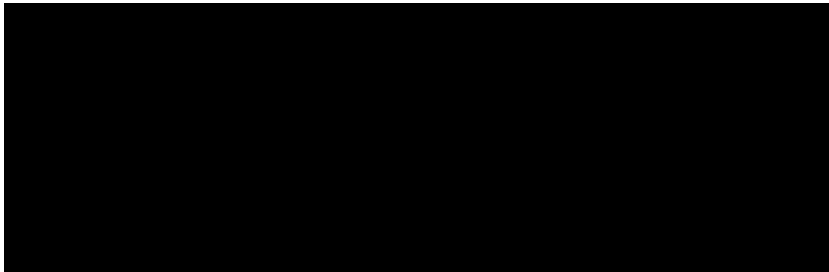


Surveillance and Broadcast Services

NTSB Data Request for N5816S Accident Investigation



Date: Original: June 23, 2015



Federal Aviation
Administration



Purpose

- **FAA/SBS Program Office response to NTSB request for graphical weather data the pilot could have been using and/or seeing given he had ForeFlight weather and Stratus on his iPad.**
 - FIS-B weather data May 18th, 2015 1538Z – 1738Z near Saltville, VA



Accident Details (source: <http://aviation-safety.net/wikibase/wiki.php?id=176222>)

Date: 18-MAY-2015

Time: 12:40 LT



Type: [Beechcraft 95-B55 Baron](#)

Owner/operator: LWF Inc

Registration: N5816S

C/n / msn: TC-941

Fatalities: Fatalities: 2 / Occupants: 2

Other fatalities: 0

Airplane damage: Written off (damaged beyond repair)

Location: Flat Top Mountain in Smyth County east of Saltville, VA -  [United States of America](#)

Phase: En route

Nature: Private

Departure airport: Spruce Creek (7FL6)

Destination airport: Mansfield Lahn Rgnl (KMFD)

Narrative:

The aircraft, a Beech 55 Baron enroute to Mansfield, Ohio, has been reported missing approximately seven statute miles north of Tazewell County Airport (KJFZ), Richlands, Virginia.

The wreckage of the plane was found on Tuesday 19 May 2015 in Smyth County east of Saltville.

There were no survivors.

Weather may have been a factor to the accident.



Accident Details (source: Extract from NTSB Preliminary Report ERA15FA215)

- On May 18, 2015, at 1238 eastern daylight time, a Beech 95-B55 (T42A), N5816S, was destroyed during collision with terrain near Saltville, Virginia. The commercial pilot and passenger were fatally injured. The airplane departed Spruce Creek Airport (7FL6), Daytona Beach, Florida, about 0920, and was destined for Mansfield Lahm Regional Airport (MFD), Mansfield, Ohio. Instrument meteorological conditions prevailed, and an instrument flight rules flight plan was filed for the personal flight, which was conducted under the provisions of Title 14 Code of Federal Regulations (CFR) Part 91.
- Preliminary radar and air traffic control information from the Federal Aviation Administration (FAA) revealed that at 1214:05, the airplane was in cruise flight at an altitude about 9,000 feet when the pilot contacted Tri-Cities Approach Control. The air traffic controller acknowledged the pilot and issued the altimeter setting. At 1220:02, the controller asked the pilot his on-course heading; the pilot responded 356 degrees. The controller advised the pilot of scattered areas of unspecified weather of unknown intensity about 40 miles directly ahead of the airplane. The pilot stated he would like to deviate east if possible. The TRI air traffic controller approved deviations left and right as necessary, and instructed the pilot to maintain 9,000 feet. At 1232:16, the air traffic controller switched the pilot to the Indianapolis Air Route Traffic Control Center (ZID) and the pilot acknowledged the communications transfer. There were no further communications between the accident airplane and air traffic control.
- Radar data depicted an easterly deviation off course, along with a gradual descent, before radar contact was lost.
- A search was initiated, and the airplane wreckage was discovered in heavily wooded, mountainous terrain on May 19, 2015.
- At 1235, the weather recorded at Tazewell County Airport, 8 miles north of the site, included scattered layers at 2,900 feet, 3,600 feet, and a broken ceiling at 8,000 feet with 10 miles visibility. The wind was from 210 degrees at 5 knots. The temperature was 24 degrees C, and the dewpoint was 18 degrees C. The altimeter setting was 30.26 inches of mercury. A Center Weather Advisory issued at 1204, valid west of the airplane's flight track, forecasted areas of heavy to extreme precipitation in isolated thunderstorms.



FIS-B Services Background

- **Flight Information Services – Broadcast (FIS-B)**
 - Provides a full range of weather information including NEXRAD, PIREPs, SIGMETs, AIRMETs, METAR, TAF, and winds aloft data
 - Aircraft can receive data from all radios in line of sight and should prioritize based on radio proximity and desired product look ahead range
 - Information is for strategic weather decision making
 - Portions of the weather image can be up to 20 minutes old in worst case
 - Operational use of FIS (FAA AIM Ch7 Sec 1-11)
 - FIS aviation weather products (e.g. graphical ground-based radar precipitation depictions) are not appropriate for tactical avoidance of severe weather such as negotiating a path through a weather hazard area. FIS supports strategic weather decision making such as route selection to avoid a weather hazard area in its entirety. The misuse of information beyond its applicability may place the pilot and aircraft in jeopardy.



FIS-B Services Background

- **Performance Requirements**

- Update and Transmission Intervals

Product	Update Interval	Transmission Interval (95%)
AIRMET	As Available	5 minutes
Convective SIGMET	As Available, then at 15 minute intervals for 1 hour	5 minutes
METAR/SPECI	1 minute (where available), As Available otherwise	5 minute
NEXRAD Reflectivity (CONUS)	~5 minutes (10 minutes for clear air mode)	15 minutes
NEXRAD Reflectivity (Regional)	~5 minutes (10 minutes for clear air mode)	2.5 minutes
NOTAMs-D/FDC	As Available	10 minutes
PIREP	As Available	10 minutes
SIGMET	As Available, then at 15 minute intervals for 1 hour	5 minutes
SUA Status	As Available	10 minutes
TAF/AMEND	8 Hours	10 minutes
Temperature Aloft	12 Hours	10 minutes
Winds aloft	12 Hours	10 minutes

- Latency

- All products except SUA Status are queued for transmission within 10 seconds of receipt of new product
 - SUA Status is queued within 20 seconds

FAA/ SBS Program Office Response to NTSB Data Request in Reference to the accident of N5816S

Description of Support Requested:

1. Request any graphical weather data the pilot could have been using and/or seeing given he had Foreflight weather and Stratus on his iPad. Any FIS-B NEXRAD data archived for the period around the accident. This request would contain the weather data one hour either side of the 1238 EDT accident time near Saltville, VA
 - Slide 9 identifies the composite coverage provided by all operational radio stations relevant to the N5816S flight path on May 18th, 2015
 - Coverage data indicates that N5816S was in coverage of one or more radios throughout its flight with the entire flight path covered at 1,500 feet AGL and above
 - Slides 10 to 12 identify time phased transmission of the FIS-B Regional NEXRAD products from the radio stations.
 - Slides 13 to 21 identify the Regional NEXRAD from FIS-B with the flight track of N5816S derived from the TIS-B tracks generated by SBS using the FAA's surveillance radar
 - Images of SIGMETs, PIREPs, and AIRMETs applicable to the flight time of N5816S and in proximity of its flight track are shown in slides 22 to 25. These slides provide images of SIGMETs and AIRMETs that were available to aircraft over Virginia on 5/18/2015 at 1600Z. All SIGMETs were Convective.
 - Text listings of FIS-B products are provided as follows:
 - SIGMETs: SigmetSummary_1600.xlsx
 - AIRMETs: AirmetSummary_1600.xlsx
 - PIREPs: PirepSummary_1600.xlsx



