



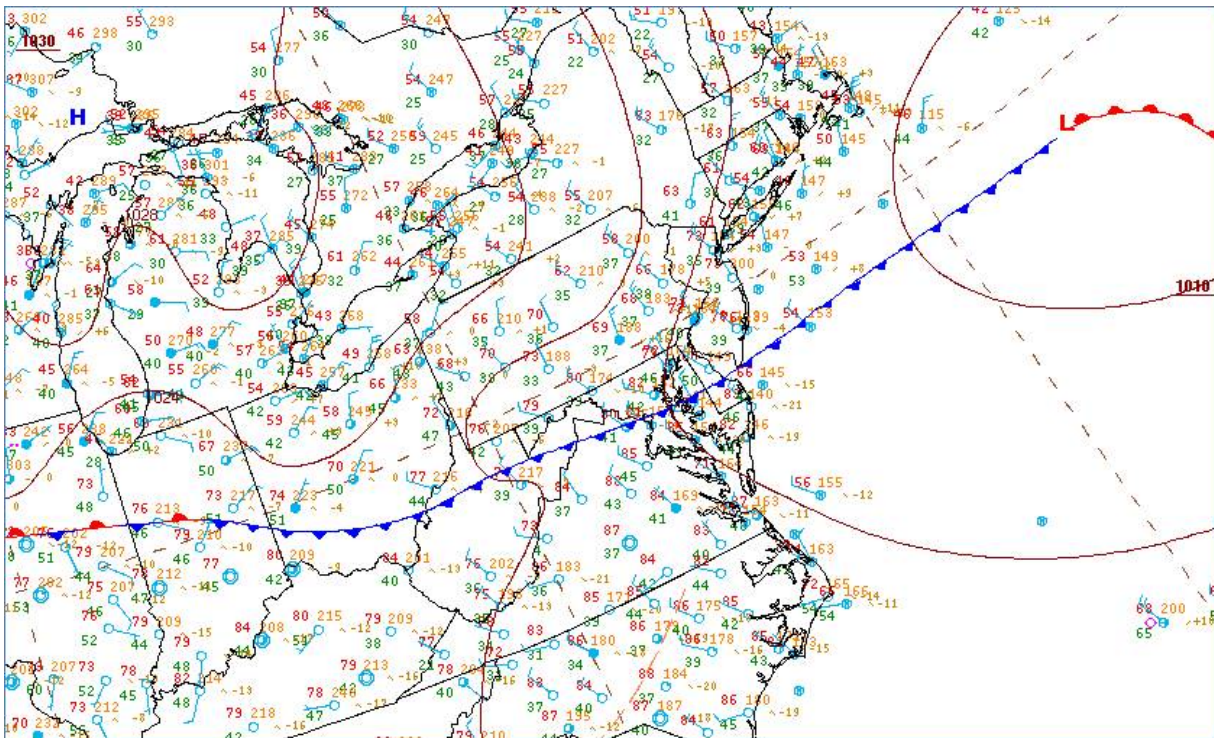
MEMORANDUM OF RECORD

Donald E. Eick
Senior Meteorologist
Operational Factors Division (AS-30)

