Germantown
Columbia
Vineland
Delaware
Salisbury
Fredericksburg
Fort A.P. Hill
Lake Anna
462 ft
Rappahannock River
Rapidan River
Po River
South Anna River
Mattaponi River
Appomattox River
Richmond
Chesapeake Bay

Tornadoes

NATIONAL WEATHER SERVICE
OCEANIC AND ATMOSPHERIC ADMINISTRATION

Preliminary
Damage Survey Results

Near Plum Point, MD	
Date	Tue Aug 4 2020
Time (Local)	7:33-7:37 AM EDT
EF Rating	EF1
Est. Peak Winds	90 MPH
Path Length	1.7 MILES
Max Width	100 YARDS
Injuries/Deaths	0/0

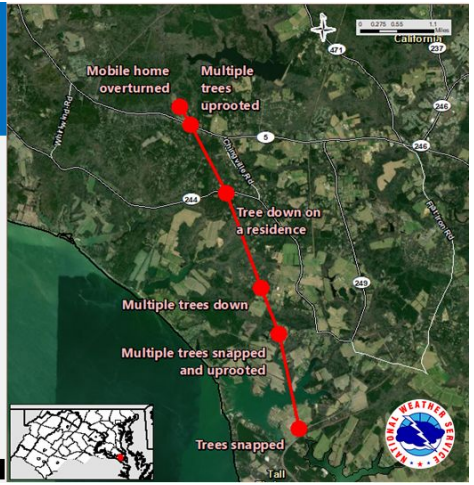
ISSUED: 4:40 PM - Wednesday, August 5, 2020

NATIONAL WEATHER SERVICE
OCEANIC AND ATMOSPHERIC ADMINISTRATION

Preliminary
Damage Survey Results

Piney Point to Callaway, MD	
Date	Tue Aug 4 2020
Time (Local)	6:32-6:41 AM EDT
EF Rating	EF-1
Est. Peak Winds	95 MPH
Path Length	5.3 MILES
Max Width	100 YARDS
Injuries/Deaths	0/0

ISSUED: 7:44 PM - Friday, August 7, 2020

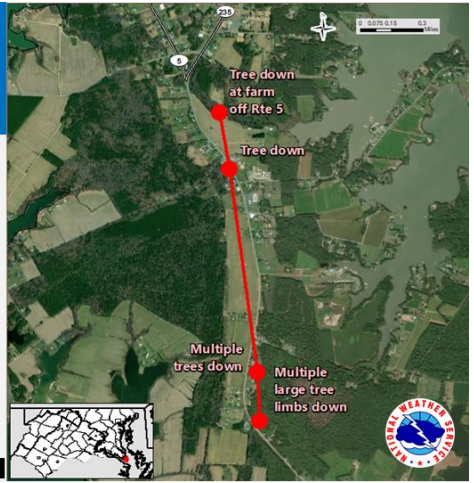


NATIONAL WEATHER SERVICE
OCEANIC AND ATMOSPHERIC ADMINISTRATION

Preliminary
Damage Survey Results

Near Scotland, MD	
Date	Tue Aug 4 2020
Time (Local)	6:27-6:31 AM EDT
EF Rating	EF-0
Est. Peak Winds	80 MPH
Path Length	1.5 MILES
Max Width	75 YARDS
Injuries/Deaths	0/0

ISSUED: 6:20 PM - Friday, August 7, 2020



But was there LLWS?

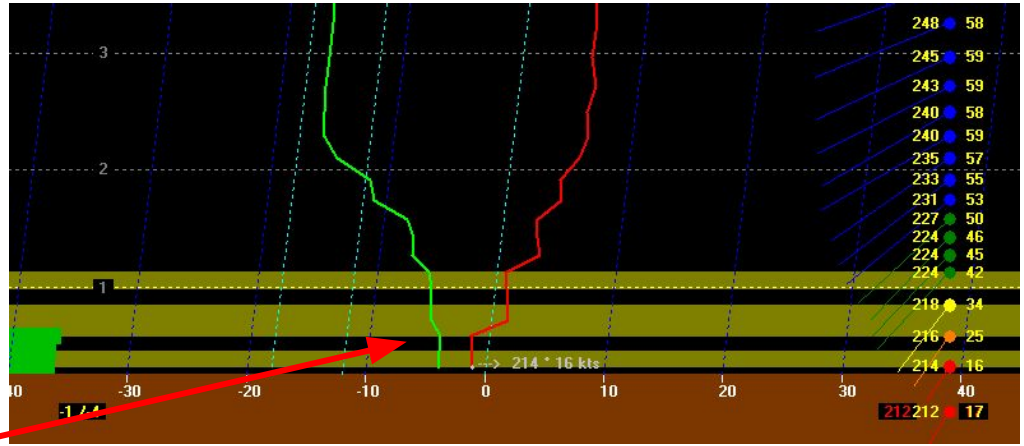
Key points from directive:

- 30 kt within 2000 ft AGL (non-convective)
- Not a pure difference in speed from top to bottom of layer
- Directional shear and a critical layer are often important
- Gusty surface winds from a deep mixed layer often result in mechanical turbulence instead of LLWS
- PIREP of 30 kt gain/loss of airspeed within 2000 ft of surface warrants an addition to the TAF
- Collaborate with CWSU on when to include in the TAF
- Definitions have changed slightly over the past decade

Old Examples

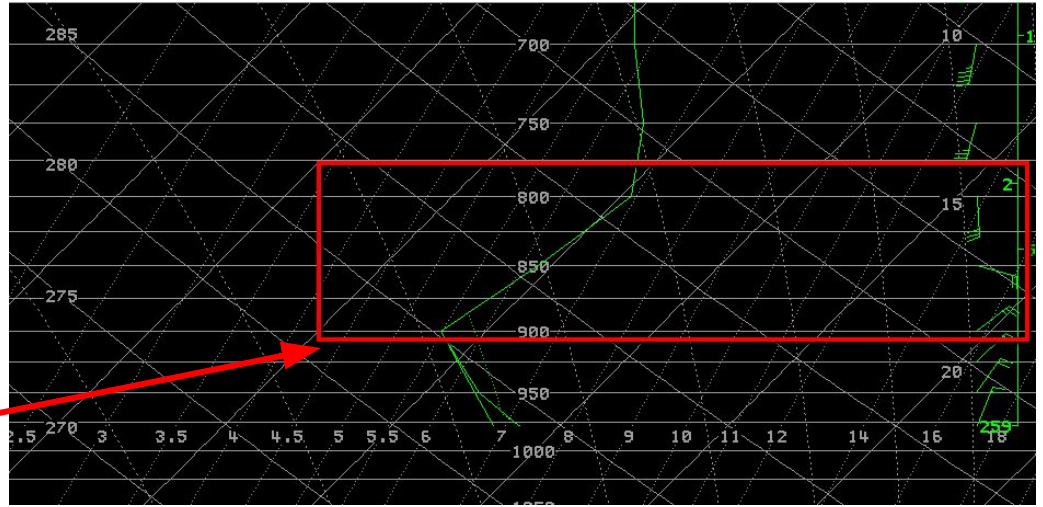
This instigated inclusion of LLWS in many TAFs across the midwest but verified in only one PIREP of LLWS

➜ No directional change, gradual increase in speed



This resulted in a 25 kt change in airspeed (but above 2000ft AGL)

➜ Sharp directional change with moderate speed in small layer



Tools at our disposal

Forecast soundings

➜ Layer shear tool in BUFKIT (model sounding analysis tool)

DAS

- Algorithm/tool calculation (LWX current default)
  ➜ Uses NWS forecast surface wind and selected model wind aloft
- National Blend of Models
- CONSShort (blend of near term mesoscale models)