#1 FIS-B Coverage Along Route of Flight



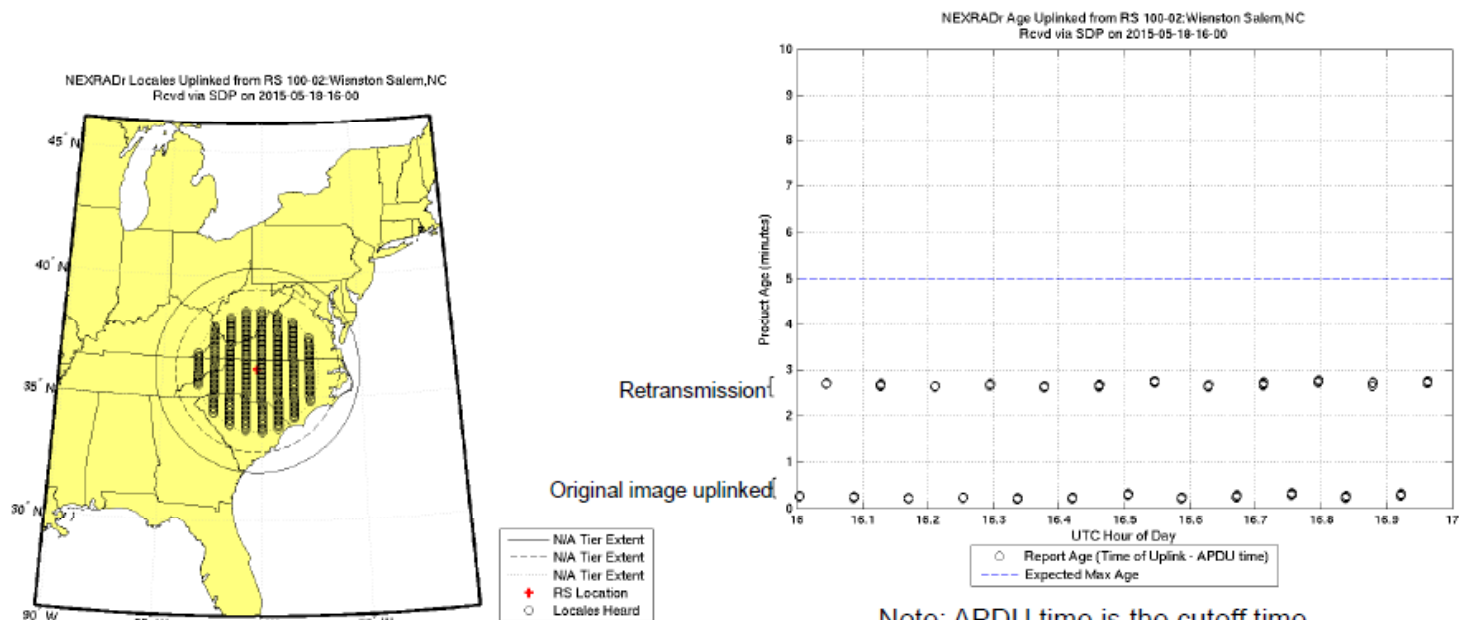
FIS-B Broadcast coverage along N5816S route of flight 1,500ft AGL Composite from all radios



- Orange shaded locations indicate where service coverage was available at 1,500ft AGL and above
- Aircraft was flying at 9,000ft AGL

Winston Salem, NC Radio 100-02 Regional NEXRAD Uplink

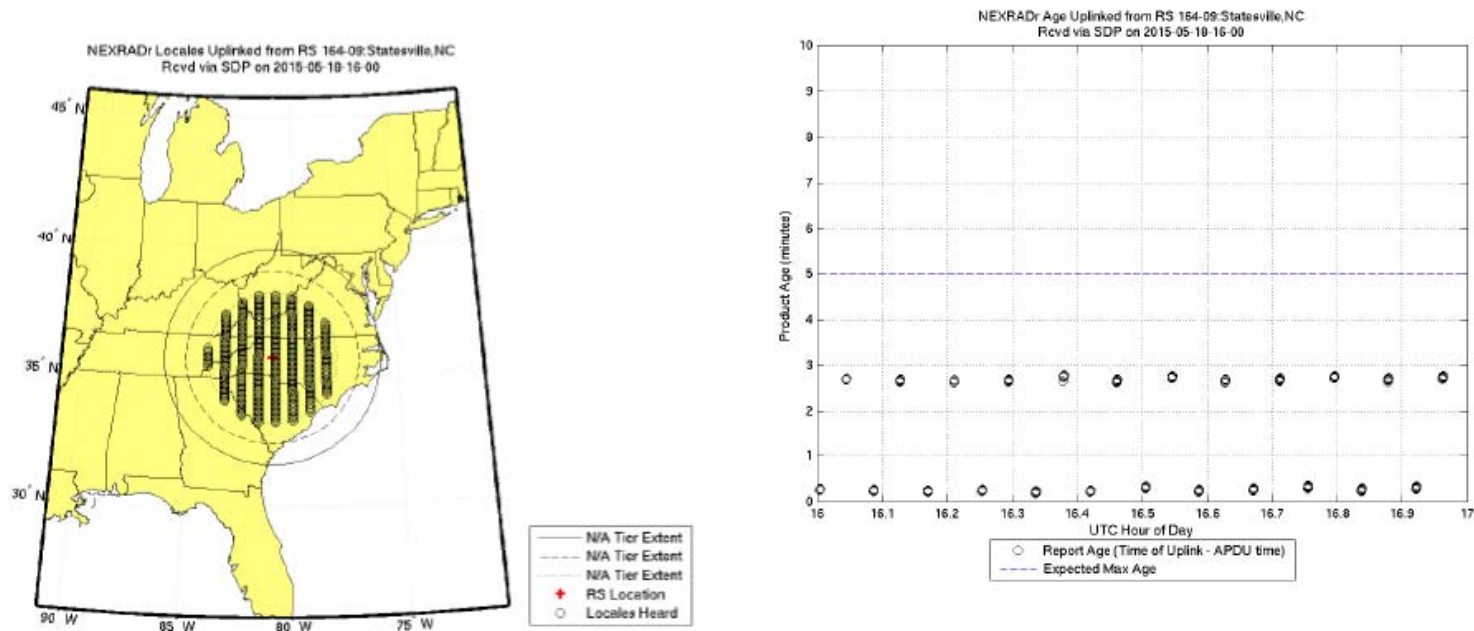
This radio transmitted a complete FIS-B Regional NEXRAD product throughout the hour.



Note: APDU time is the cutoff time of the mosaic processor. Portions of the image could be up to 10 mins older in the worst case