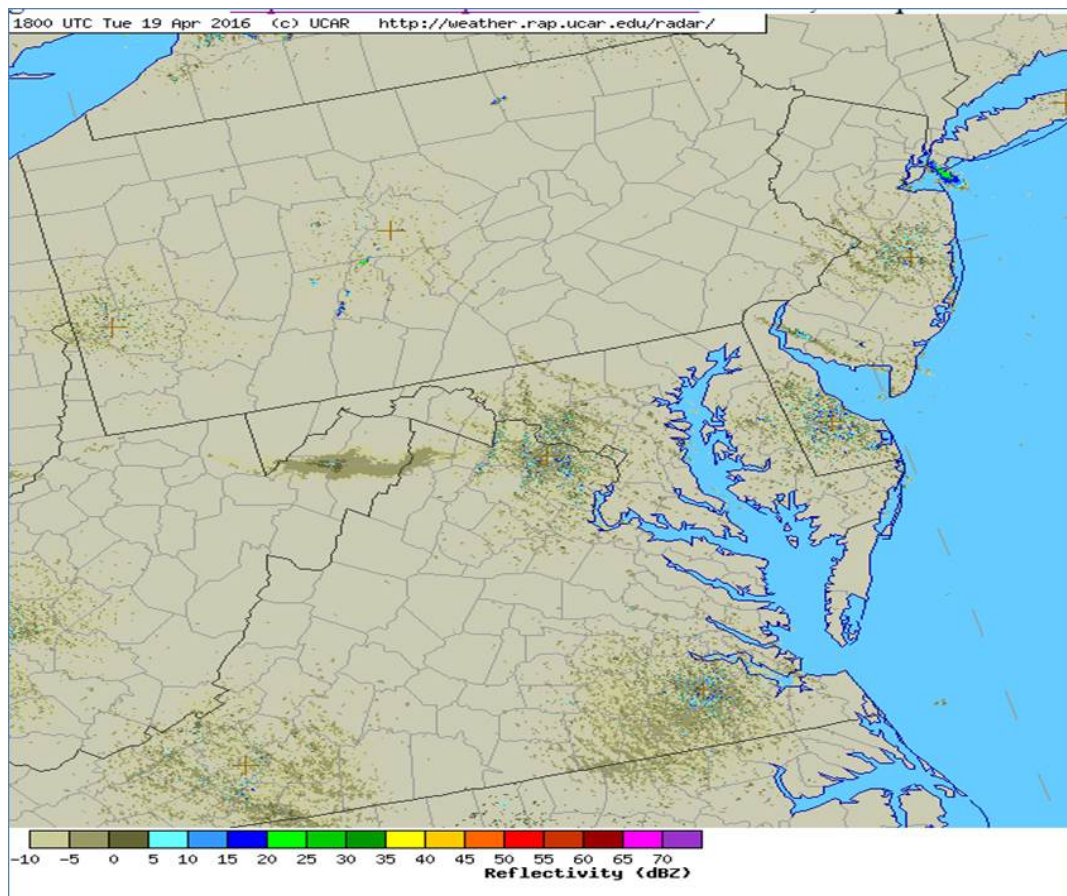
Subject: Stevensville, Maryland weather on April 19, 2016
NTSB Accident Number: ERA18LA082

ERA16FA165 - Stevensville, Maryland weather on April 19, 2016

Synoptic conditions – The NWS Surface Analysis Chart for 1500 EDT (1800Z) on April 19, 2016 depicted a low-pressure area at 1010-hectopascals (hPa) to the east with a “back door” cold front extending westward across Delaware, Maryland, into northern Virginia and was located in the general vicinity at the time of the accident. A high-pressure system at 1030-hPa was located over the Great Lakes with a ridge extending southeastward. The resultant pressure gradient resulted in sustained northwest winds of 10 to 20 knots behind the front. Temperatures were noted in the 80’s degrees Fahrenheit (F) along and south of the cold front and in the 60’s on the northern or cold air side of the front. No significant weather was depicted obscuring visibility over the area.



A review of the regional weather radar mosaic indicated no weather echoes over the area.



Observations – the surrounding area was documented utilizing NWS METAR and SPECI reports.

Bay Bridge Airport (KW29), Steenville, MD at an elevation of 15 feet, and a magnetic variation of 11 W had an Automated Weather Observation System (AWOS-III) installed, which reported limited weather information, specifically; time, visibility, temperature, dew point, and altimeter. The system did not have a precipitation sensor and thus could not report any kind of obscuration or weather phenomena. The observations surrounding the time of the accident were as follows:

Bay Bridge Airport weather at 1308 EDT, wind missing, visibility 10 miles, temperature 26° Celsius (C), dew point 6° C, altimeter 29.99 inches of mercury (Hg)

The airport is located on the Chesapeake Bay eastern coast and open to the northwest and north allowing strong wind gusts. The raw observations:

KW29 191648Z 10SM 25/06 A2999 RMK AO1
 KW29 191708Z 10SM 26/05 A2999 RMK AO1
 Accident 1720Z
 KW29 191728Z 10SM 26/05 A2999 RMK AO1
 KW29 191748Z 10SM 26/06 A2999 RMK AO1
 KW29 191808Z 10SM 26/06 A2999 RMK AO1
 KW29 191828Z 10SM 26/06 A2999 RMK AO1
 KW29 191848Z 10SM 25/06 A3000 RMK AO1
 KW29 191908Z 10SM 25/06 A3000 RMK AO1
 KW29 191928Z 10SM 25/07 A3001 RMK AO1
 KW29 191948Z 10SM 24/06 A3002 RMK AO1

