



# NWS NAM Weather Impacts

FPAW

**Frank Brody**  
Meteorologist in Charge  
National Weather Service  
National Aviation Meteorologists  
FAA/ATCSCC, Warrenton, VA  
*August, 2016*  
*FPAW/NBAA*



# Overview

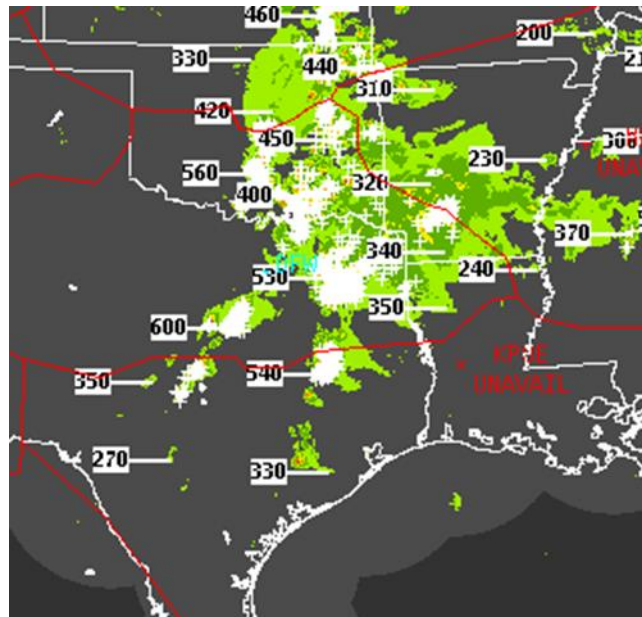
- **Situations:**
  - April 29, 2016
  - June 30 - July 1, 2016
- **Conceptual Model - Delays vs Met Inputs**
- **Summary**

**“Weather is intertwined with nearly every decision we make.”**

**- Bryan Beck, FAA / ATCSCC National Operations Manager (NOM)**



# April 29, 2016

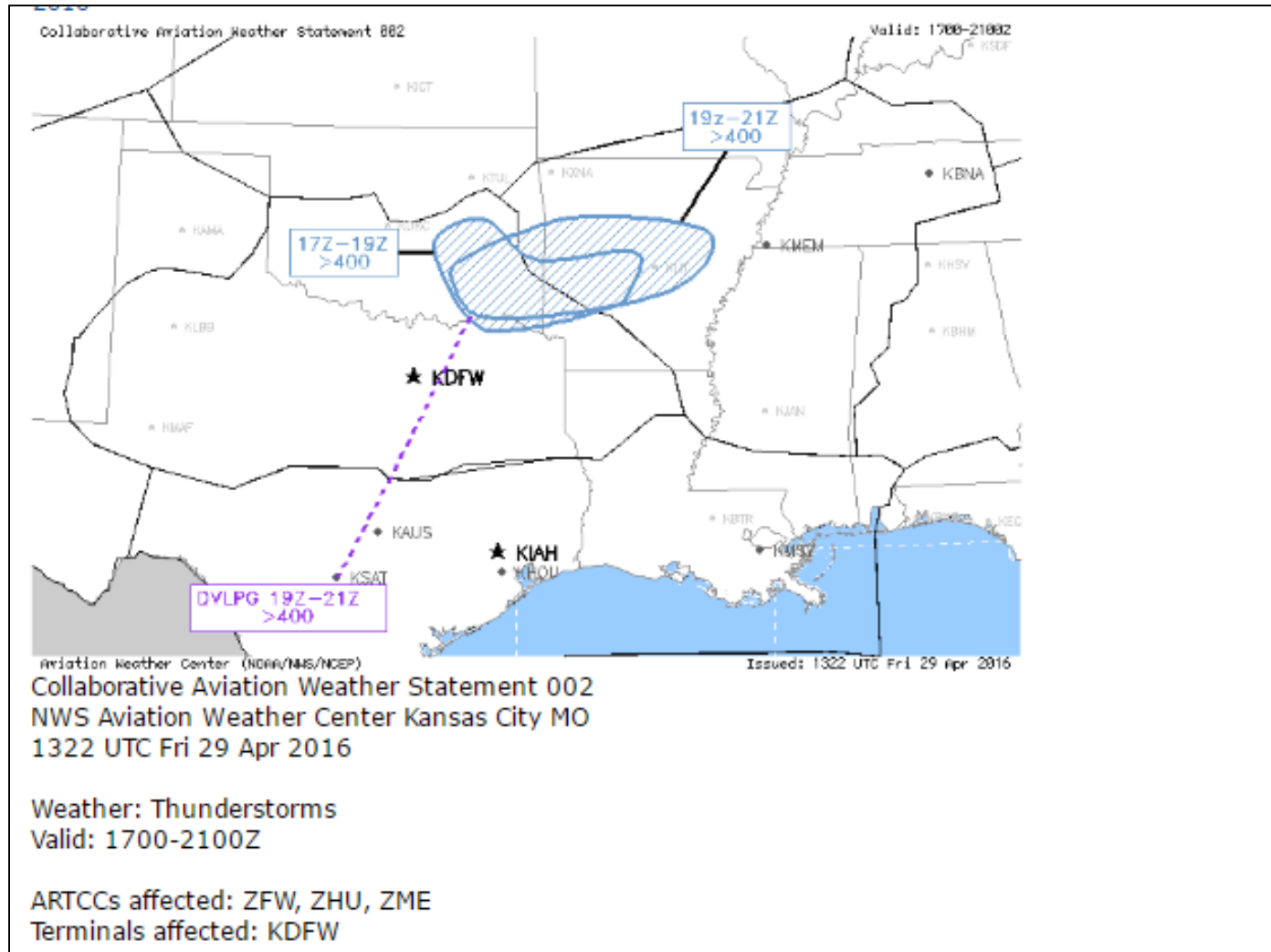


# April 29, 2016: DFW

- NAM / CWSU briefings and CAWS 11Z – 14Z focused on TS line development in east TX after 19Z
- FAA GDP issued at 1530Z ... for period 19Z – 02Z
- GDP Issued several hours before TS started
- GS in place 19Z – 01Z