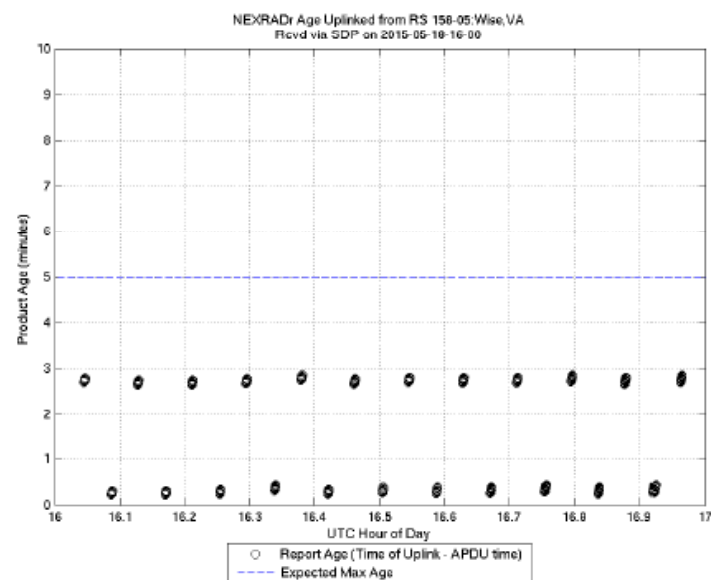
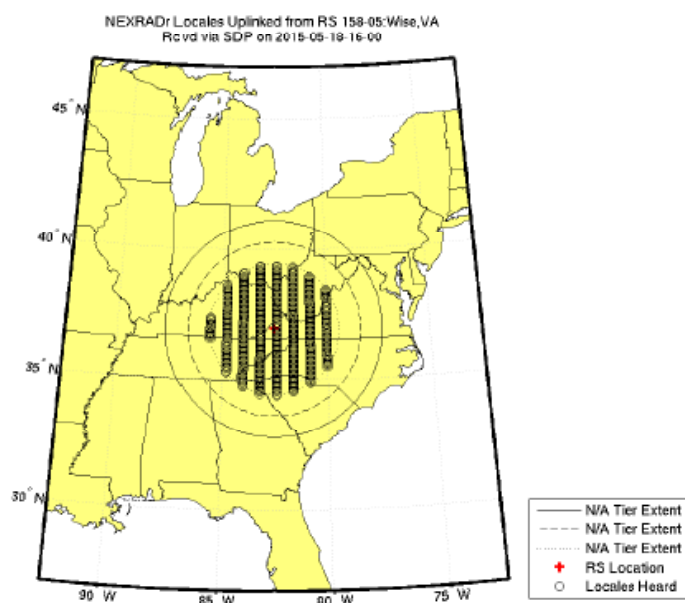
Statesville, NC Radio 164-09 Regional NEXRAD Uplink

This radio transmitted a complete FIS-B Regional NEXRAD product throughout the hour.



Wise, VA Radio 158-05 Regional NEXRAD Uplink

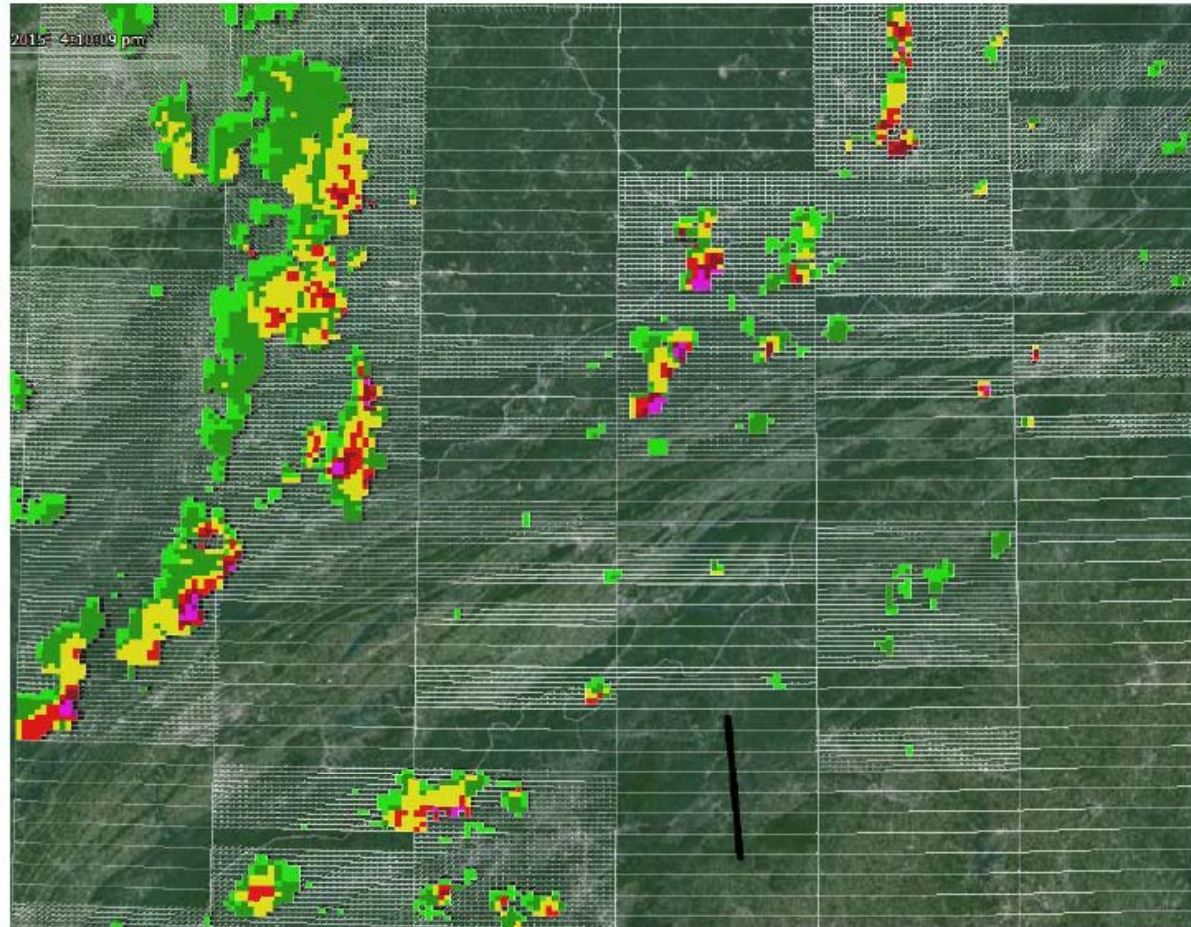
This radio transmitted a complete FIS-B Regional NEXRAD product throughout the hour.



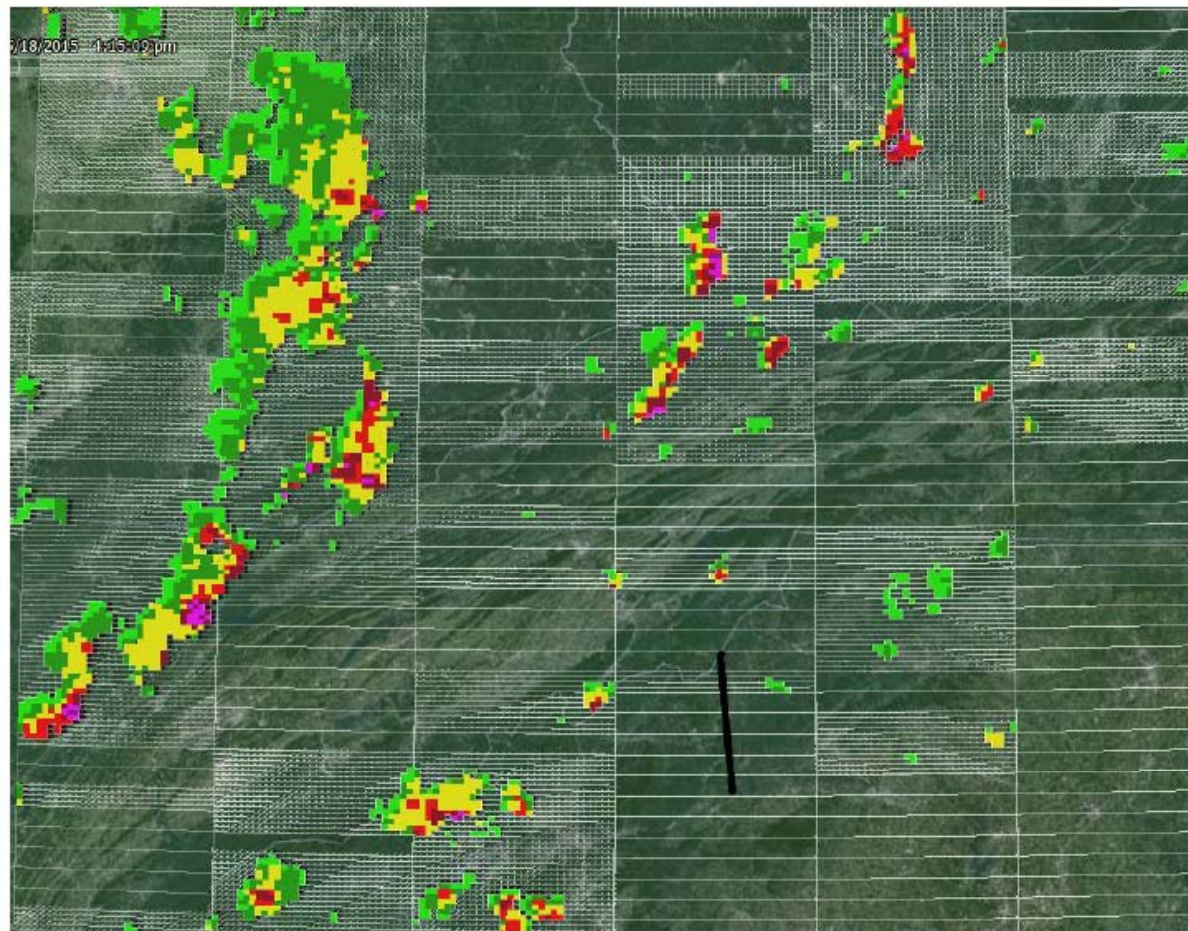
#2: FIS-B Regional NEXRAD with Flight Path