United States Naval Academy (KNAK), Annapolis, MD was the next closest weather report facility located approximately 7 miles west of the accident site and on the western side of the Chesapeake Bay, and relatively sheltered from the northwest winds from the Chesapeake Bay. The raw observations surrounding the period were as follows:

METAR KNAK 191554Z AUTO 32008KT 10SM CLR 26/06 A3000 RMK AO2 SLP161 T02560061
METAR KNAK 191654Z AUTO **32009KT** 10SM CLR 26/07 A2999 RMK AO2 SLP156 T02610067
Accident 1720Z
METAR KNAK 191754Z AUTO **31011KT** 9SM CLR 26/06 A2998 RMK AO2 SLP154 T02610061 10261 20150 56013
METAR KNAK 191854Z AUTO 02014G22KT 10SM CLR 25/07 A2999 RMK AO2 SLP156 T02500072
METAR KNAK 191954Z AUTO 02013G22KT 10SM CLR 23/09 A3001 RMK AO2 SLP163 T02330094

Easton/Newnam Field Airport (KESN), Easton, MD was located approximately 16 miles southeast of the accident site at an elevation of 72 feet. The airport had an AWOS and reported the following conditions:

KESN 191450Z 33011KT 10SM SCT250 A3006
KESN 191555Z 33010G16KT 10SM SCT250 A3005
KESN 191645Z **32010G16KT** 10SM SCT250 A3002
KESN 191755Z **36010G18KT** 10SM SCT250 A3001
KESN 191855Z 35010G19KT 10SM BKN250 SCT180 A3002
KESN 191945Z 02015G23KT 10SM BKN250 SCT150 A3003

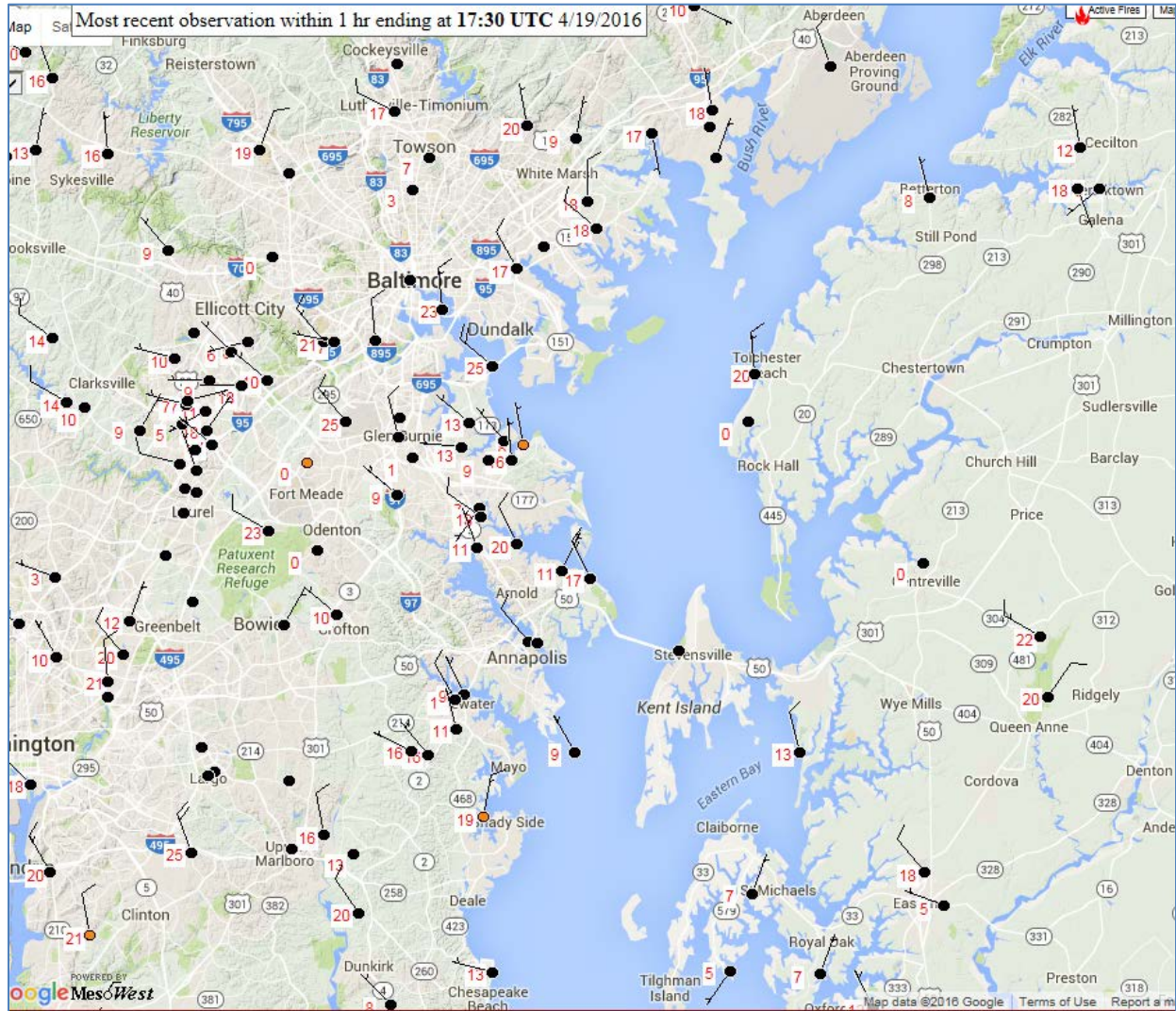
Baltimore/Washington International Thurgood Marsh Airport (KBWI), Baltimore, MD was located approximately 20 miles northwest of the accident site at an elevation of 143 feet. The airport had a federally installed and maintained Automated Surface Observation System (ASOS) and was augmented by NWS certified observers. The following conditions were reported at the time of the accident:

KBWI 191554Z 31012G20KT 10SM SCT160 BKN250 27/05 A3000 RMK AO2 SLP158 T02720050
KBWI 191654Z **32012G22KT** 10SM FEW065 BKN160 BKN250 27/06 A2999 RMK AO2 SLP156 T02720056
Accident 1720Z
KBWI 191754Z **31014G22KT** 10SM FEW090 BKN160 BKN250 28/06 A2998 RMK AO2 SLP152 T02780056 10283 20178 56011
KBWI 191854Z 36012G20KT 10SM FEW090 OVC160 27/06 A3000 RMK AO2 SLP158 T02670061
KBWI 191954Z 36014G23KT 10SM FEW090 OVC160 26/07 A3002 RMK AO2 SLP162 T02560072

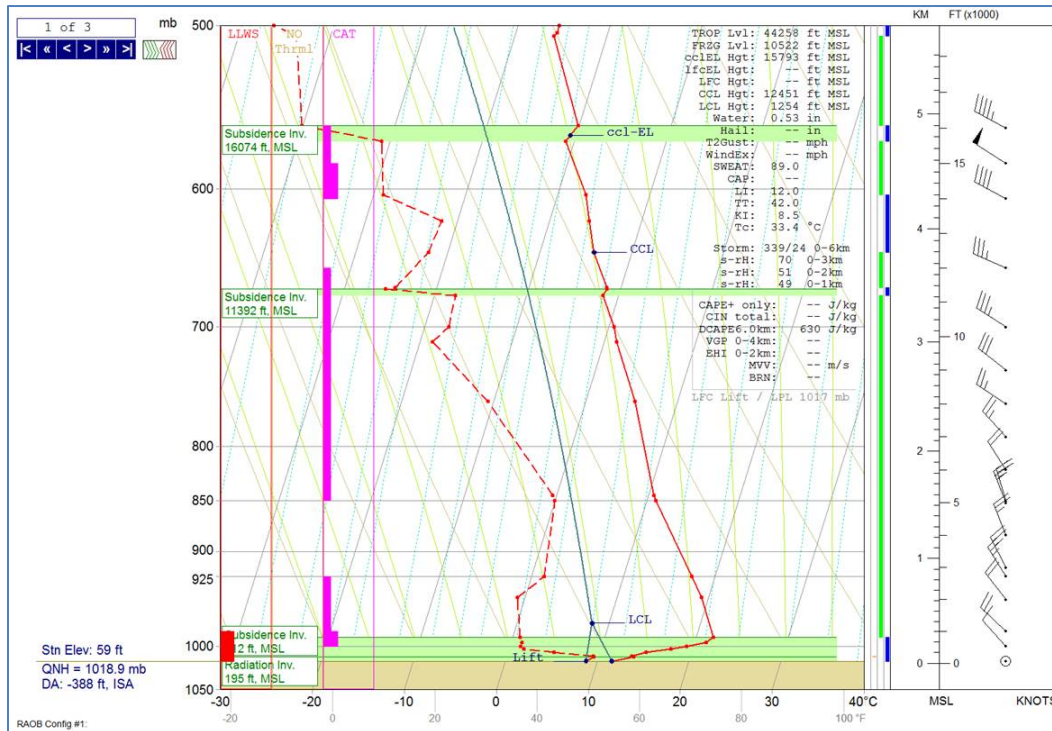
The closest Terminal Aerodrome Forecast (TAF) to the accident site was also from KBWI and was as follows: winds NW 16 knots gusting to 25 knots.