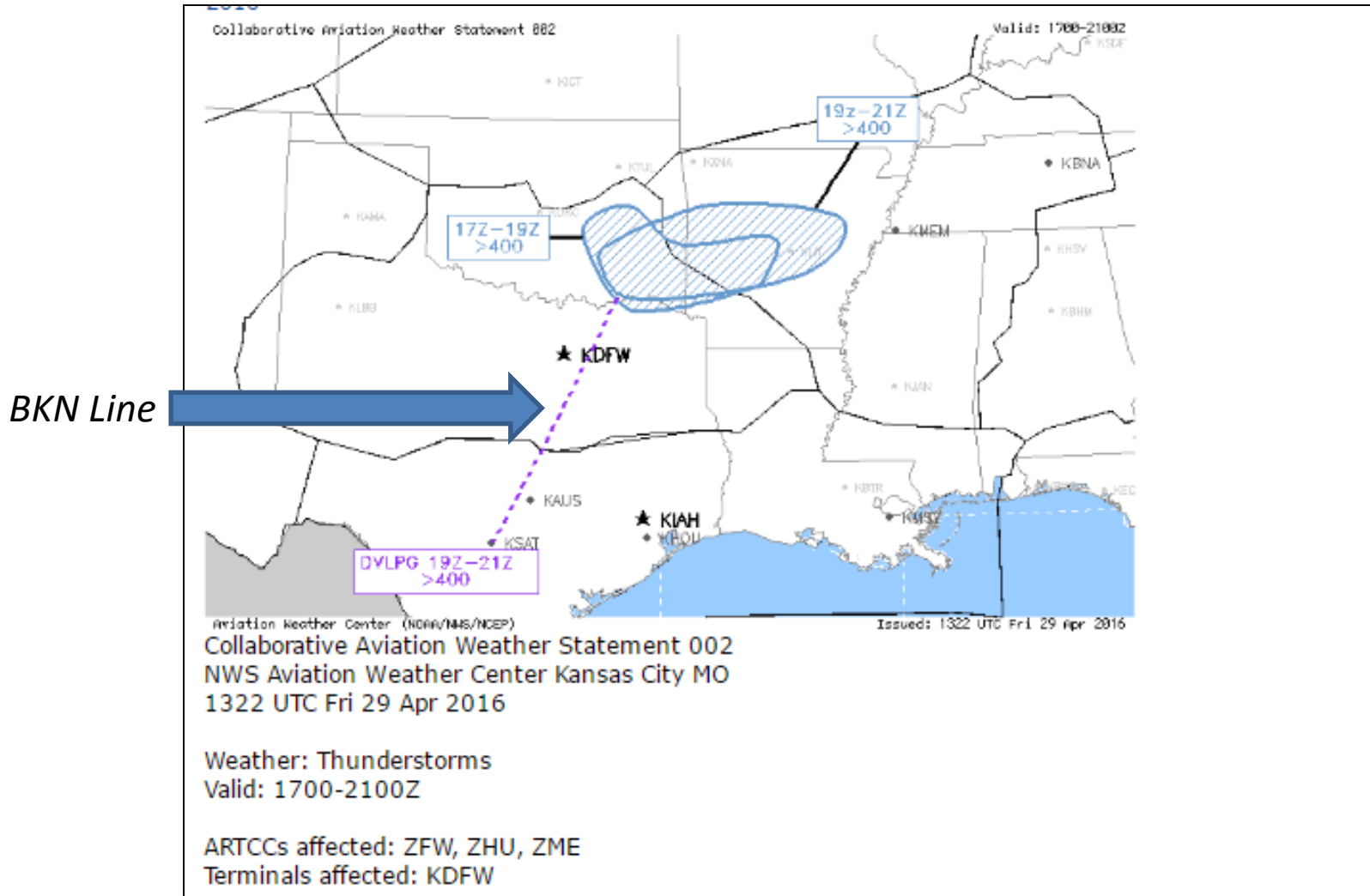
# CAWS 002: 4/29/16

*Issued 1322z -- valid 17z - 21z*

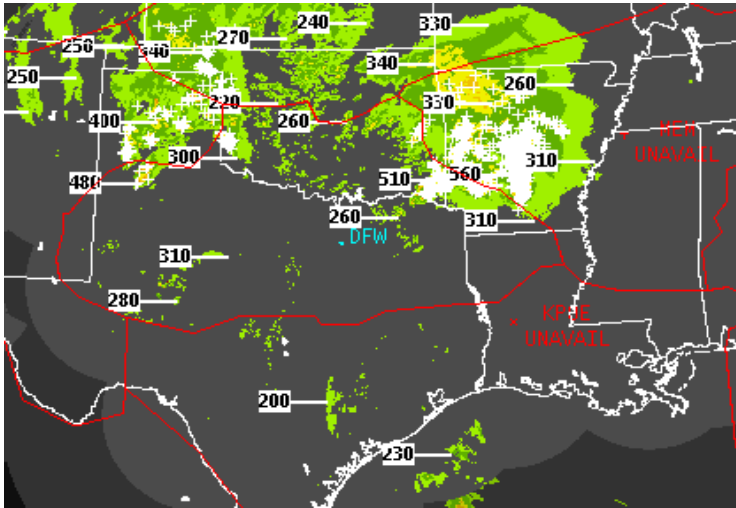


# CAWS 002: 4/29/16

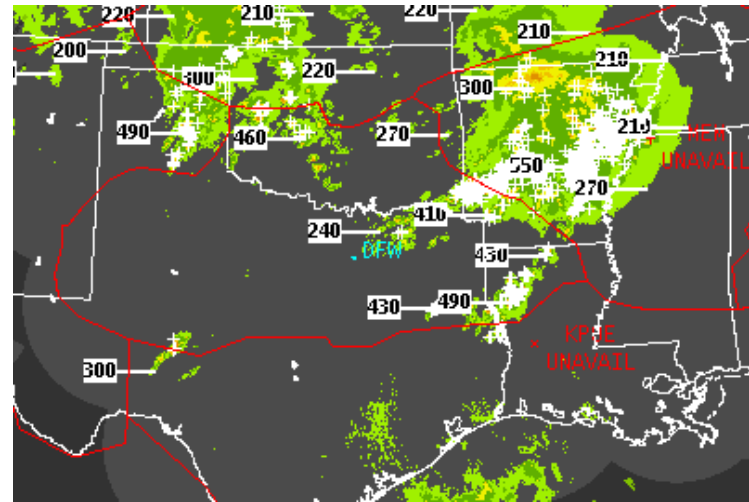
*Issued 1322z -- valid 17z - 21z*



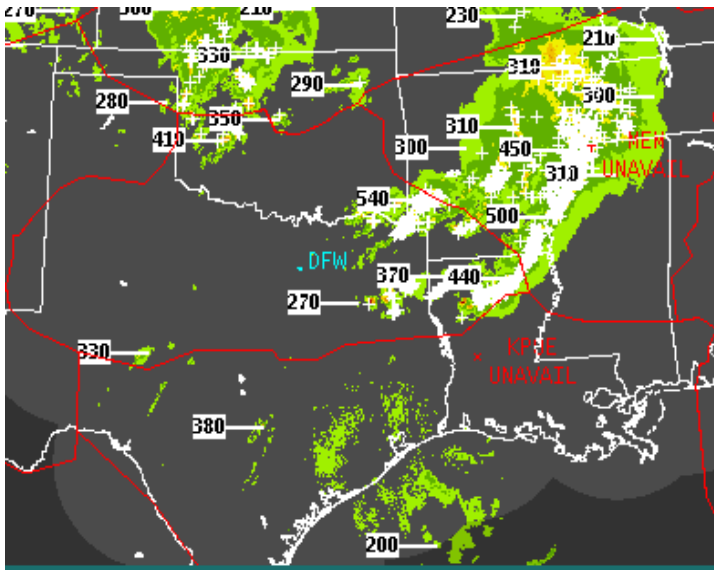
# Radar / Lightning Data 4/29/16



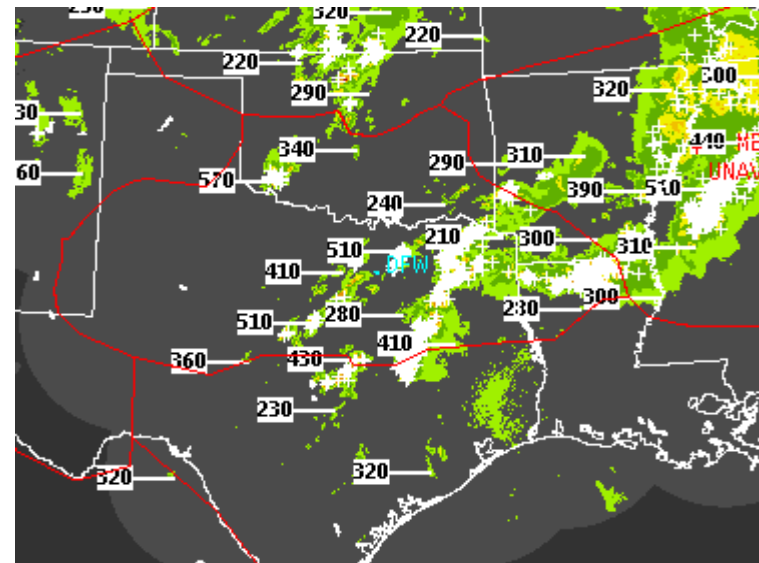
1300Z



1500Z



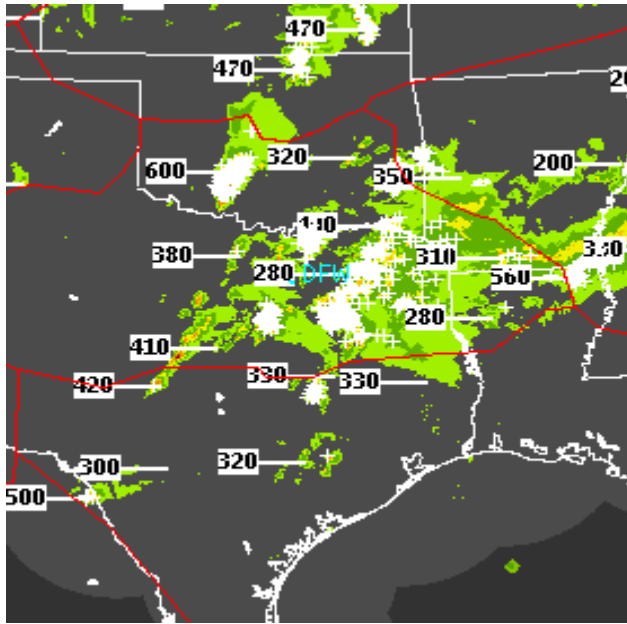
1700Z



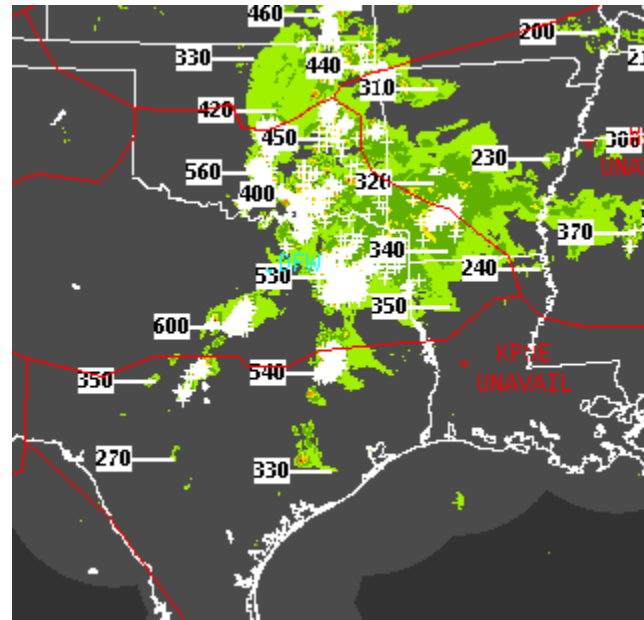
1900Z



# Radar / Lightning Data 4/29/16



2100Z



2300Z

# DFW ASPM Data: 4/29/16

- Departure Delays: **249**
- Airborne Holding Minutes: **792**
- Diversions: **7**

- *7 Diversions relatively small for DFW with TS*
- *GS probable factor in low number of Diversions*

# FAA NAS Aero Data

NAS Daily Report For Friday, April 29, 2016

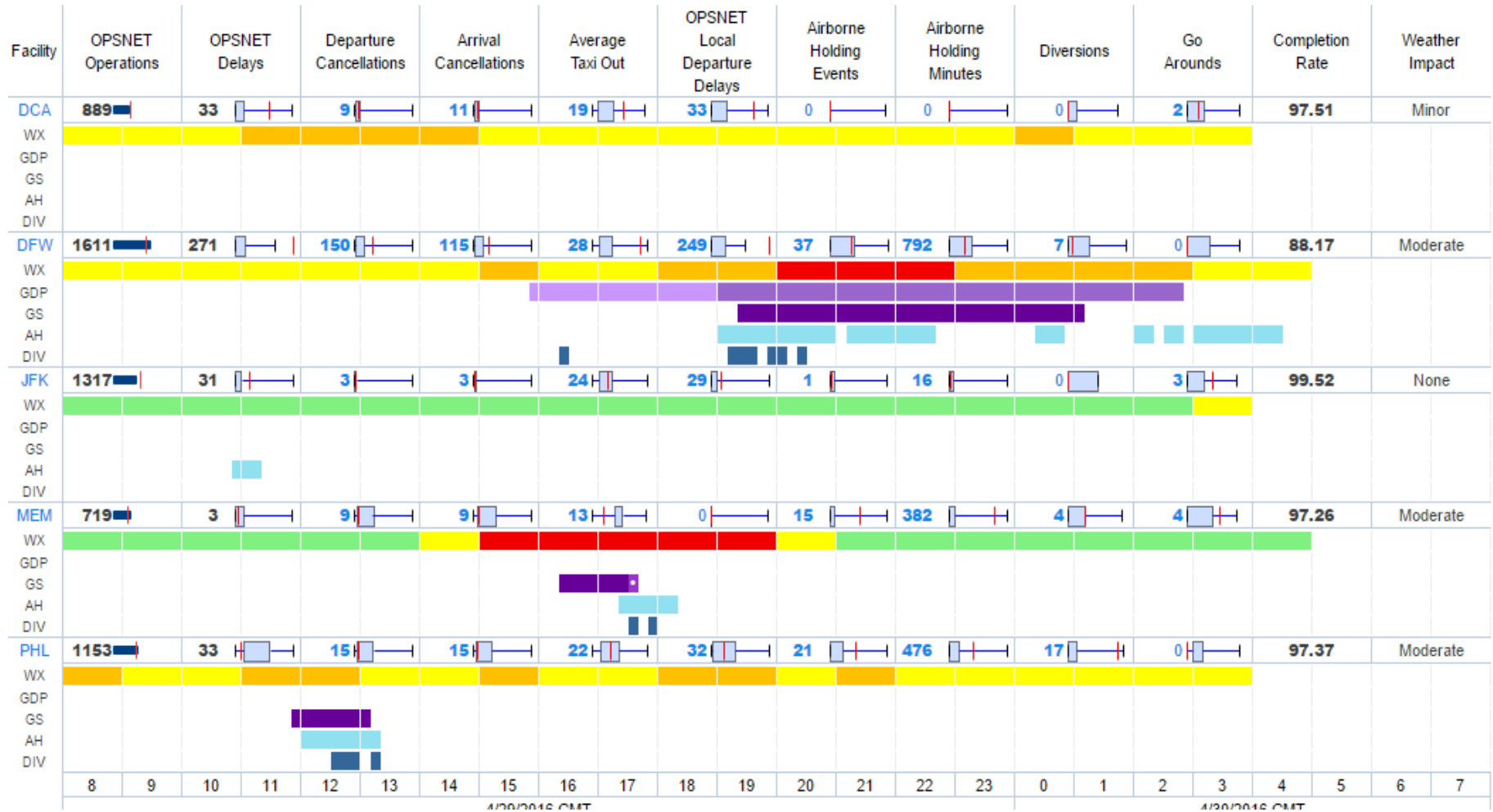
**Daily NAS Totals:** IFR Ops: **46805** (2.87%)      Delays: **955**      Holding Minutes: **2551**      Diversions: **55**  
 AC Ops: **28952** (0.27%)

NAS Daily data is not for public or media release and is for official FAA use only. NAS Daily data is preliminary and subject to change.

Facility	Ops Total	Delays					Traffic Mgmt Init (TMI)		Diversions	Efficiency / TAER			
		OPSNET Total	% of Ops	TMI To	At Airport/ARTCC		Reason	Type		Times	Daily	Target	YTD
					Depart	AH							
DFW	1611	271	16.82	271	249	37	Thunderstorms	GDP ,GS	1900-0259	7	92.59	96.15	95.88
PHL	1153	32	2.78	14	32	21	Aircraft Emergency	GS		17	88.10	92.04	90.37
DAL	511	8	1.57	8	60	9	Thunderstorms	GS		3	85.25	0.00	95.00
MEM	719	3	0.42	3	0	15	Thunderstorms	GS		4	73.08	91.77	89.72
ZFW	5224	299	5.72	256	0	43	Thunderstorms						