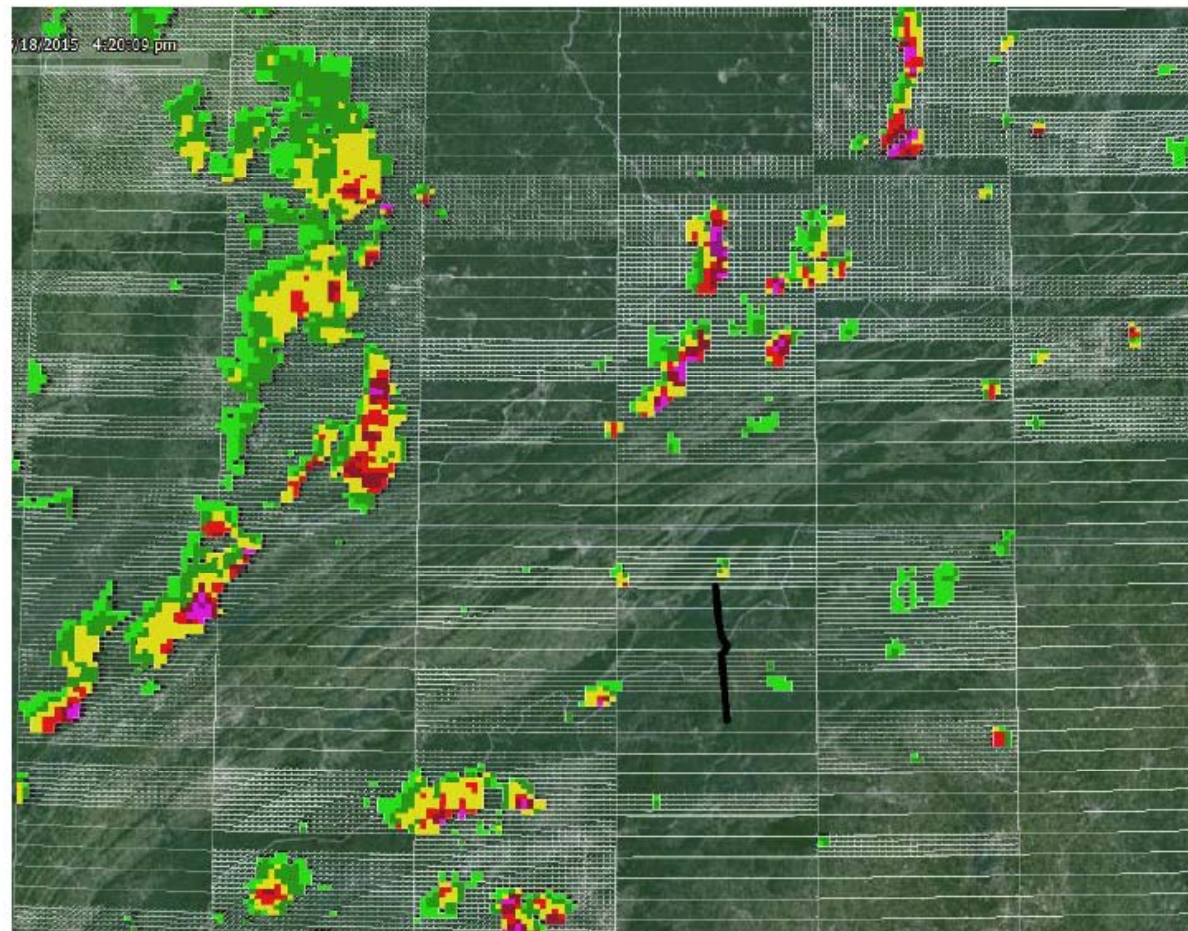
Regional NEXRAD Mosaic Creation Time 16:10 UTC N5816S Flight Path 16:00 to 16:10 UTC



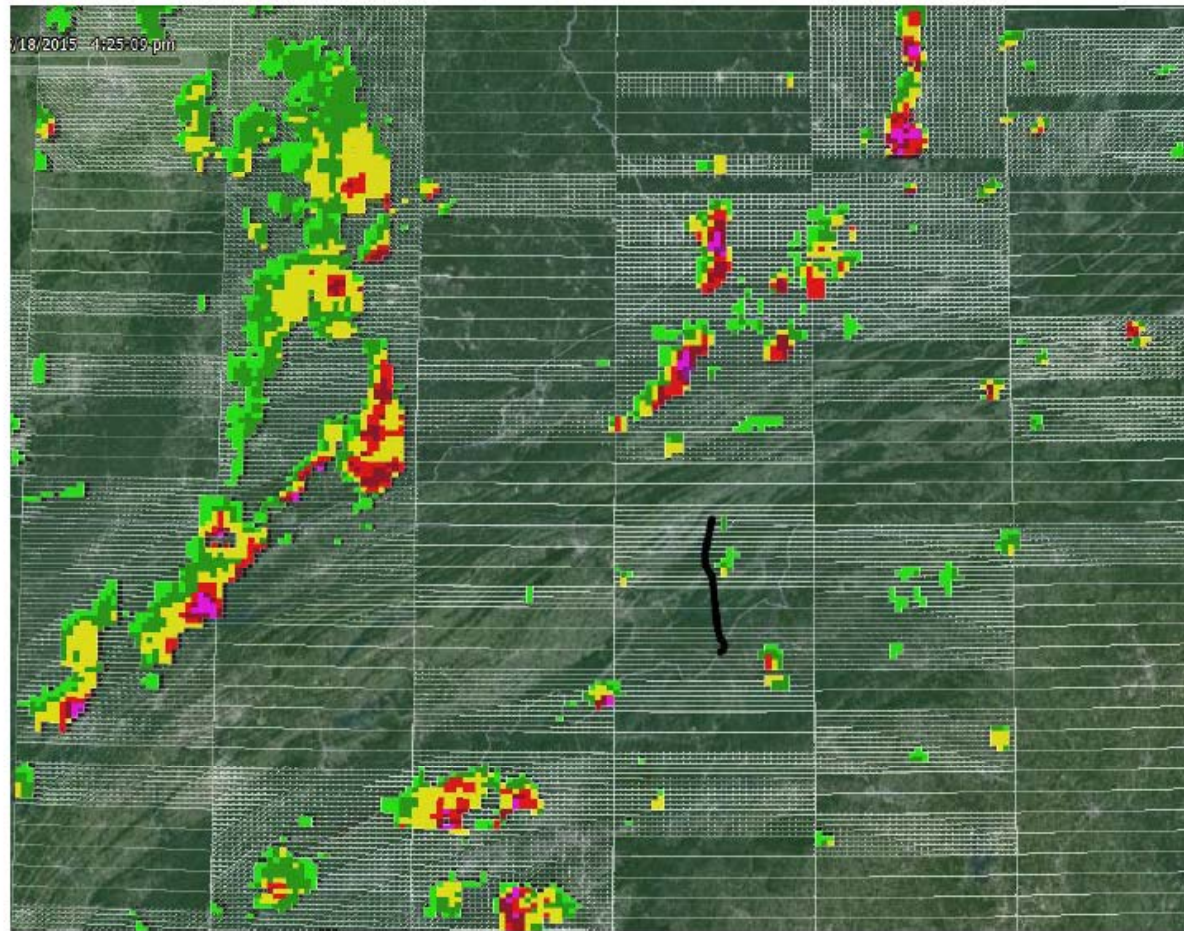
Regional NEXRAD Mosaic Creation Time 16:15 UTC N5816S Flight Path 16:05 to 16:15 UTC