TAF KBWI 191431Z 1915/2018 31009KT P6SM FEW160 BKN250
FM191530 34016G25KT P6SM FEW070 BKN200
FM200200 01009KT P6SM FEW250
FM200800 35005KT P6SM SKC

Mesonet of Observation – A search of MesoWest data base of any additional local observations at the time provided the following image at 1330 EDT with wind direction and speed (mph) provided in the station model with the peak gust next to the station. The best estimate of the conditions at the time of the accident indicated NNW winds at 15 knots with gusts to near 25 knots over the Chesapeake Bay.



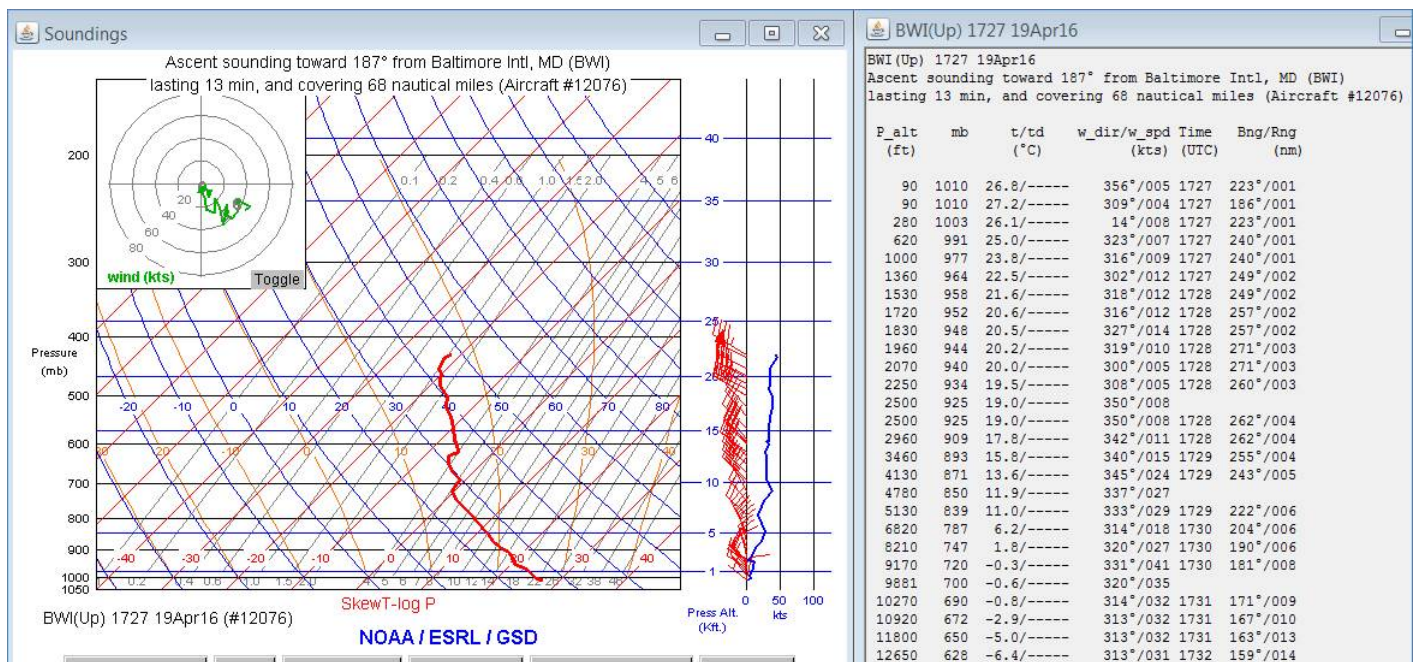
Local Sounding – the closest upper air sounding site was from Aberdeen Proving Grounds (KAPG), MD located approximately 32 miles north-northeast of the accident site and on the western shore of the Chesapeake Bay. The 0800 EDT (1200Z) sounding is included below. The sounding indicated a morning surface based inversion to approximately 800 feet. Winds were from the northwest at 10 knots and increasing in wind speed to over 20 knots immediately above the inversion. The strong shear resulted in a potential low-level wind shear conditions and turbulence.