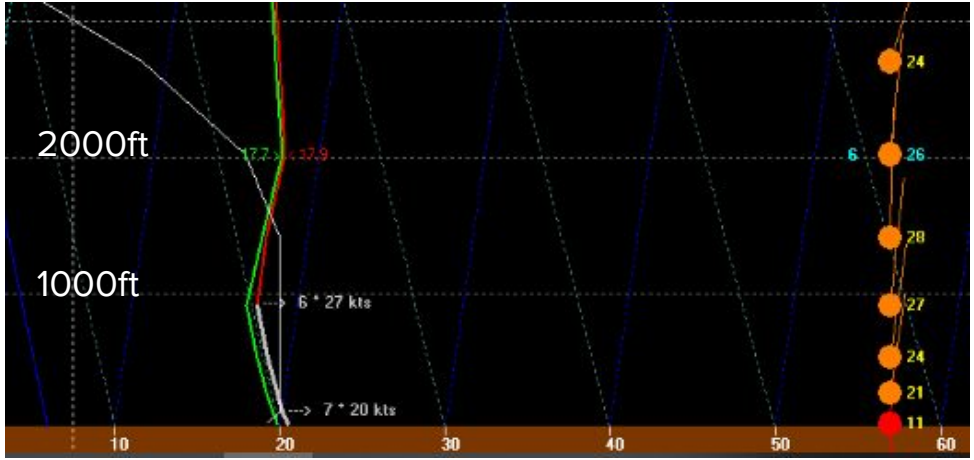
* Vertical resolution can be an issue

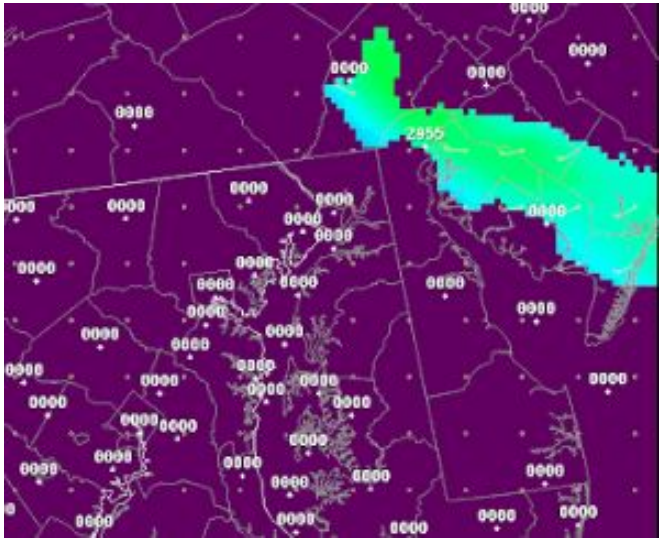
Other tidbits over the years

- “Several pilots (GA and FedEx) have told me LLWS is really hard to get outside of thunderstorms or lake/terrain breezes.” *-Ohio SOO*
- AWC met looks at vector difference between 2,000 ft (AGL) wind and 10 m wind (40 kt a good threshold) [*note: how to calculate/visualize on the fly?*]
- “In some cases, I think the pilots report LLWS when it should be reported as Mechanical Turbulence. In high wind events (i.e. NW winds 25g40 kt with a well mixed atmosphere in the low-levels) pilots will often send a PIREP with LLWS +- 20 gain/loss of speed). This type of report triggers an update in the TAF but is it truly LLWS or severe turbulence?” *-CWSU MIC*

What about Isaias?

- Our TAFs intermittently had LLWS for some airports but not others.
- Strong winds, but forecast soundings showed little shear in lowest 2000 ft
- Only a few PIREPS of LLWS EWR to BOS, worst was +/- 20kt
- Likely an artifact of algorithm due to offset between NWS vortex center at surface and NAM vortex center aloft, creating *directional* shear
- Created small ribbons of transient LLWS ➔ hit or miss nature in TAFs





Thoughts to ponder…

- Fractional amount of training compared to other aviation hazards
- Definition is difficult to conceptualize and forecast compared to other hazards
- Somewhat rare event
- “Black Box” tools and model blends
- Equals forecasters accepting algorithm/model output?

- Mets: Do you have LLWS forecasting tips?
- What are important LLWS thresholds to you?
- When is LLWS important/impactful (outside of thunderstorms)?
- Any other observations/recommendations regarding LLWS?

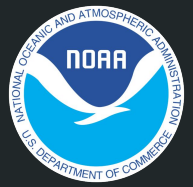
Review Action Items From 2019 Meeting

https://docs.google.com/document/d/1-m9D_TrP5XXGccZnkvyxJvvJT2dKs_Fl1CoJ7UXWbeA/edit

(for attendee access to list, see separate email attachment)

Open Forum

Questions, comments, concerns



Review New Action Items

Thank you for attending!

Plan for an annual meeting in late fall/early winter time frame

Contact information:

- Jim Lee, LWX Meteorologist-in-Charge: james.e.lee@noaa.gov
- Rick Winther, ZDC Meteorologist-in-Charge: richard.winther@noaa.gov
- Steve Zubrick, LWX Science and Operations Officer: steven.zubrick@noaa.gov
- Andrew Snyder, LWX Aviation Program Leader: andrew.snyder@noaa.gov
- 24/7 operations floor: 571-888-3501 (NEW; unlisted)