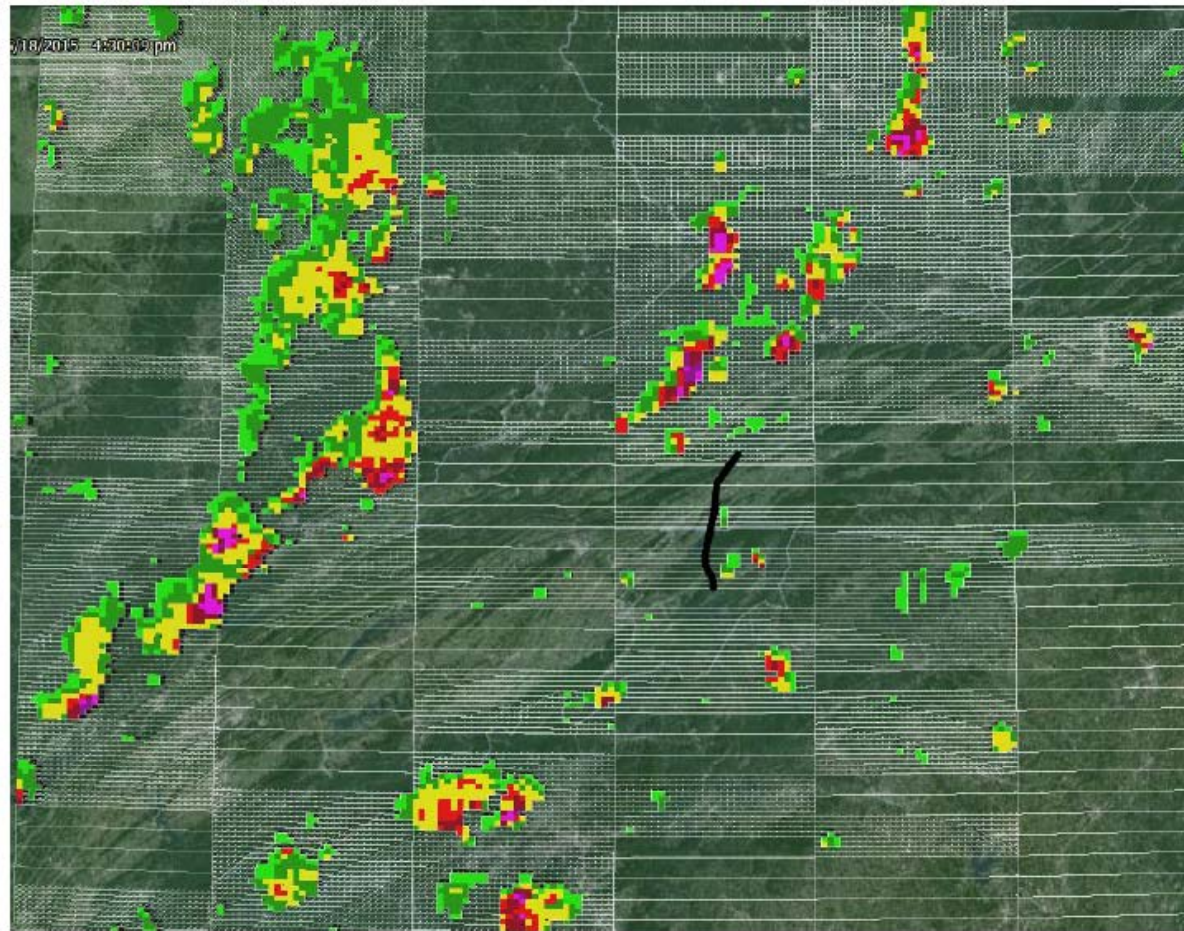
Regional NEXRAD Mosaic Creation Time 16:20 UTC N5816S Flight Path 16:10 to 16:20 UTC



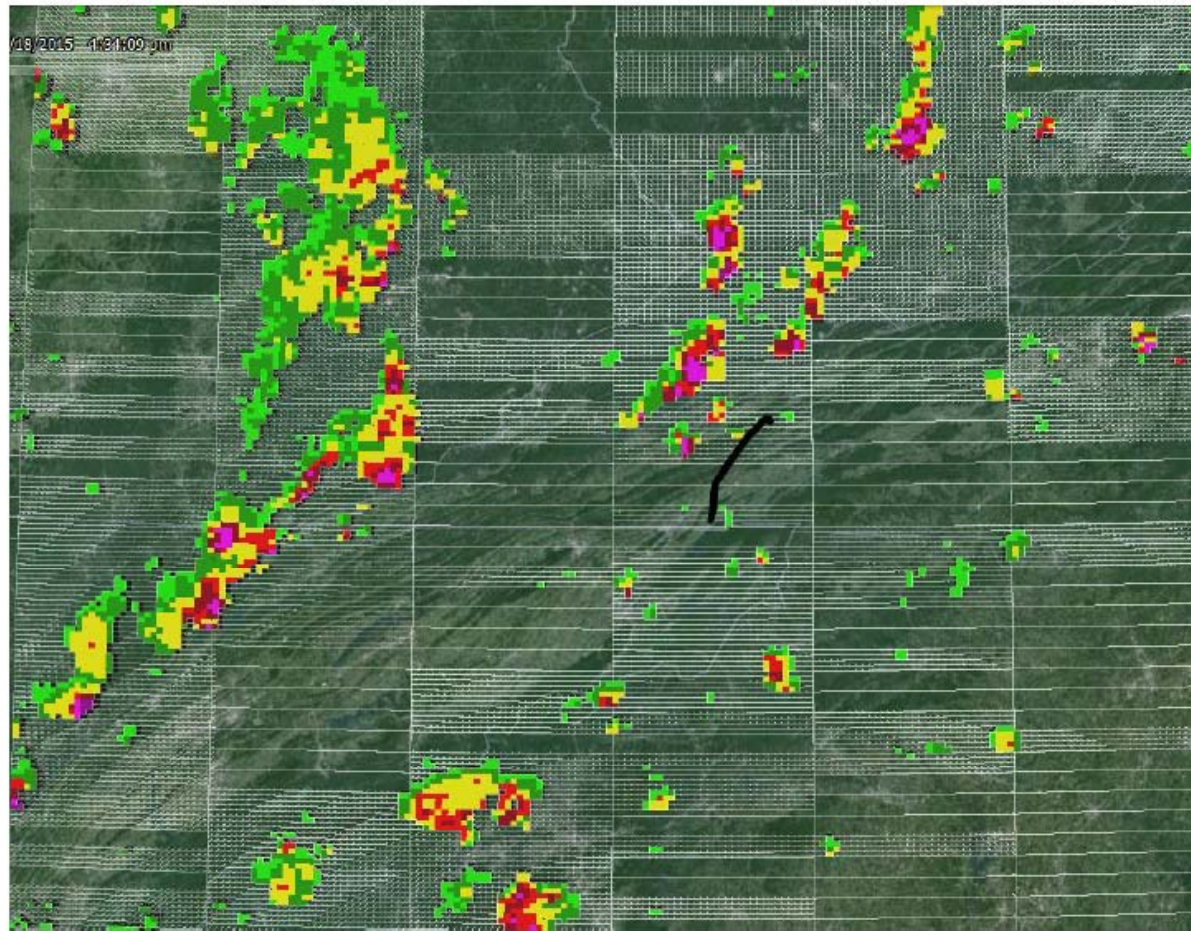
Regional NEXRAD Mosaic Creation Time 16:25 UTC N5816S Flight Path 16:15 to 16:25 UTC