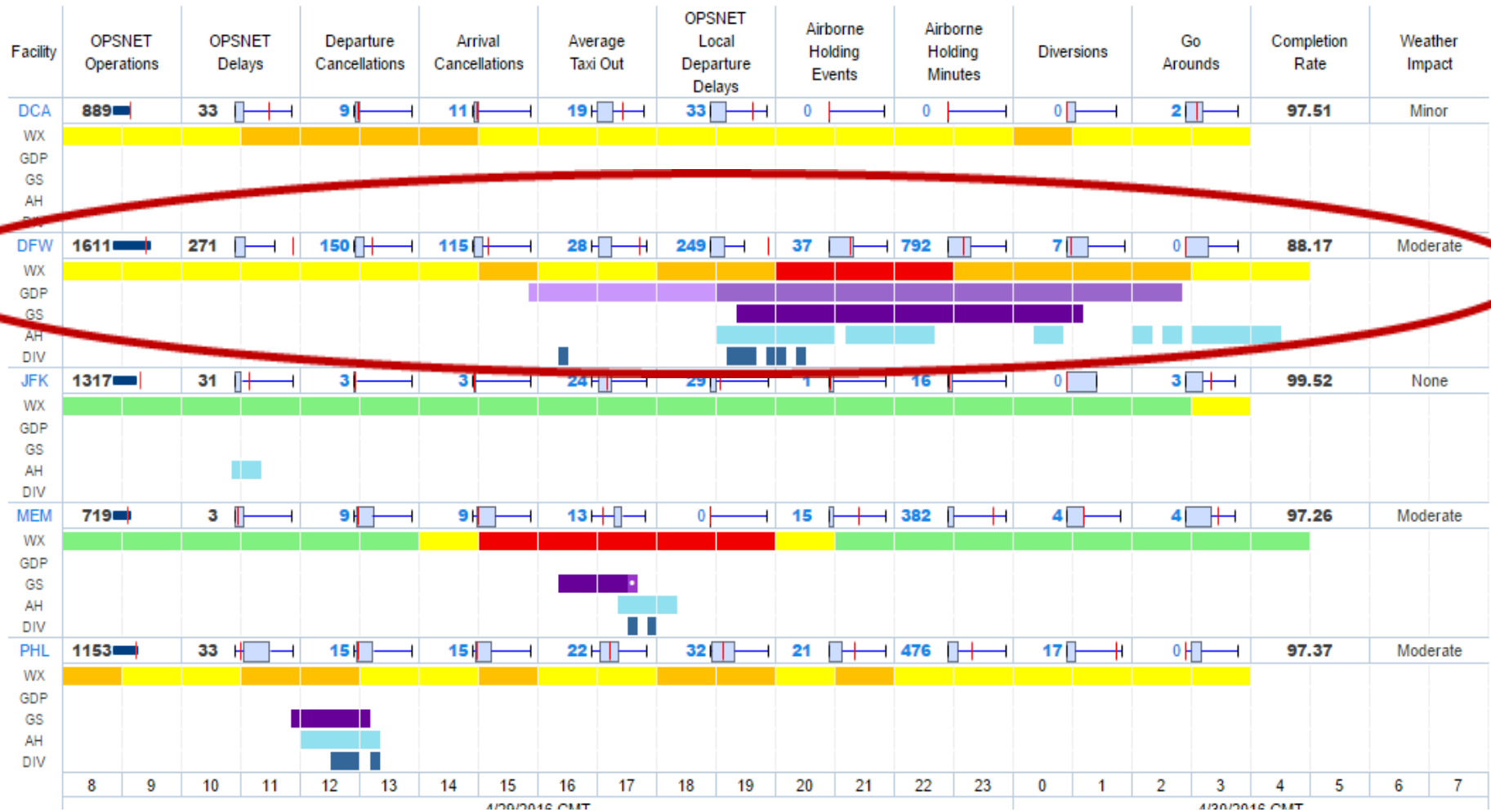
# FAA NAS Aero Data

## 4/29/16



# FAA NAS Aero Data

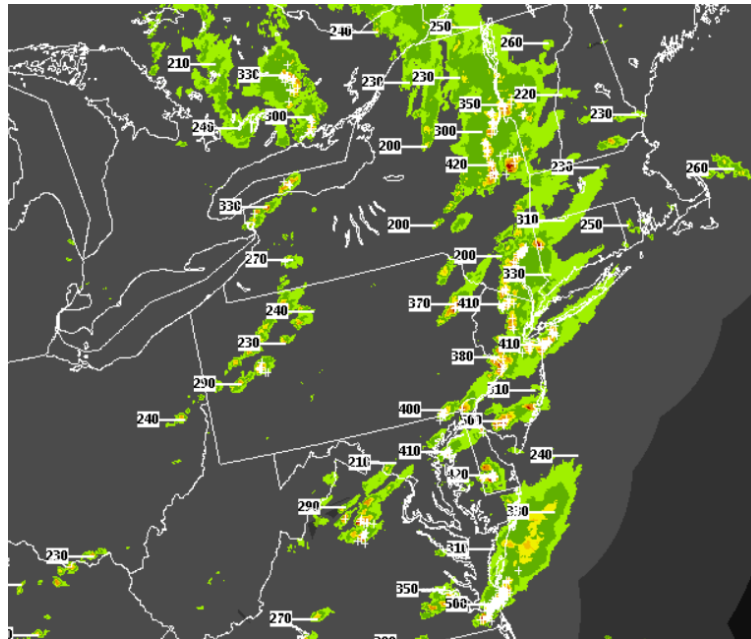
## 4/29/16



# Summary – April 29, 2016

- **Well forecast TS event for east TX**
- CAWS and Met briefings focused on high confidence TS development
- Thus -- GDP for DFW issued with ~ 4 hours lead time before TS formed near and east of DFW
- DFW delays (249) and airborne holding (792 mins) high
- DFW diversions relatively low (7) – probably due to long GS
- *Meteorological inputs resulted in proactive TMI*
- *Mitigation of impacts?*

# June 30 – July 1, 2016



# June 30 – July 1, 2016

- PERTI approach initiated on-the-fly by ATCSCC
  - PERTI = Plan, Execute, Review, Train, Improve*
- Detailed special NAM weather briefing evening of June 30 – for Northeast TS on July 1
- ATCSCC and NAM day shifts had a “running start” for July 1
- Significant coordination / collaboration by NWS mets on June 30 and July 1: AWC, NAMs, CWSUs – for briefings and TAFs.
- AFPs and GDPs were issued early on July 1



NWS/NCEP/AWC/NAM



# PERTI Weather Outlook for July 1, 2016

*Issued by NWS/NAM June 30, 2016*

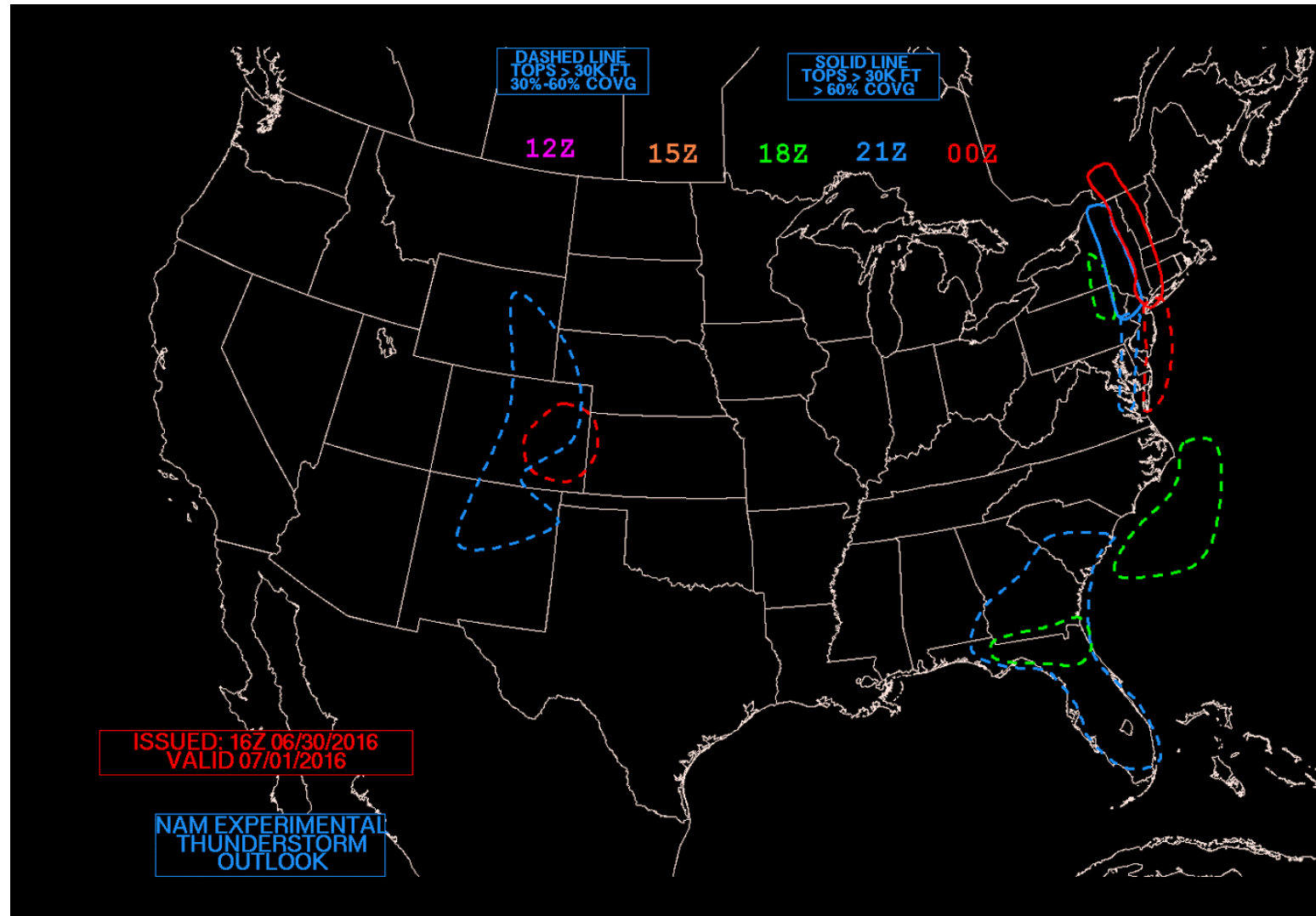
***HIGHLIGHTS: Significant impacts to NY/BOS/PHL routes and terminals tomorrow afternoon and evening as a cold front moves through the region.***

- Route/Gate impacts across NY/PA after 18-19Z...through 02Z***
- NY/PHL terminal impacts possible after 20Z...likely after 22Z***
- BOS Terminal impacts possible aft 21Z...more likely aft 00Z***

***Higher uncertainty in coverage across ZDC airspace.***

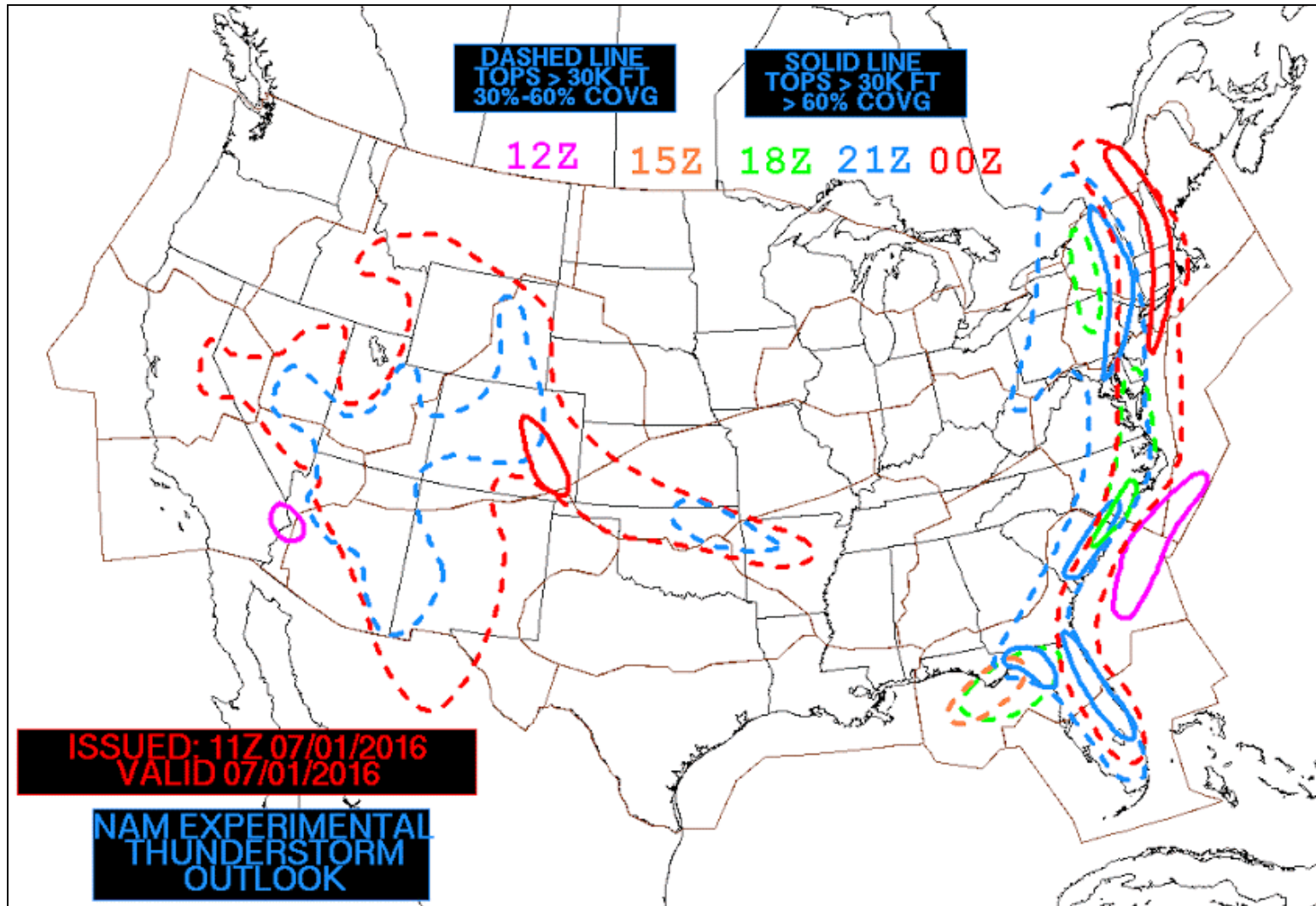
# Internal **Day 2** TS Outlook for July 1, 2016