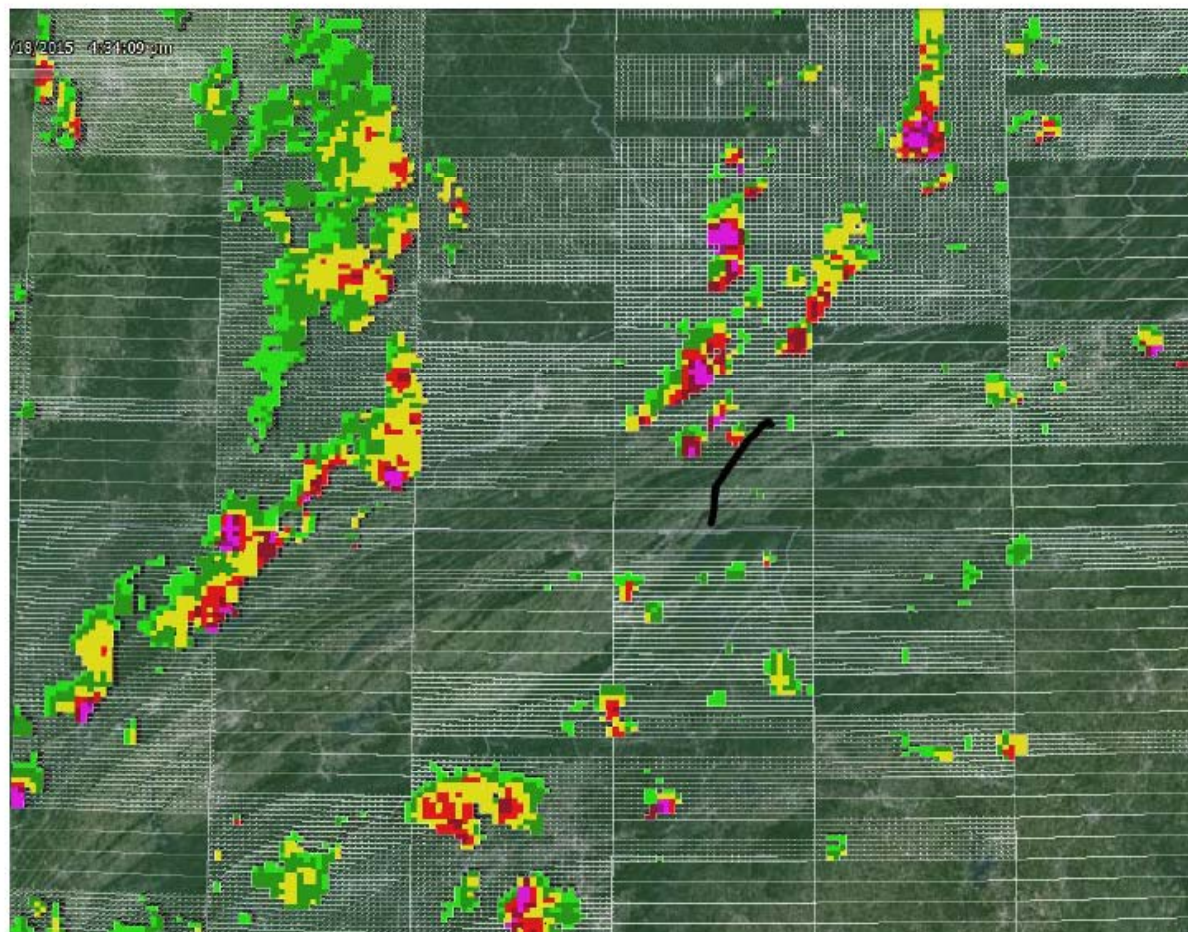
Regional NEXRAD Mosaic Creation Time 16:30 UTC N5816S Flight Path 16:20 to 16:30 UTC



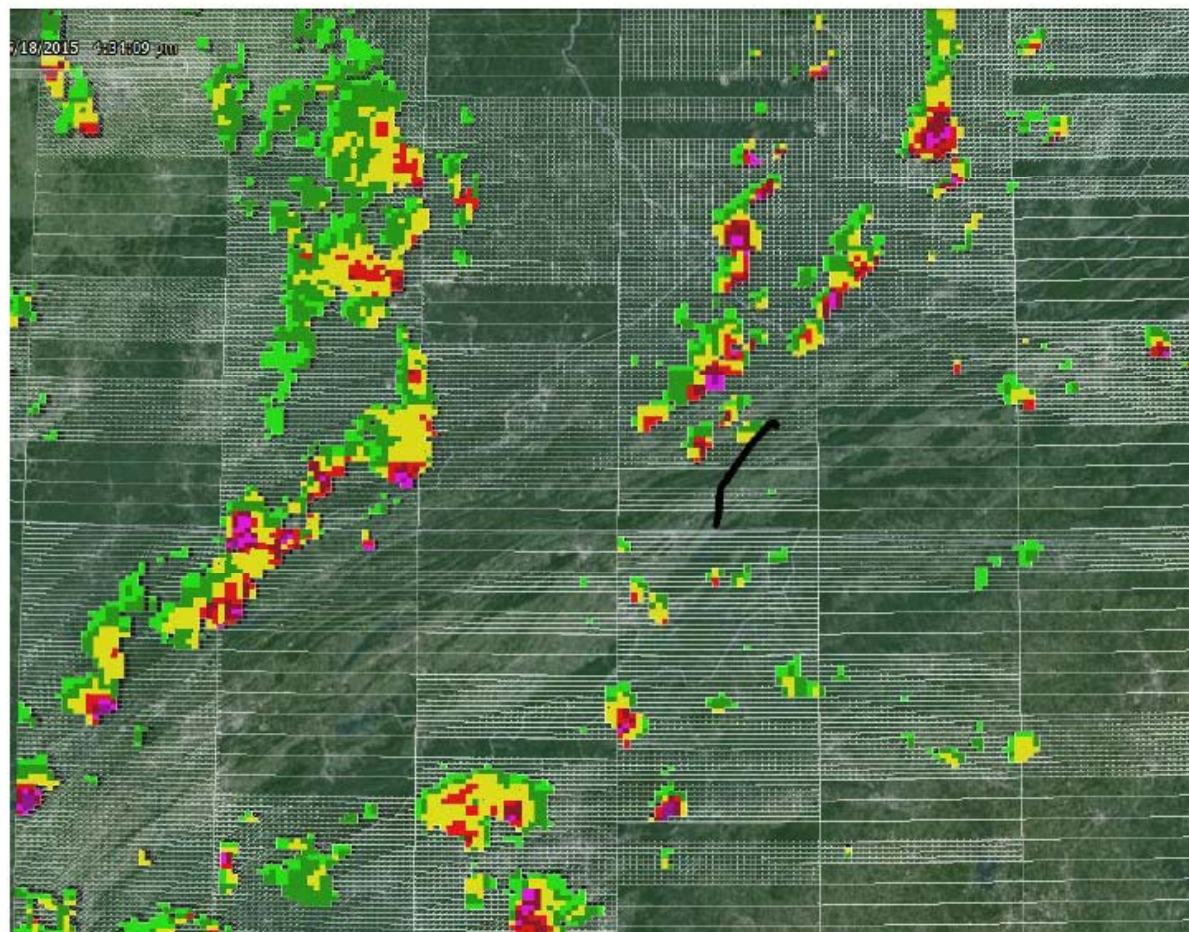
Regional NEXRAD Mosaic Creation Time 16:35 UTC N5816S Flight Path 16:25 to 16:35 UTC