*Briefed to ATCSCC 20Z June 30, 2016*

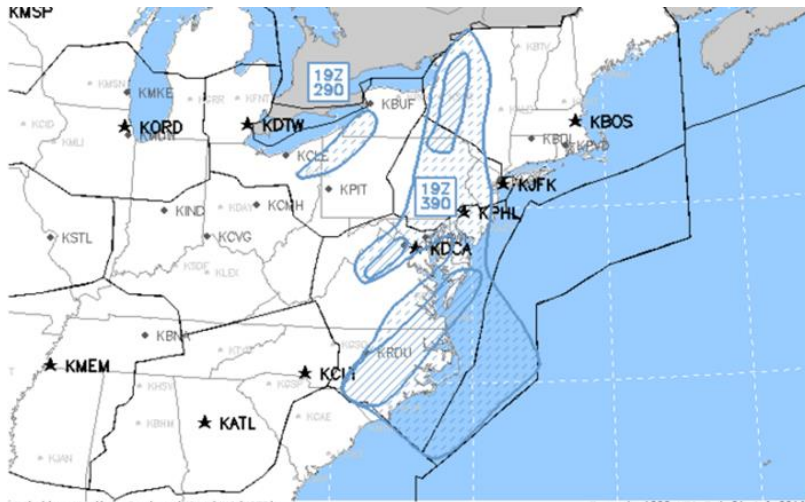


# Internal **Day 1** TS Outlook for July 1, 2016

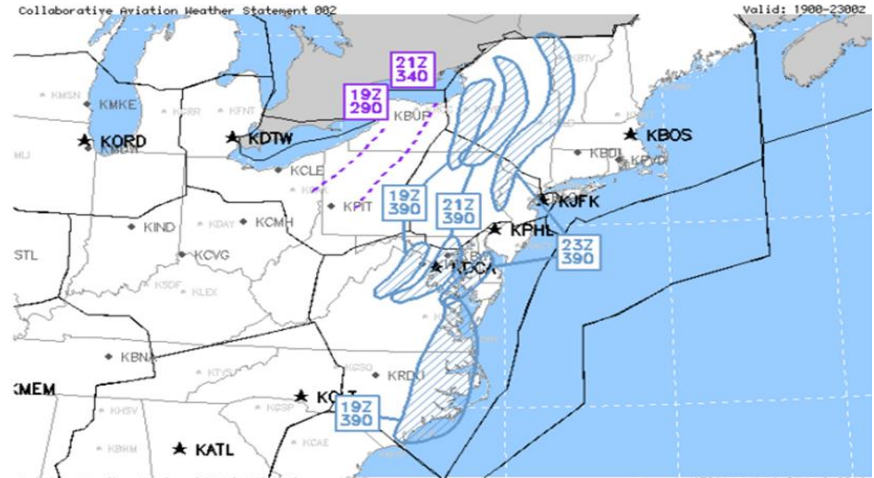
*Briefed to ATCSCC 12Z July 1, 2016*



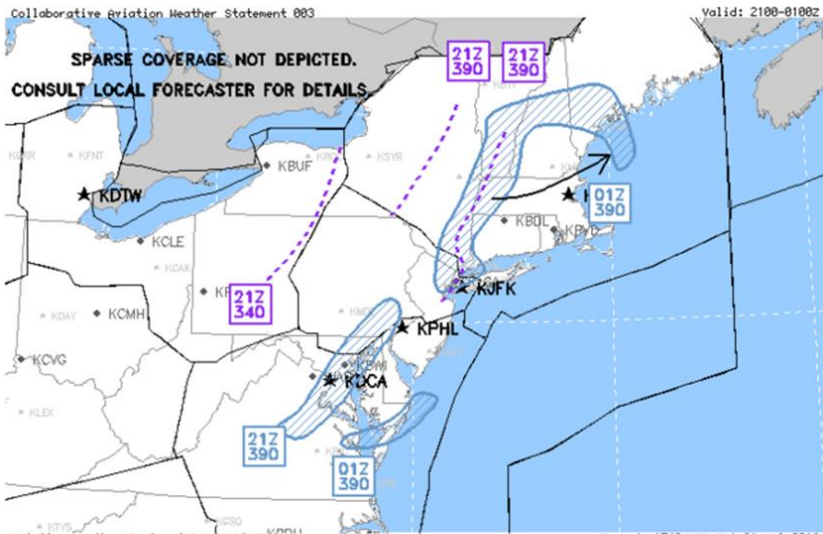
# CAWS 001 – CAWS 004 7/1/16



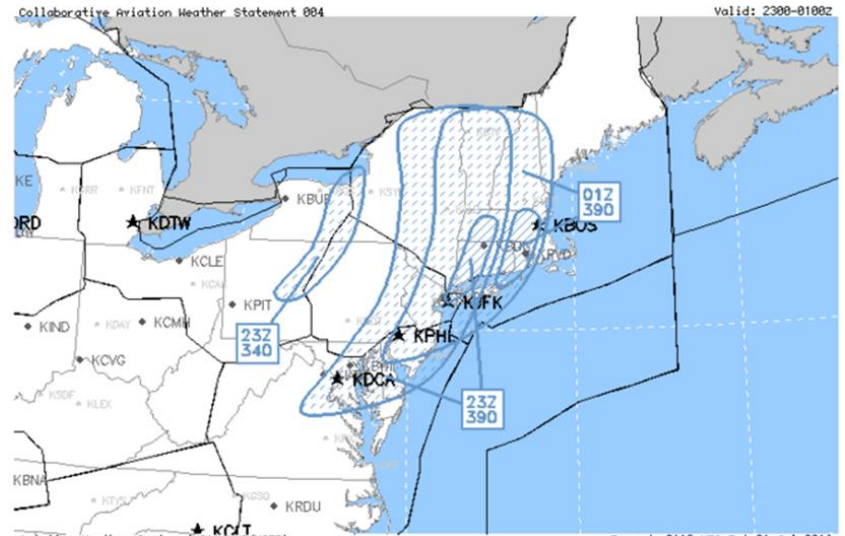
Aviation Weather Center (NOAA/NWS/NCEP)  
 Collaborative Aviation Weather Statement 001  
 NWS Aviation Weather Center Kansas City MO  
 1332 UTC Fri 01 Jul 2016



Aviation Weather Center (NOAA/NWS/NCEP)  
 Collaborative Aviation Weather Statement 002  
 NWS Aviation Weather Center Kansas City MO  
 1521 UTC Fri 01 Jul 2016



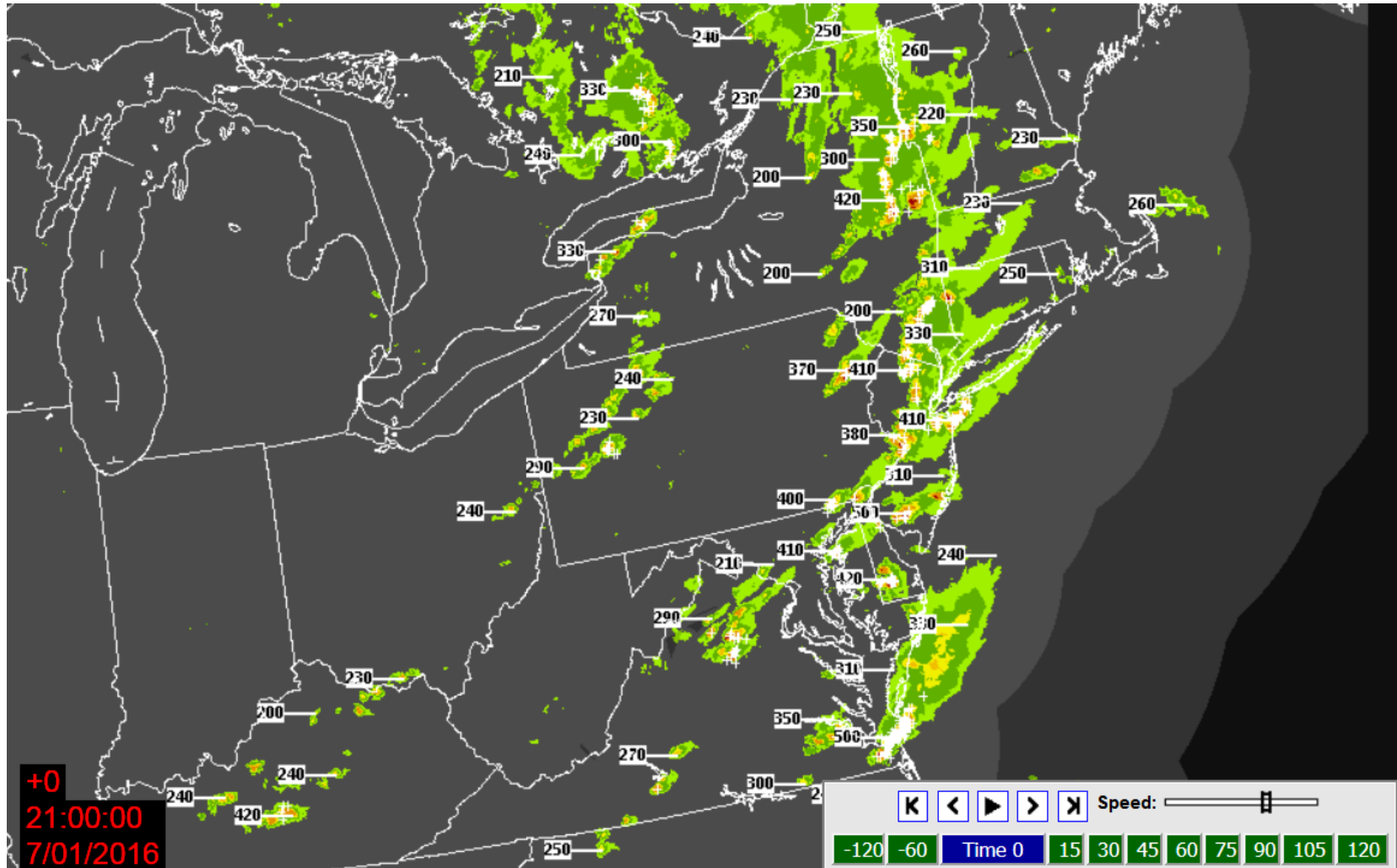
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 NWS Aviation Weather Center Kansas City MO  
 1748 UTC Fri 01 Jul 2016



Aviation Weather Center (NOAA/NWS/NCEP)  
 Collaborative Aviation Weather Statement 004  
 NWS Aviation Weather Center Kansas City MO  
 2119 UTC Fri 01 Jul 2016

# Radar / Lightning / Tops

## 2100Z 7/1/16



# July 1, 2016

## ASPM Data

Station	Departure Delays	Airborne Holding Mins	Diversions
JFK	138	1600	20
EWR	196	2694	31
LGA	79	3129	45
BOS	205	M	2
PHL	128	151	0

# NAS AERO Data July 1, 2016

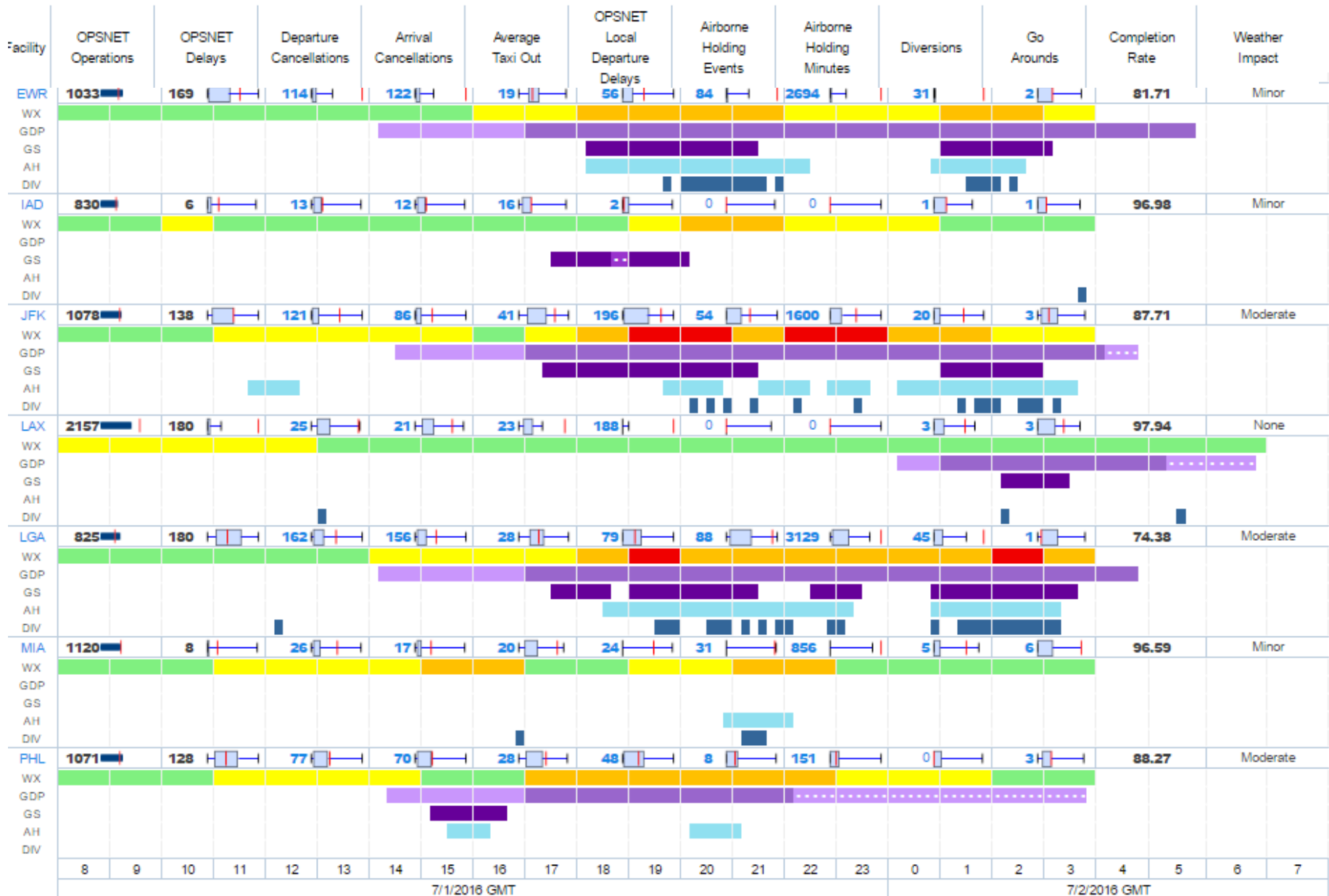
## NAS Daily Report For Friday, July 01, 2016