Regional NEXRAD Mosaic Creation Time 16:40 UTC N5816S Flight Path 16:25 to 16:35 UTC



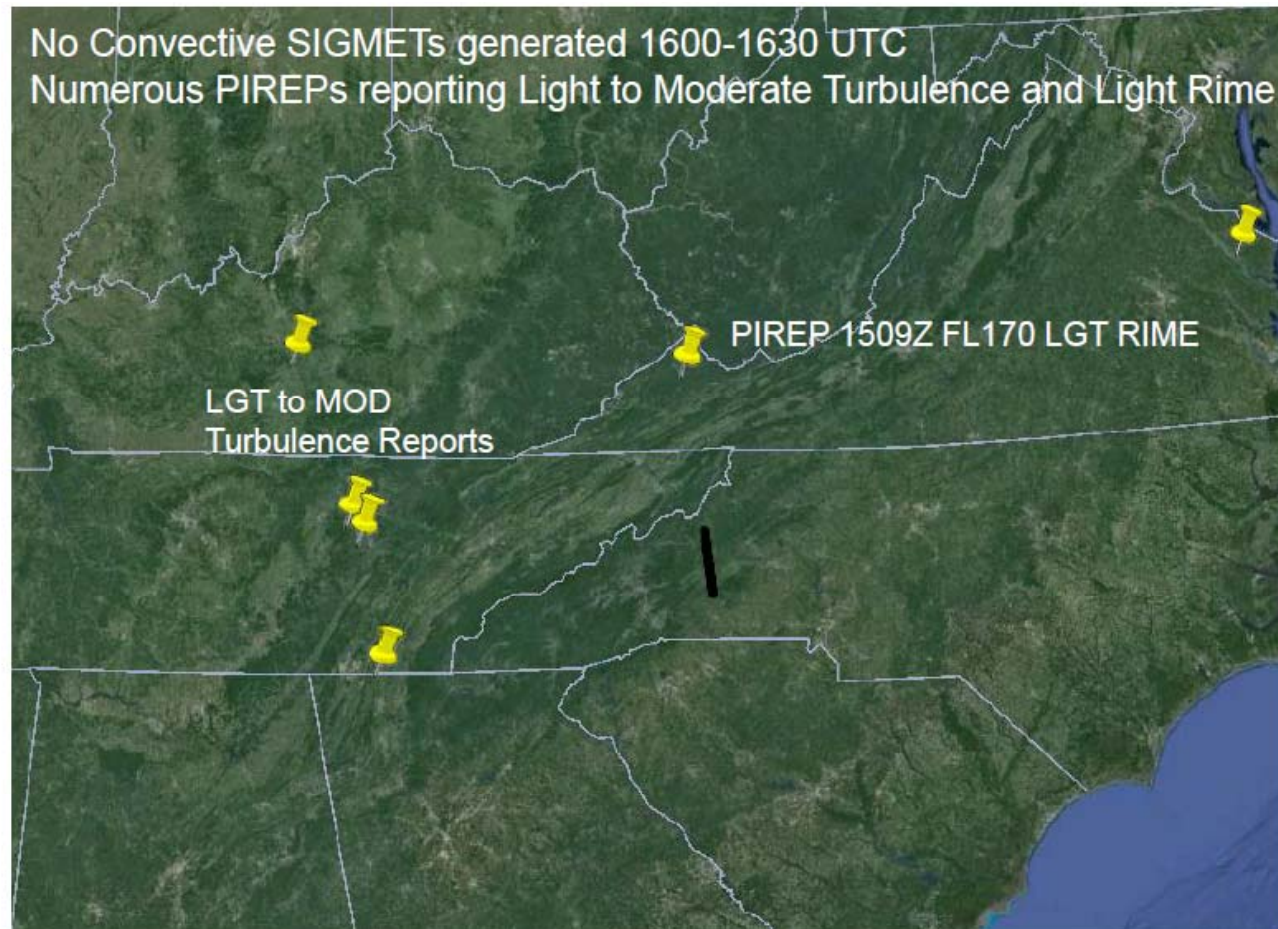
Regional NEXRAD Mosaic Creation Time 16:45 UTC N5816S Flight Path 16:25 to 16:35 UTC