**Daily NAS Totals:** IFR Ops: **50232** 2.11% Delays: **2383** Holding Minutes: **10276** Diversions: **195**  
 AC Ops: **31313** 5.45%

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Facility	Ops Total	OPSNET Total	% of Ops	TMI To	Delays			Traffic Mgmt Init (TMI)			Efficiency / TAER		
					At Airport/ARTCC		Reason	Type	Times	Diversions	Daily	Target	YTD
					Depart	AH							
LGA	825	251	30.42	180	79	88	Thunderstorms	GDP ,GS	1700-0459	45	93.61	95.98	95.87
BOS	1232	212	17.21	205	33	3	Thunderstorms	GDP	1700-0242	2	96.19	94.40	94.25
EWR	1033	169	16.36	169	56	84	Thunderstorms	GDP ,GS	1700-0557	31	90.06	93.95	94.53
JFK	1078	138	12.80	138	196	54	Thunderstorms	GDP ,GS	1700-0411	20	87.46	90.92	90.60
PHL	1071	128	11.95	128	48	8	Thunderstorms	GDP ,GS	1700-2219		89.30	92.04	90.61

# NAS AERO Data July 1, 2016





# Summary -- July 1

- Well-forecast and highly briefed TS event - up to 3 days out
- PERTI-style weather and ATFM briefing on June 30 (D-1) during evening FAA Planning Webinar
- CAWS and briefings on July 1 focused on Northeast TS
- *Still – a high number of departure delays and Diversions at Northeast terminals*



Facility	Ops Total	Delays					Reason	Traffic Mgmt Init (TMI)			Efficiency / TAER		
		OPSNET Total	% of Ops	TMI To	At Airport/ARTCC			Type	Times	Diversions	Daily	Target	YTD
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PHL	1071	128	11.95	128	48	8	Thunderstorms	GDP ,GS	1700-2219		89.30	92.04	90.61

# Key Questions / Challenges

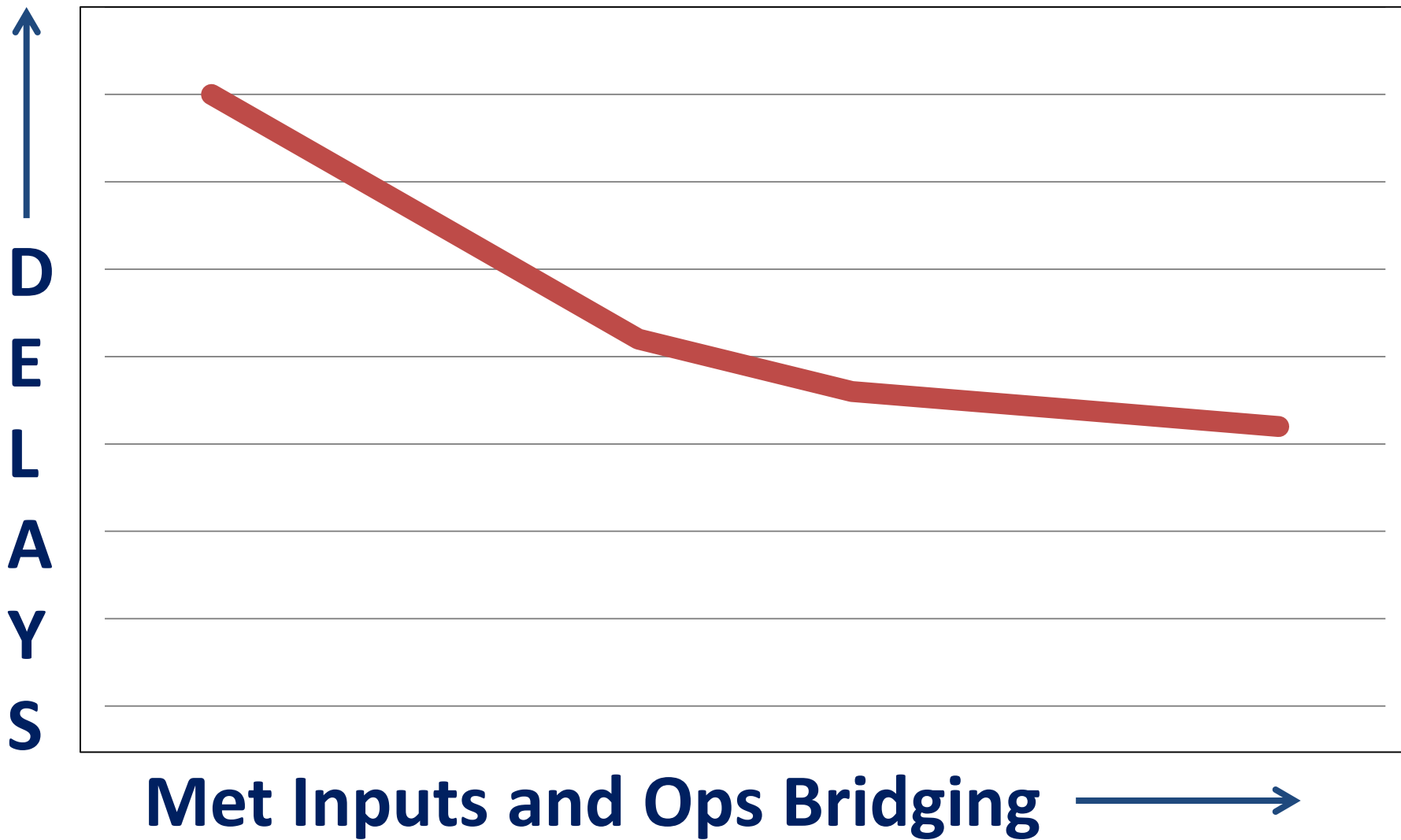
**What is relationship of dedicated meteorological inputs & Ops Bridging to NAS impacts?**

**How to systematically quantify the value of integrated weather decision support?**

- Importance of lead times?
- Impacts avoided via improving – or avoiding -- a TMI?
- Fuel / cost savings?

# Met Inputs & Ops Bridging vs. Delays

*Conceptual Model \**



\* *Strawman*

NWS/NCEP/AWC/NAM

# Met Inputs & Ops Bridging vs. Delays

*Conceptual Model \**



**Met Inputs and Ops Bridging** →

\* *Strawman*

# Summary

- **Convection** - intensive focus / coordination / collaboration
- Ops Bridging occurs via NWS and airline mets
- *In general, focused met inputs appear to mitigate delays and improve TMI issuances. Hard to quantify.*
- **Some weather situations – regardless of how well-forecast and briefed – will still result in significant NAS impacts**



# NWS / AWC / NAM

Ops Bridging & Integrated Decision Support



## The Critical 6 C's:

- **Coordination**
- **Collaboration**
- **Consistency**
- **Customization**
- **Confidence**
- **Consultation**

# Questions / Discussion / Debate ?



# BACKUP CHARTS



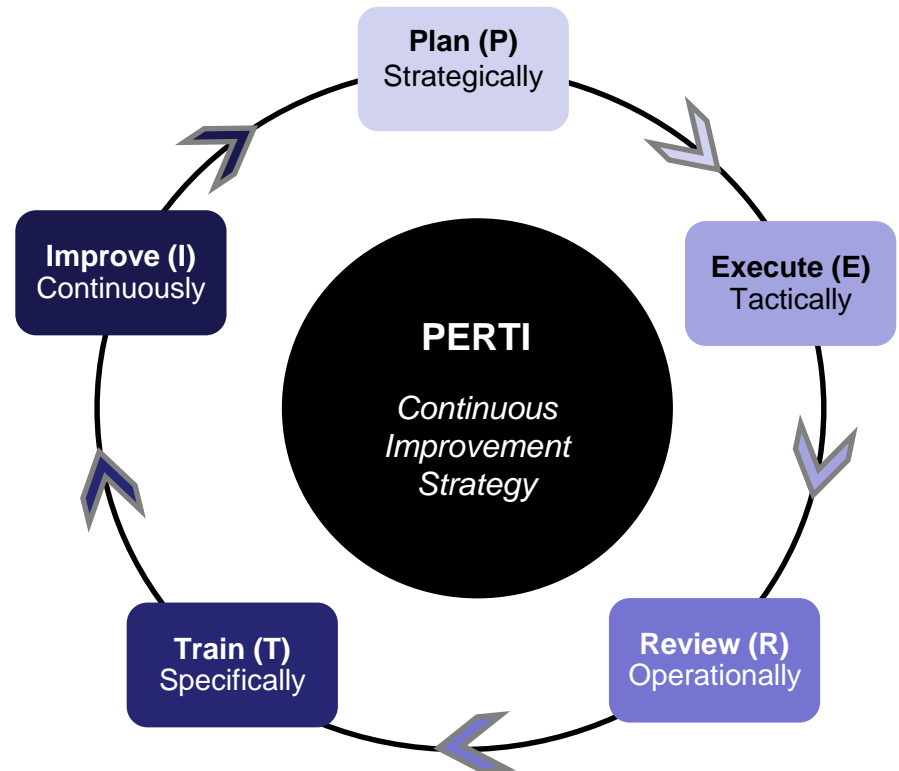
# Other Issues

- Multiple convective-allowing models (CAMs) and convective forecast products available to mets and decision-makers
- Met collaboration is labor intensive
  - Sometimes results in a better product
  - Sometimes does not result in a better product

# PERTI Program Overview

## What is PERTI?

- NAS-wide ATO initiative
- Next phase of the SysOps Continuous Improvement Strategy
- Involves resources, processes, and analytics
- Enables SysOps to become more strategic and proactive to reduce current trends



# Program Overview

## What does PERTI involve?

### PLAN

- Expand and align the planning horizon to better prepare for predictable events mitigating impacts

### EXECUTE

- Execute the pre-tactical plan to serve as the basis of daily operations

### REVIEW

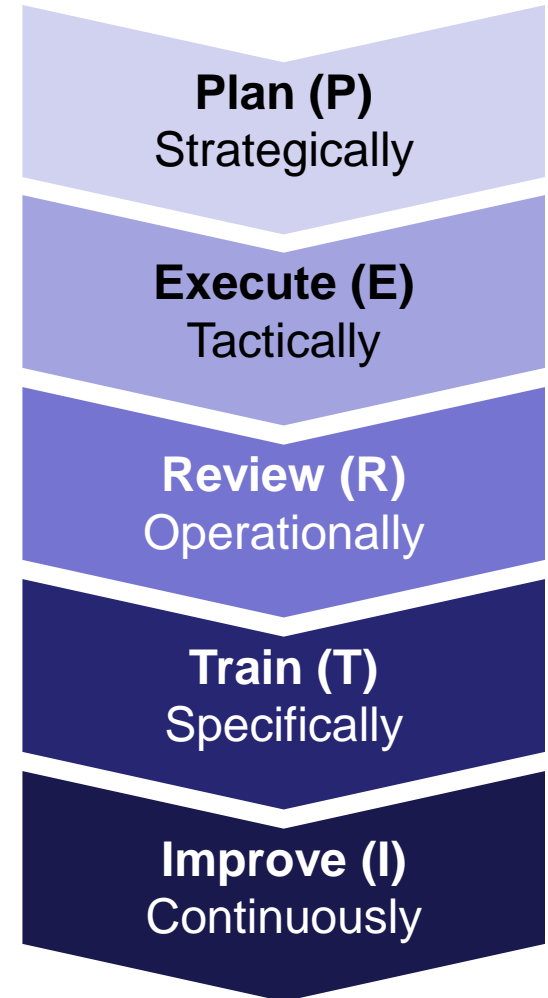
- Develop operational insights using data, metrics, and tools to expand the institutional knowledge

### TRAIN

- Use the information gained through the Review process to specifically customize appropriate training on process and systems

### IMPROVE

- Measure new capabilities and system performance with key metrics and integrate lessons learned into the operation to continuously refine and improve processes



# Program Overview

## How will PERTI help?

- Provide required resources to enhance strategic planning
- Expand the planning horizon and align strategic processes
- Provide timely collaboration to solve operational challenges
- Provide a mechanism to evaluate new operational capabilities and procedures
- Deliver a review, feedback process to integrate operational insights into training for continuous improvement
- Mitigate impacts of disruptive events (such as severe weather, planned outages, NOTAMs, capacity changes/impacts)
- Better optimize daily available capacity