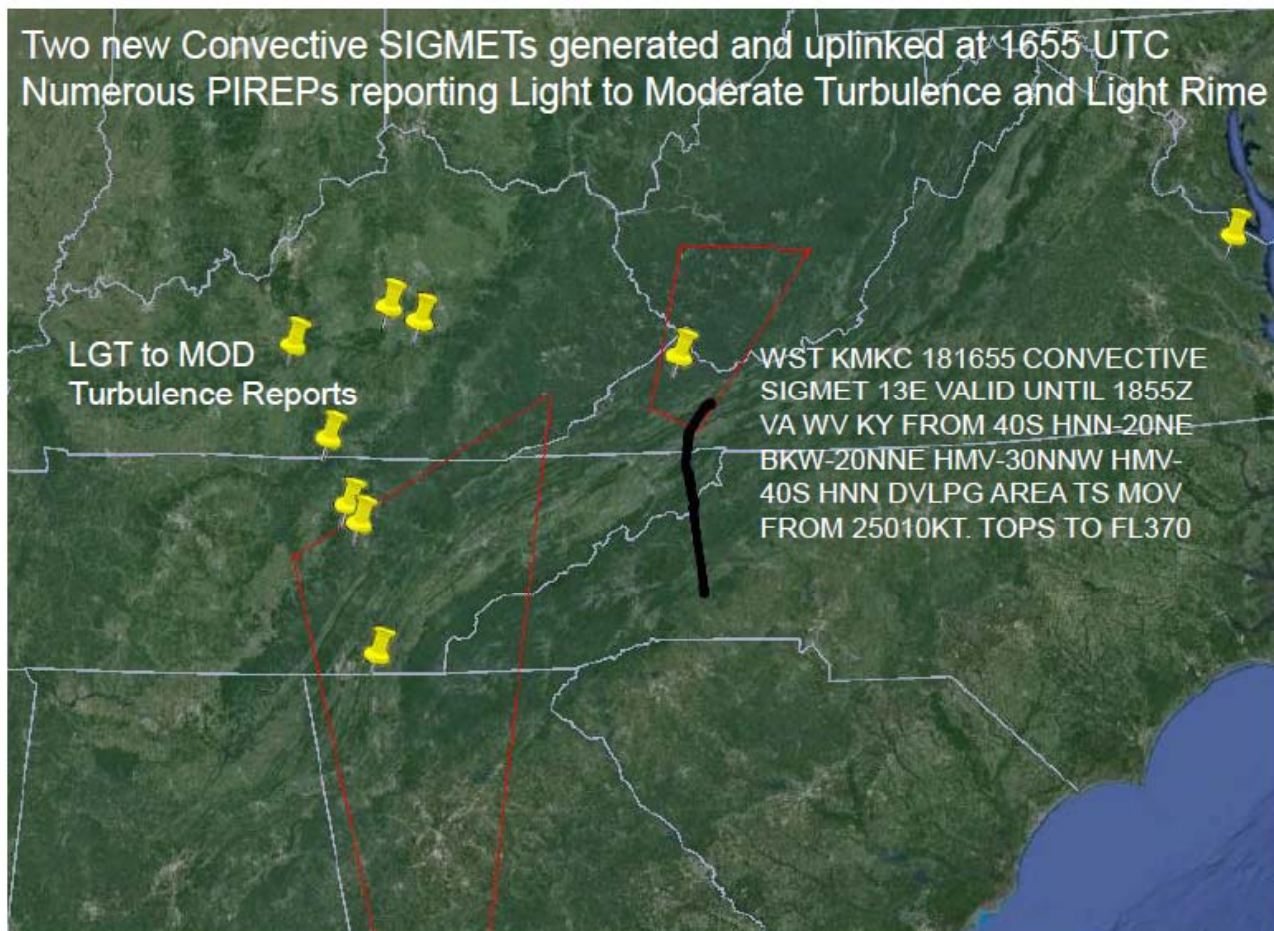
#3: SIGMETs, PIREPs, and AIRMETs



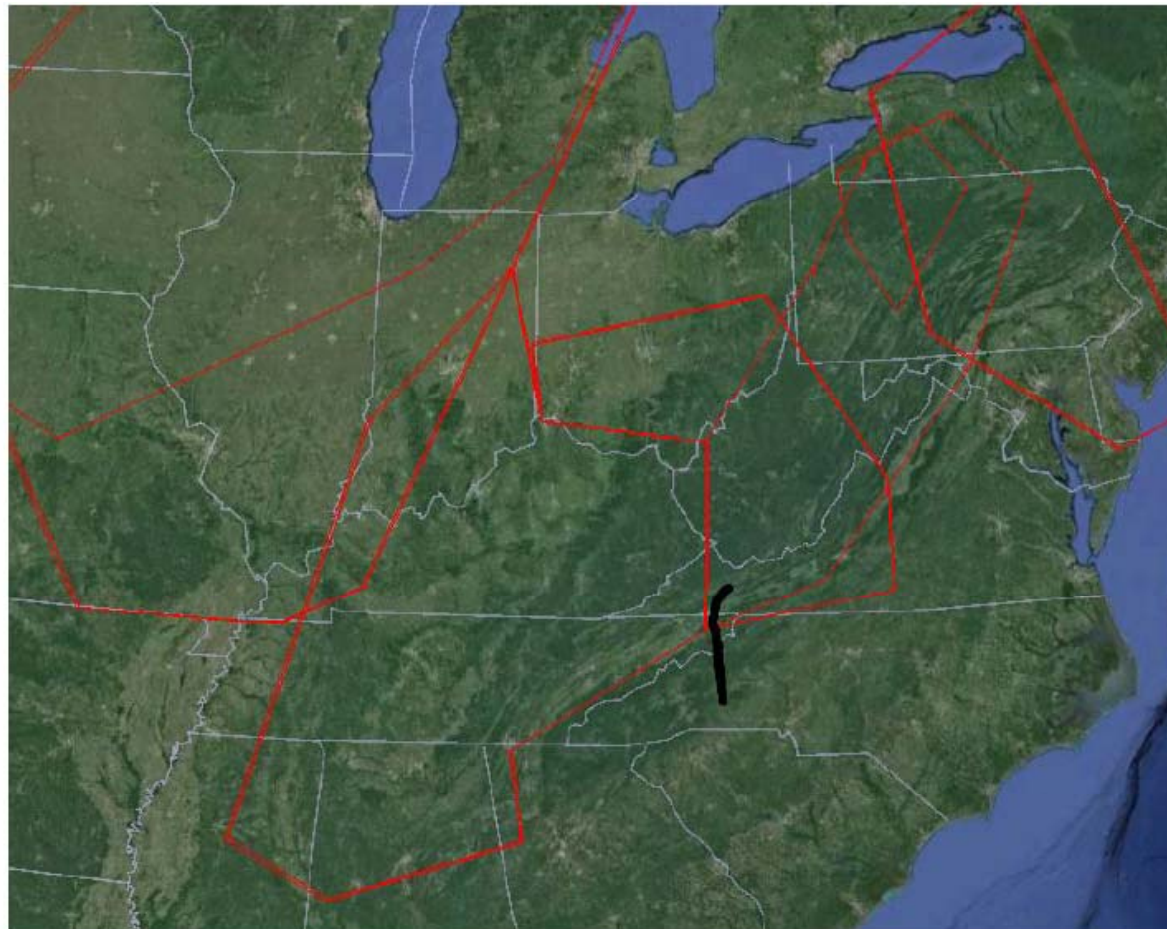
PIREP and Convective SIGMET at 1600 UTC



PIREP and Convective SIGMET at 1655 UTC



AIRMET Boundaries (see attached list for text)



Note on FIS-B NEXRAD Processing for Uplink

- The FIS-B ground system uses the Composite Reflectivity product provided from each NEXRAD sensor to create each NEXRAD product uplinked. Each NEXRAD sensor uses a volume scan composed of antenna rotations at multiple elevation angles. The Composite Reflectivity product is composed of the greatest echo intensity (reflectivity) from any elevation angle seen from the NEXRAD sensor.
- A mosaic process is performed by the FIS-B ground system on all NEXRAD sensor data within CONUS, within AK and within HI, (i.e. where sensors can have overlapping coverage). A mosaic is created for each of these areas based on all the NEXRAD sensors in that area. The Composite Reflectivity product used for the CONUS NEXRAD sensors has a 124 NM range from each operating NEXRAD sensor.
- The data lattice of bins produced in the initial CONUS mosaic processing and the Global Block format for data uplinked by FIS-B have similar cylindrical mapping projection but with different bin sizes from that of the “Global Block” uplink format. An additional processing step within the FIS-B ground system performs the necessary remapping into the Regional (high resolution) and CONUS (medium resolution) Global Block formats. In addition, the data conversions from the initial mosaic bin intensity values to the FIS-B Intensity Encoded Values for each product are performed.
 - For the Regional NEXRAD product, each radio station (RS) receives a “cutout” of its respective mosaic that is tailored to that RS area. Use of a mosaic in areas with overlapping NEXRAD sensor data gives a seamless view of the NEXRAD data as the aircraft transition between RS along its flight path.
 - The CONUS NEXRAD product is a down-sampled version of the CONUS mosaic.

*Text pulled from FIS-B MOPS Draft Appendix



Note on NEXRAD Product Timing and Latency

- When there is detectable convective precipitation within range of a NEXRAD sensor, that sensor is routinely put in “Precipitation” mode. In precipitation mode, the NEXRAD sensor can take up to 6 minutes to complete its volume scan and release the Composite Reflectivity product for use by the FIS-B ground system. NEXRAD sensors are not synchronized with each other: each sensor’s scan may complete at random times. In those areas where the NEXRADs are processed into a mosaic by the FIS-B ground system, the mosaics are generated at fixed five minute intervals. These five minute epochs of the mosaic processor represent what is termed the “cutoff” time, since the mosaic processor doesn’t wait any longer for newer data and must use the latest Composite Reflectivity product available from each sensor. It is this cutoff time that is encoded in the APDU Header Time.
- In any given area where significant weather is present, the worst case time from original sensing of the weather to the time a complete update is first available in the cockpit can be estimated for the Regional NEXRAD product as follows:
 - a) NEXRAD sensor scan time (6 minutes to complete volume scan)
 - b) Worst case NEXRAD sensor output maximum age at mosaic processor cutoff time (4:59 i.e., this sensors new output just misses the cutoff time due to the asynchronicity of the NEXRAD sensor scan with the mosaic processor)
 - c) Mosaic cutoff time to time original uplink sequence is complete (~2 minutes)
 - d) Delay time in the FIS-B avionics (<30 seconds)
- Total worst case latency can therefore be estimated to be around 14 minutes from time of sensing of the Composite Reflectivity to its first availability on the cockpit display. Avionics manufacturers should ensure users are aware of this potential latency.
- The latency estimate covers the normal case where there are no sensor or communication failures between the NEXRAD sensor and the FIS-B ground system. If there is a failure such that an update of the Composite Reflectivity product provided by any given sensor is not available, the SBS FIS-B system will reuse the last available product for that sensor for up to 20 minutes from the start of the radar scan. After 20 minutes, the sensor will revert to a “no data” status. Therefore under a worst case failure condition the latency could be increased by an additional 14 minutes.
- There is also a “Clear Air” mode where the volume scan takes longer, but we assume here that the NWS will have the sensor into Precipitation Mode before any convective activity occurs within that sensor’s range that could be hazardous to aviation. Therefore the clear air mode is of less interest here.

*Text pulled from FIS-B MOPS Draft Appendix