**June 16, 2016**

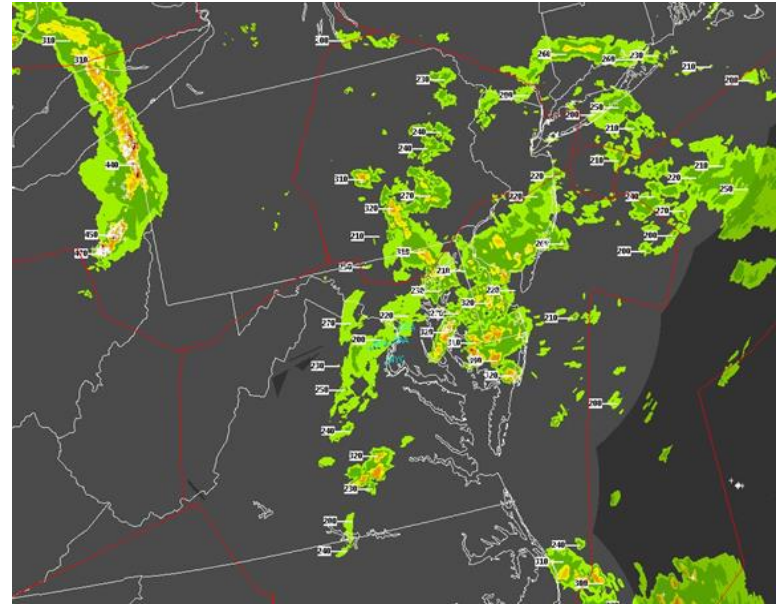
# June 16, 2016

- Major delays in NY / PHL markets
- Complex weather scenario
- TS coverage / confidence / tops did not meet CCFP or CAWS criteria
- FAA “Deep Dive” review conducted
- One outcome: *More flexibility needed in weather products (i.e. CAWS).*
- Minimally accounted for in review: real-time Ops Bridging verbal briefings

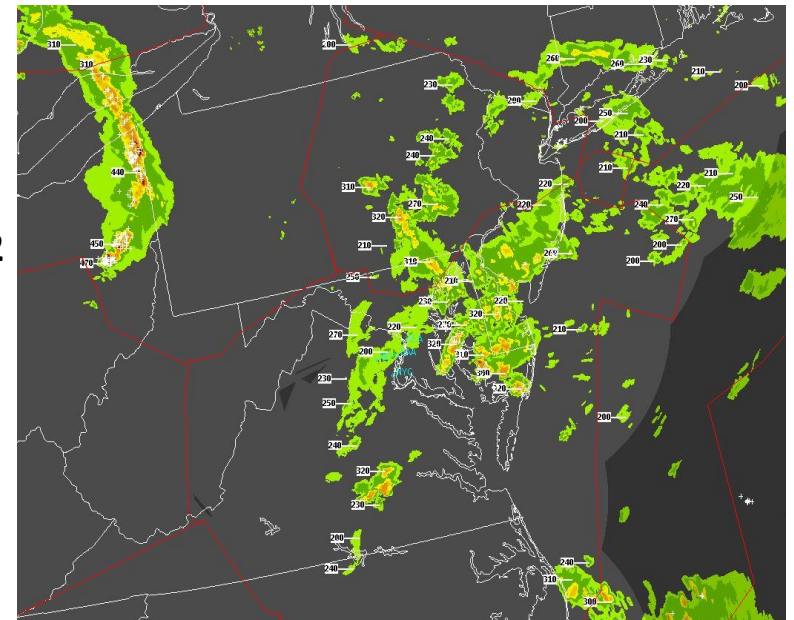
# CCFP vs 13Z Radar Images June 16, 2016



**09Z CCFP F004  
AND RADAR  
VALID 1300Z**



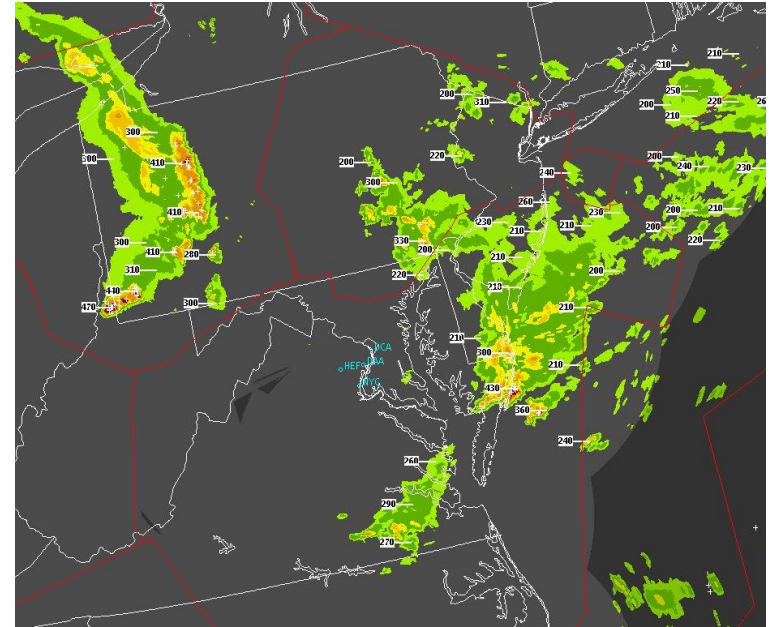
**11Z CCFP F002  
AND RADAR  
VALID 1300Z**



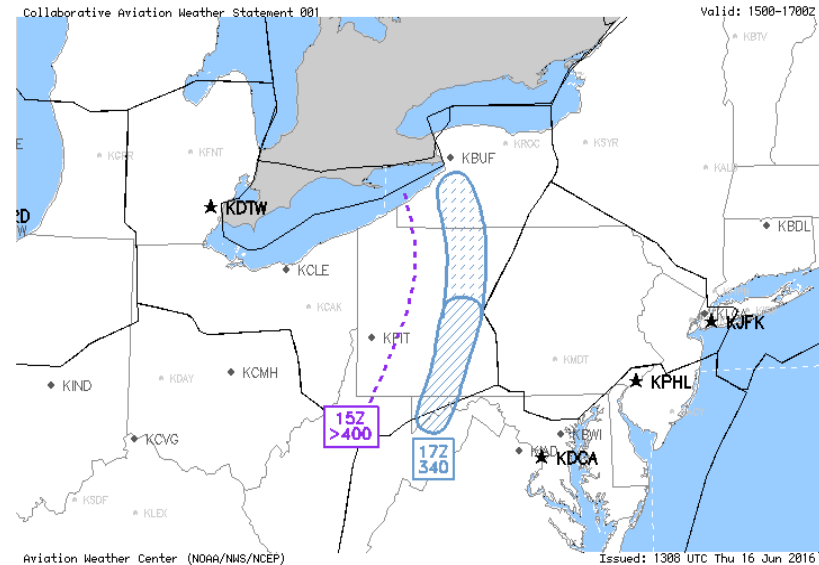
# CCFP vs 15Z Radar Images June 16, 2016



**11Z CCFP F004  
AND RADAR  
VALID 1500Z**



**CAWS ISSUED  
AT 1308Z/13Z  
CCFP F002  
AND RADAR  
VALID 1500Z**





# Summary – June 16, 2016

- Combination events was major factor:
  - Isold TS Delmarva
  - Short narrow line TS OH/Wrn PA
  - Poorly forecast by models / auto-CCFP
- Delmarva / ZDC TS did not meet CAWS or CCFP criteria: less than 25 pct “sparse” coverage”
- CAWS issued for western PA TS
- Intensive real-time briefings by Mets on both areas in 0-3 hour timeframe



# Summary – June 16, 2016

Significant delays / diversions due to *combination of locations* of TS areas

If areas had not occurred simultaneously, likely much fewer impacts  
(per ATCSCC ops personnel)

**NAS Daily Report For Thursday, June 16, 2016**

**Daily NAS Totals:** IFR Ops: **50449** 0.23%    Delays: **2334**    Holding Minutes: **3306**    Diversions: **80**  
 AC Ops: **30480** 5.28%

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Facility	Ops Total	OPSNET Total	% of Ops	Delays		Traffic Mgmt Init (TMI)			Efficiency / TAER				
				TM To	At Airport/ ARTCC Depart AH	Reason	Type	Times	Diversions	Daily	Target	YTD	
LGA	1077	265	24.61	265	213	16	Thunderstorms	GDP ,GS	1621-0028	5	97.81	95.98	95.81
PHL	1107	190	17.16	190	129	1	Thunderstorms	GDP ,GS	1617-0007	1	92.10	92.04	90.46
EWR	1235	172	13.93	172	177	8	Thunderstorms	GDP ,GS	1620-0035		94.87	93.95	94.52
JFK	1374	153	11.14	153	201	0	Thunderstorms	GDP ,GS	1623-0033	2	90.99	90.92	90.42
DCA	787	45	5.72	27	23	14	Thunderstorms	GS			89.03	93.26	93.51
BWI	698	21	3.01	21	8	2	Thunderstorms	GS		2	91.55	93.37	94.50
LAX	2095	43	2.05	10	53	1	Multi-taxi	GS		1	97.61	97.87	97.58
IAD	869	11	1.27	11	25	32	Thunderstorms	GS		28	88.57	92.39	93.47
MCO	885	7	0.79	7	25	0	Thunderstorms	GS		2	89.43	95.85	96.51
ZNY	7572	811	10.71	797	0	14	Thunderstorms						
ZDC	7332	291	3.97	243	0	48	Thunderstorms	AFP	1900-2350				
ZOB	7487	78	1.04	63	0	15	Thunderstorms	AFP	1900-2142				

# FAA/ASPM Data 6/16/16

## High number of Departure Delays

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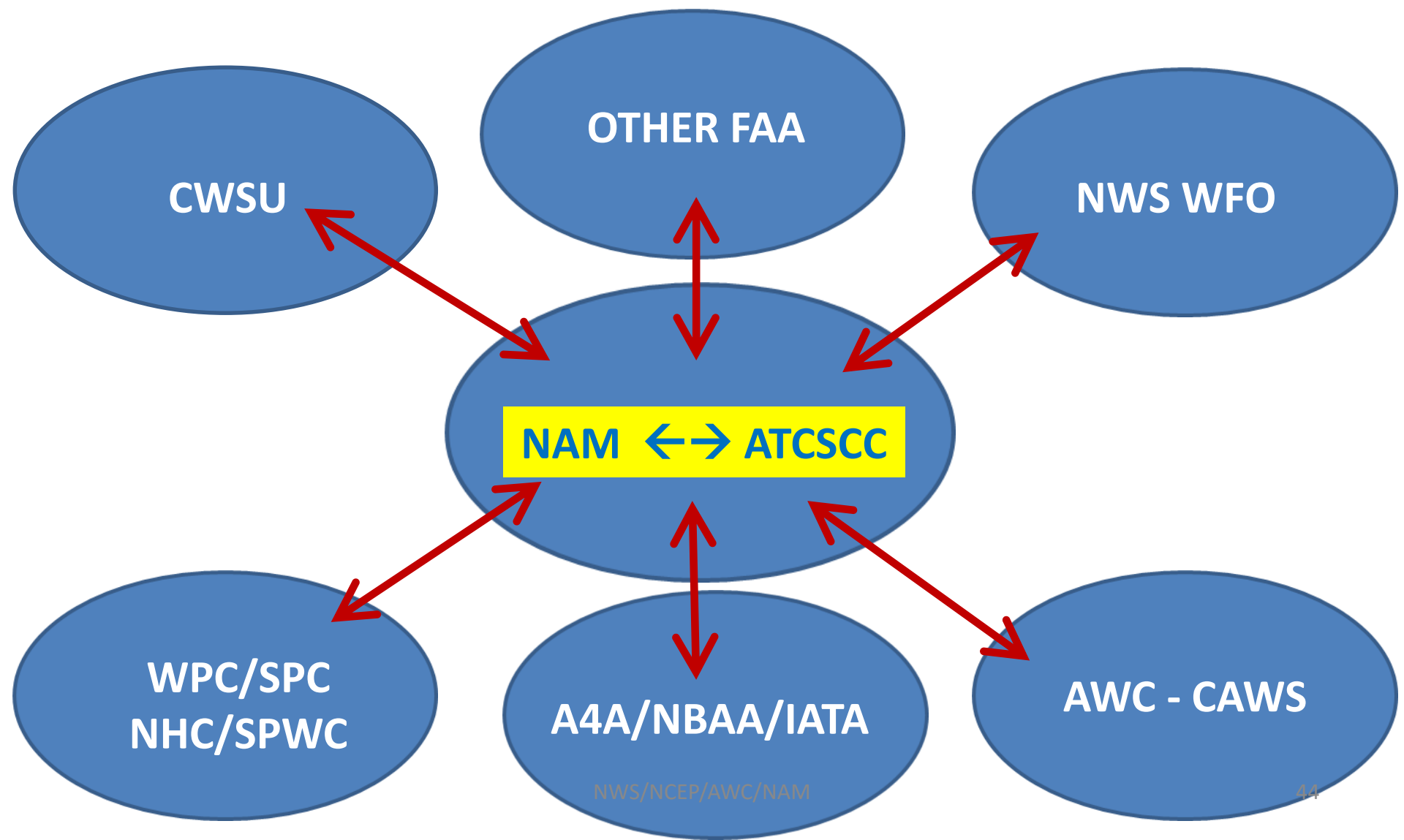
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PHL	1107	190	17.16	190	129	1	Thunderstorms	GDP ,GS	1617-0007	1	92.10	92.04	90.46
EWR	1235	172	13.93	172	177	8	Thunderstorms	GDP ,GS	1620-0035		94.87	93.95	94.52
JFK	1374	153	11.14	153	201	0	Thunderstorms	GDP ,GS	1623-0033	2	90.99	90.92	90.42
DCA	787	45	5.72	27	23	14	Thunderstorms	GS			89.03	93.26	93.51
BWI	698	21	3.01	21	8	2	Thunderstorms	GS		2	91.55	93.37	94.50
LAX	2095	43	2.05	10	33	1	Multi-taxi	GS		1	97.61	97.87	97.58
IAD	869	11	1.27	11	25	32	Thunderstorms	GS		28	88.57	92.39	93.47
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Airports

ARTCCs



# Coordination / Collaboration





# Summary

- National Weather Service NAMs provide key weather decision support to ATCSCC and the National Air Space
- Meteorological expertise is fully integrated with ATFM decision makers





# NWS/NCEP/AWC/NAM

Contact Info:

[awc.nam@noaa.gov](mailto:awc.nam@noaa.gov)

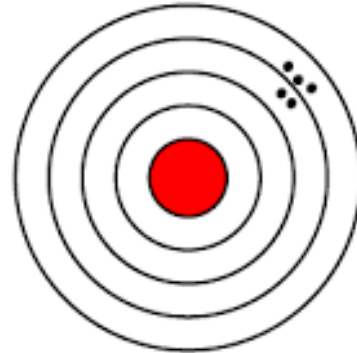
[frank.brody@noaa.gov](mailto:frank.brody@noaa.gov)

540-422-4511

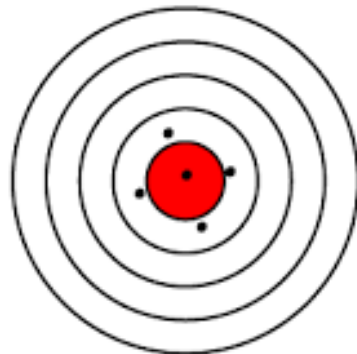
# Accuracy and Consistency



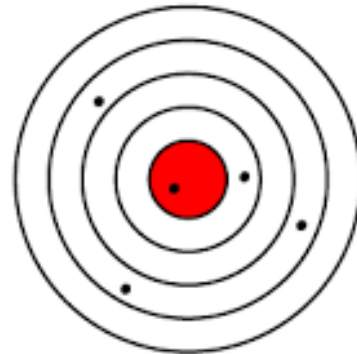
Accurate & Consistent



Not Accurate  
but Consistent

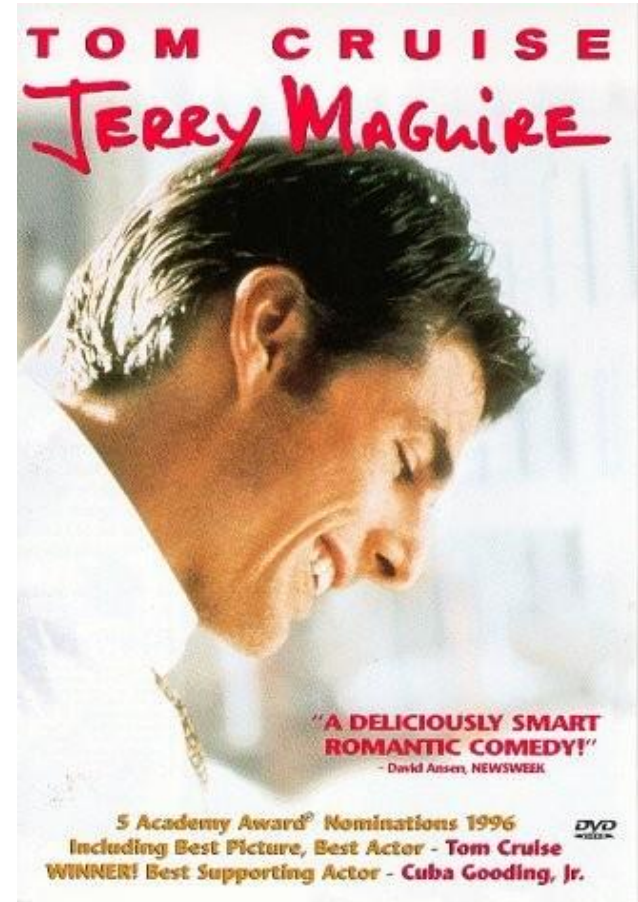


Accurate but  
Not Consistent



Not Accurate &  
Not Consistent

# “Show Me The Money... \$\$”





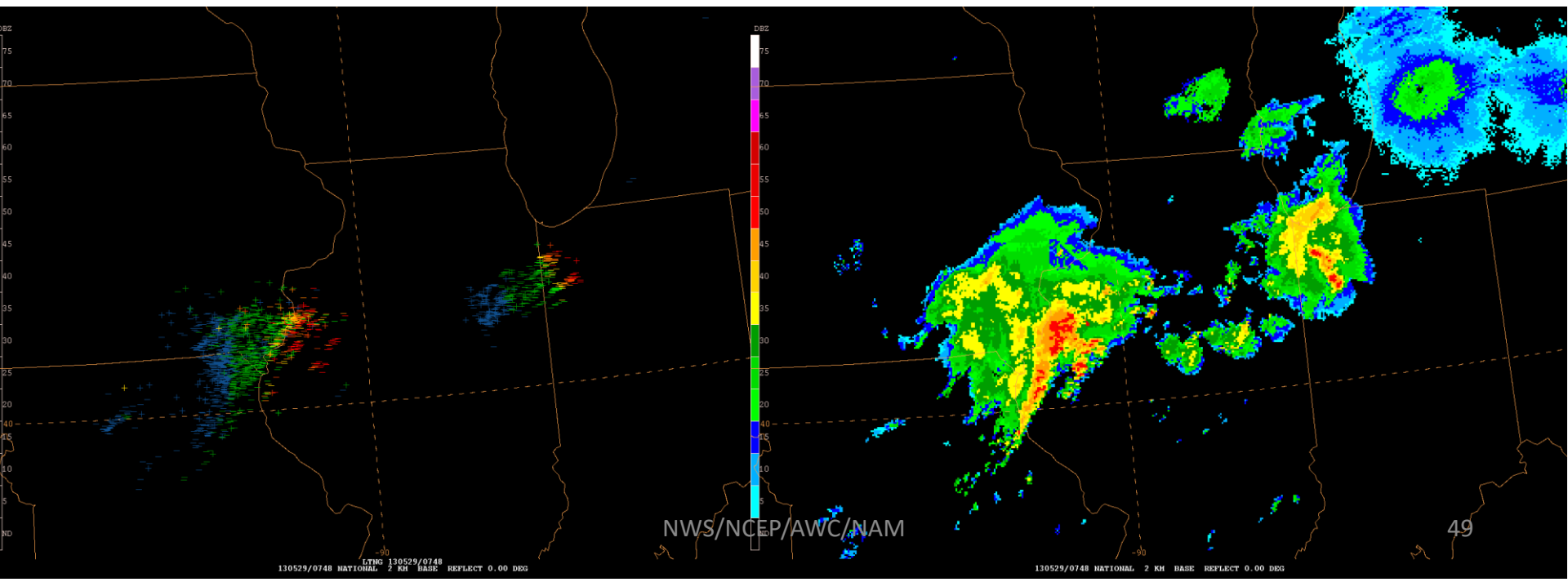


# Accurate Forecast Saves \$\$

## *A Case Study*



- Thunderstorms southwest of Chicago
- WILL IT REACH THE TERMINAL?
- ORD TRACON/TOWER **ASKS FOR GROUND DELAY PROGRAM**

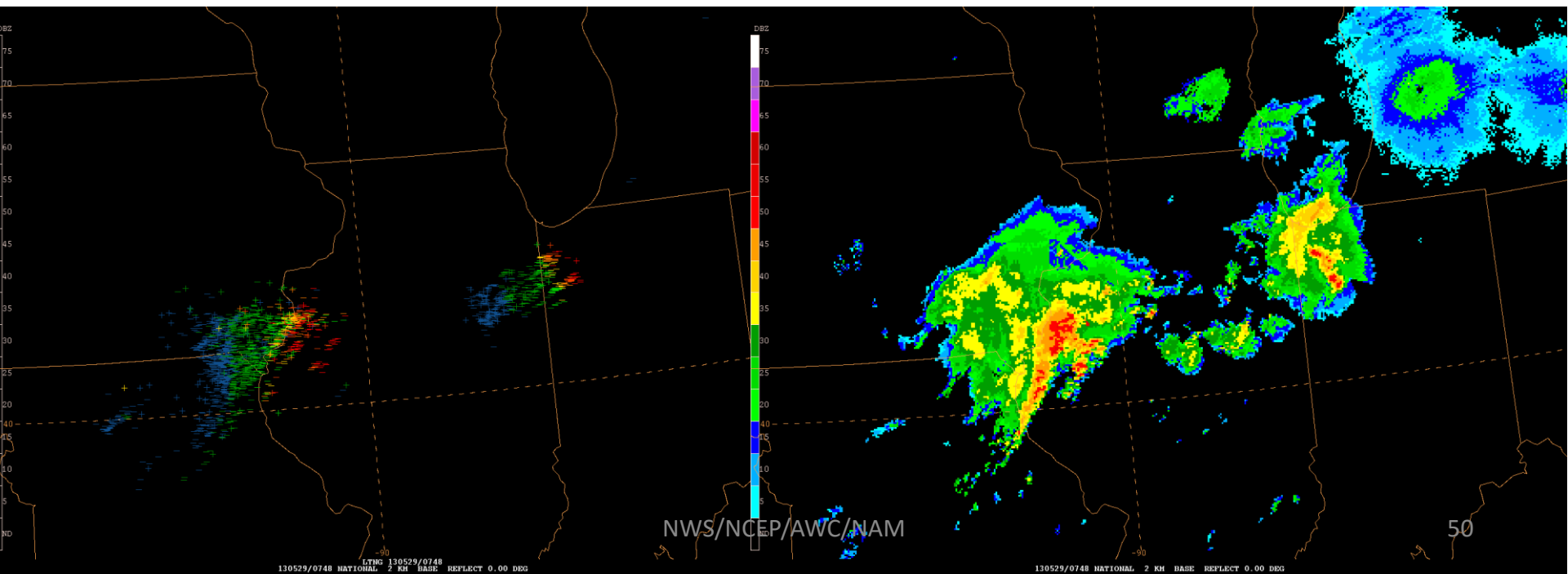




# Accurate Forecast Saves \$\$



- Thunderstorms southwest of Chicago
- WILL IT REACH THE TERMINAL?
- ORD TRACON/TOWER ASKS FOR GROUND DELAY PROGRAM
- Program length = 2 hours
- #Flights affected = 154
- #Passengers affected = **~15,400**
- Average Delay (per flight) = 21 min
- Total Delay in NAS = 3,200 min or **53.3 hours**





# Accurate Forecast Saves \$\$

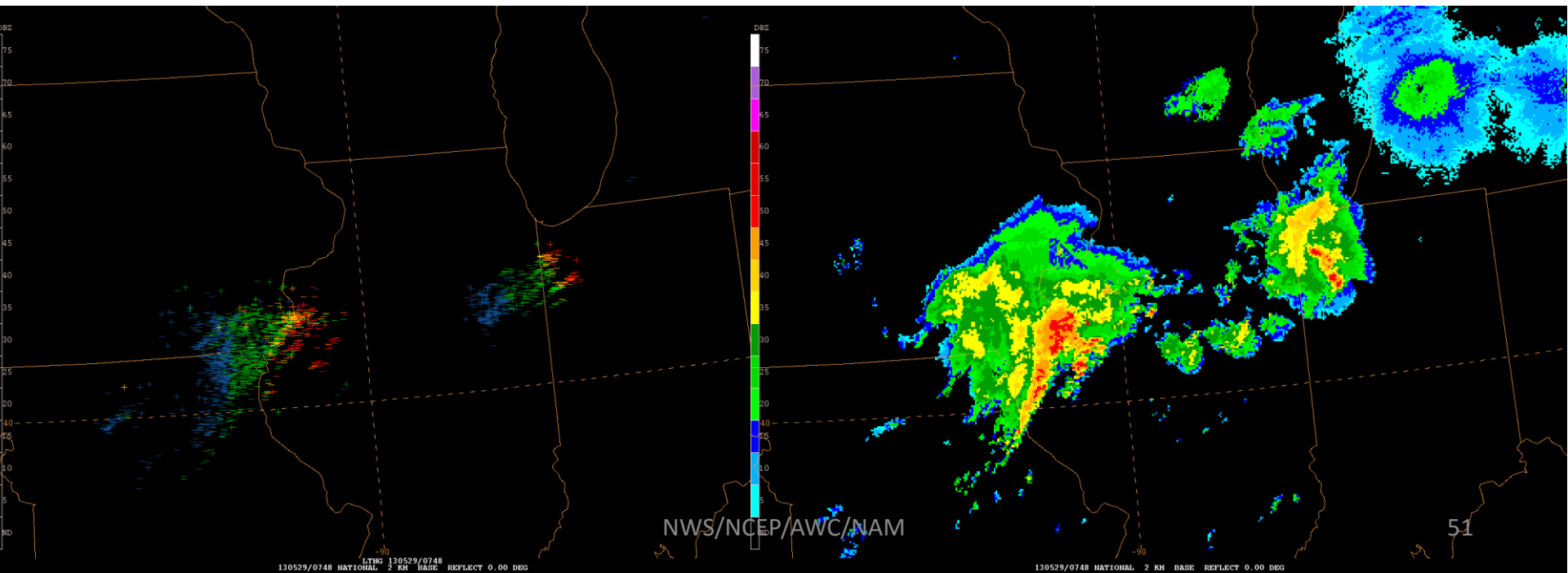


→ NAM briefed NO thunderstorm impacts to ORD/MDW

→ \$\$ Savings -- **\$4,690 per hour cost of delay**

→ **53.3 hours X \$4690 per hour =**

**SAVINGS:  
\$250,000**



# Typical Day

(all times UTC)

## Scheduled:

- TAF Updates - 09, 11, 13, 15, 17, 19, 21, 23 & 01
- 5-Day Terminal Outlook - 0930
- Day 1-8 Impact Graphics - 1030
- NY/PHL TAF Coordination - 1040 & 1640
- Aviation Previous Day Weather Graphic - 1100
- NWS HQ Standup - 1145 local
- ATCSCC Standup - 1200 & 2000
- NAS Day-1 Convective Outlook - 1245
- FAA NAS System Review (Day 2-4+ Outlook) - 1400
- FAA HQ (High Impacts as needed) -1430

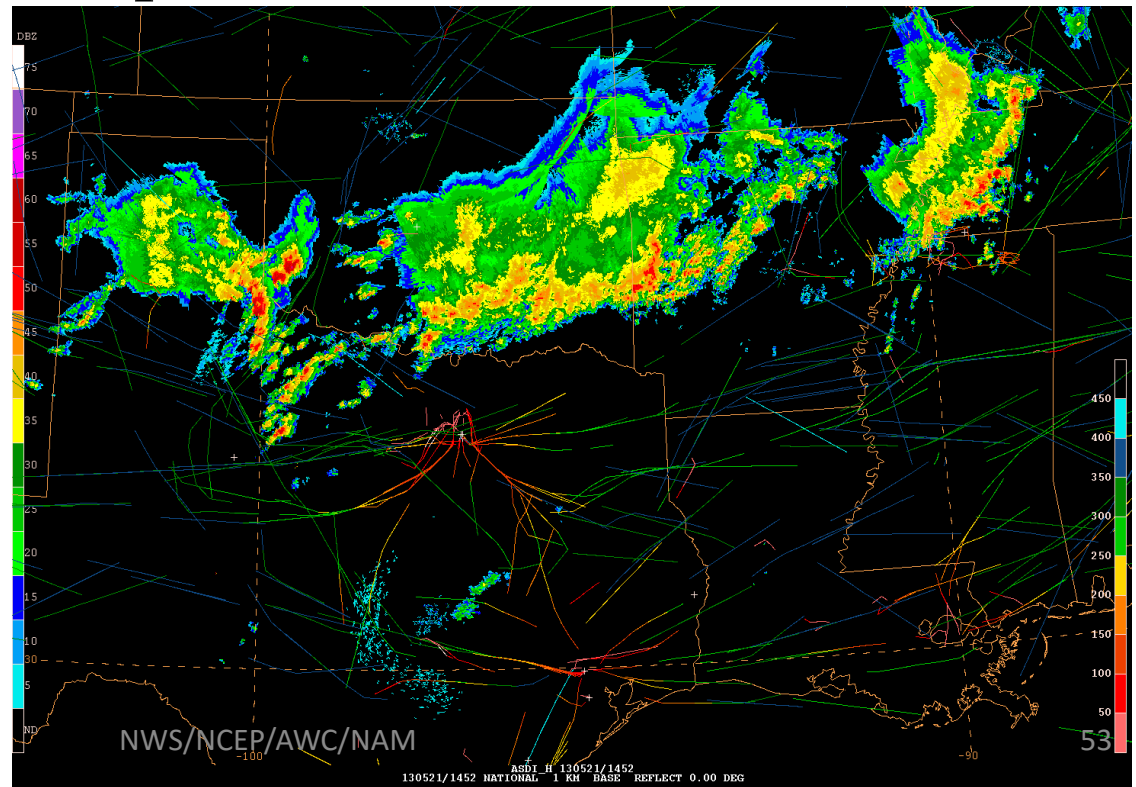
## As Needed:

- CAWS Collaboration
- SWPC & VAAC
- Ad-hoc ATCSCC Briefings/Telcons/chats – 15+ each day
- Holiday Outlooks, Special Events, Tropical...



# Most IDSS is:

- Terminal (Airport) Impacts
  - Arrival/Departure Gates
  - Weather at Airport
  - Ground Stop (GS)
  - Ground Delay Program (GDP)
- Enroute (Cruising) Impacts
  - Route blockage





# Key Aviation Weather Websites



# AWC TFM Portal

Aviation Weather Testbed  
Aviation Weather Center

Home News Organization Search  Go

Experiments Products Projects Weather Summaries Links

### Traffic Flow Management Portal

Planning and Forecasting

2-hr CCFP	0-8hr CoSPA	Day 1 Outlook	ECFP	Gálvez-Davison Index	SREF	SREF Plumes
HRRR	LAMP	3 Day Outlook	International Enroute Weather	Domestic Enroute Weather	INSITE	SPC Mesoanalysis
NCEP MAG	Experimental NSSL WRF	SSEO	NCAR Ensemble	National Hurricane Center	Central Pacific Hurricane Center	Joint Typhoon Warning Center
VAAC Products						

Tactical

Collaborative Aviation Weather Statement	Terminal Dashboard	Winter Dashboard	TRACON Forecasts	Major TAFs	Major METARs + TAFs	METARS
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# Key Aviation Weather Websites

## **NWS Aviation Weather Center:**

[www.aviationweather.gov](http://www.aviationweather.gov)

[www.aviationweather.gov/caws](http://www.aviationweather.gov/caws)

## **AWC TFM Portal:**

<http://testbed.aviationweather.gov/trafficflowmgmt/portal>

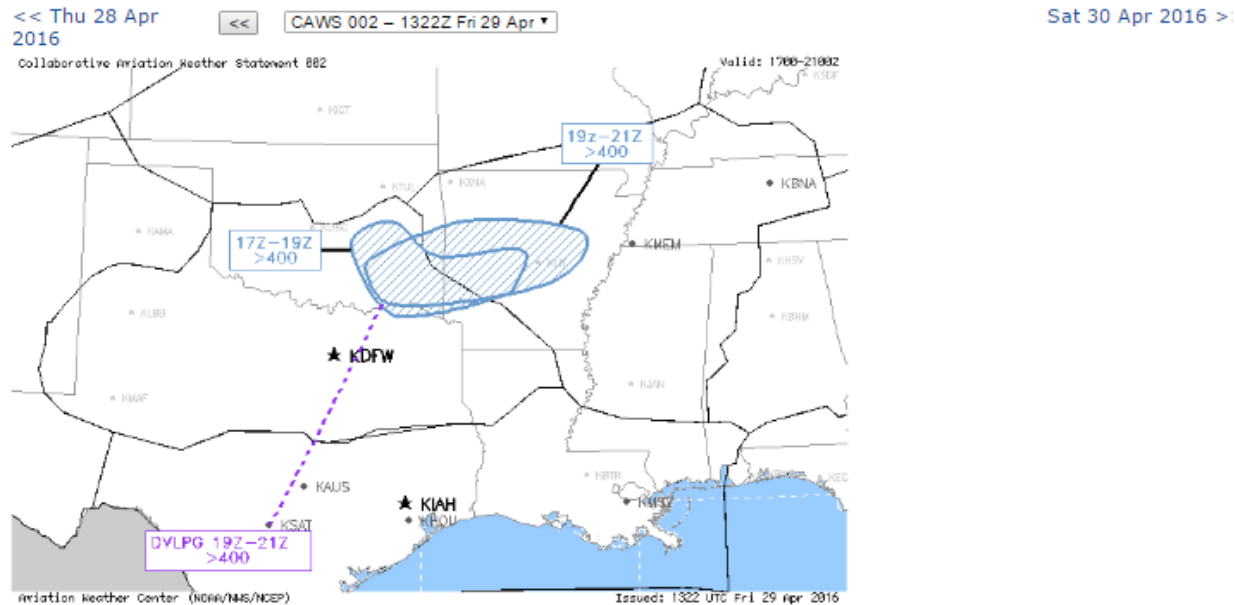


# VERBAL BRIEFINGS

- NAM Day 1 FORECAST INDICATED SCATTERED TS ACROSS WRN PA AT 15Z ... NOT ON 11Z CCFP
- 1126 DCC/WX WX: PLAN - AREA OF SHRA/TS NEAR PHL AND SOUTH WILL MOVE EAST OFF NJ COAST BY 13Z.
- 1238 DCC/WX WX: SV/STMO - TS/SHRA ACROSS SRN NJ/DELMARVA MAY STICK AROUND TIL 18Z ... AGREE WITH ZNY CWSU...GIVEN DEEP MOISTURE AND NO CAP AND THE FACT THAT IT CONTINUES TO FILL IN

# CAWS 002: 4/29/16

*Issued 1322z -- valid 17z - 21z*



Weather: Thunderstorms  
Valid: 1700-2100Z

ARTCCs affected: ZFW, ZHU, ZME  
Terminals affected: KDFW

CCFP: 13Z Issuance - Coverage too high

SUMMARY: Medium coverage in 17Z and 19Z CCFP forecasts is too broad. Sparse coverage expected over much of the CCFP medium coverage forecast.

DISCUSSION: Best forcing forcing for medium coverage of thunderstorms is forecast along the west and southwest portions of the outflow boundary from complex of thunderstorms moving through AR, to the northeast of DFW.

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.

# Key Points

- The 09Z CCFP 4 hour forecast (valid 13Z) was too far east with low/low. It missed the activity across PA all morning.
- The 11Z CCFP 2 hour forecast (valid 13Z) was very good over the Delmarva with low/low. Not good across PA.
- CAWS was issued at 1308Z to address CCFP deficiencies across Western PA
- Tops ZDC area were averaging about 25K with isolated tops 30-35K feet.
- The criteria for high confidence/sparse coverage was not met at the 2+ hour decision point.
- CAWS would be triggered with high/low... hence a low/low forecast did not trigger a CAWS.
- **Multiple briefings by AWC/NAM and CWSU Mets for 0-3 hour timeframe**

# Initial Summary

- **A convective event significantly impacted ZNY/ZBW/ZDC airspace.**
- **Advanced planning/PERTI was implemented by ATCSCC NAMs, with extensive collaboration from NWS and airline field meteorologists.**
- **CCFP was slow to catch on to the event, and in general was underdone in terms of depiction of linear features (this is an understood weakness in the auto-CCFP algorithm)**
- **CAWS issuances focused on delineating timing and location of highest coverage/impact.**

# PERTI Webinar 21Z JUNE 30, 2016

- Detailed convective outlook provided by AWC NAM
- NAM coordinated Chat/phone collaboration on timing/intensity/impacts prior to the webinar between ZNY/ZBW/ZDC CWSUs
- Used model and Collaborative forecasts to brief the following 4 graphics...(note, the ARW/SFEF was used as the model input. NAM will have to decide on the best model input to use based on each situation).

# PERTI

- **Impacts to ZNY were briefed in the NAS 2-4 Day outlook for the 3 days leading up to event.**
- **NAMs were requested to provide a Day 2 outlook during the afternoon of June 30<sup>th</sup>**
- **Detailed convective outlook was briefed on a national Webinar the evening of June 30<sup>th</sup>**
- **Forecast was well collaborated and accurate, with individual TAF sites carrying TS 18-24 hours in advance, and NAM/CWSU outlooks all in agreement.**