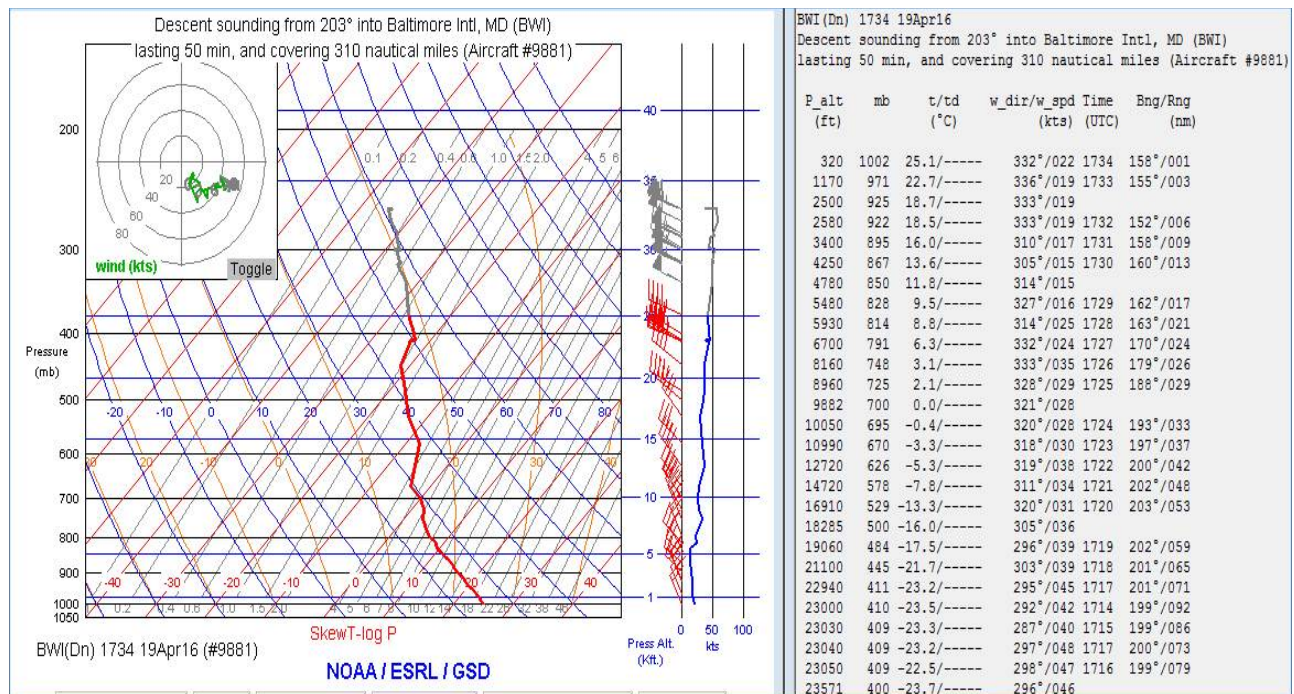
The sounding data below 10,000 feet:

Height (ft-AGL)	Pres (mb)	T (C)	Td (C)	RH (%)	DD/FF (deg/ kts)	CAT (AF)	LLWS
0	1017	11.6	8.8	83	0/0		
136	1012	13.8	9.5	75			
163	1011	13.6	9.4	76			
273	1007	15.0	5.0	51			
384	1003	17.6	1.6	34			LIGHT
468	1000	19.2	1.2	30	320/12		
581	996	21.2	1.2	26			
753	990	21.8	0.8	25		L-M	LIGHT
941	983				315/21	LGT	
2009	947	19.2	-0.8	26	325/21	LGT	
2669	925	17.4	1.4	34	330/24		
2941	916				335/23		
3941	883				340/23		
5010	850	11.0	0.0	47	345/23		
5171	845	10.6	-0.4	46		LGT	
5941	821				330/21	LGT	
6941	792				320/24	LGT	
8005	761	5.4	-10.6	30	305/26	LGT	
8941	735				310/29		
9776	712	1.4	-18.6	21		LGT	
10224	700	0.6	-17.4	25	305/34		

Aircraft Sounding (AMDARs) – A southwest Airlines flight identified as aircraft #12076 ascent sounding is included below. The aircraft took off at 1327 EDT (1727Z) and provided a wind profile over the region. The wind profile indicated a surface wind from the north to northwest at 5 knots with winds from the northwest to north with height. A low level maximum was identified at 5,000 feet with winds from approximately 330° at 29 KT. Winds below 2,000 feet were generally from the northwest at less than 15 knots.



Another Southwest Airlines flight descending into KBWI and landing at 1335 EDT (1734Z) and provided a similar sounding with slightly higher wind speeds. The wind at 320 feet or near the surface was 330° at 22 knots with wind speeds in from 15 to 19 knots below 5,000 feet.



NWS Forecast – the public forecast for the area during the afternoon for the Annapolis/Stevensville area was for mostly sunny skies with a high near 82° F, winds from the north around 17 mph with gusts as high as 26 mph. Winds diminishing after sundown.

The NWS had a Fire Warning in effect due to the low relative humidity and strong gusting winds and a marine small craft advisory in effect due to the wind gusts.

NWS In-Flight Weather Advisories – The NWS Aviation Weather Center had the following advisories current over the region:

WAUS41 KPCI 191445

2016110 1452

WA1T

-BOST WA 191445

AIRMET TANGO UPDT 2 FOR TURB VALID UNTIL 192100

AIRMET TURB...ME NH VT MA RI CT NY LO NJ PA WV MD DC DE VA AND CSTL WTRS

FROM YSC TO 190SE ACK TO 160SE SIE TO 50SSW SBY TO 40NW CSN TO 40ENE EWC TO 20S BUF TO YOW TO YSC

MOD TURB BLW 120. CONDS CONTG BYD 21Z THRU 03Z.

There were no Convective SIGMETs/SIGMETs/Center Weather Advisories current over the region forecasting any severe weather conditions.

Pilot Reports – a B737 reported moderate chop at 4,000 feet in the immediate vicinity and prior to the accident:

BWI UA /OV BWI180003/TM 1655/FL040/TP B737/TB MOD CHOP=

Center Weather Service Advisories – The Washington Center (KZDC) issued several Meteorological Impact Statements regarding the weather conditions over the region during the period:

FAUS20 KZDC 191114

ZDC MIS 01 VALID 191115-191900

...FOR ATC PLANNING PURPOSES ONLY...

COLD FRONT MOVING SOUTH INTO N ZDC THIS MORNING...WINDS BECMG NW-N G20-30KT SPCLY NE ZDC.

OCNL LGT-MOD TURB BLW 100 AND ABV FL200. OTRWS VFR.

FAUS20 KZDC 191949

2016110 1949

ZDC MIS 02 VALID 191950-200300

...FOR ATC PLANNING PURPOSES ONLY...

COLD FNT PUSHES S THROUGH ZDC...BUT NO TS EXPECTED. LGT-MOD TURB CONTINUES FL220-390 AND BLW 150 ACROSS ZDC WITH ISOL SEV TURB POSS

BLW 080 N ZDC. NW-NE SFC WIND GUSTS 20-25 KTS DC METROS. AREAS OF MAINLY LGT ICE POSS 110-FL200 N ZDC.

Area Forecast Discussion (AFD) issued by the Sterling NWS Weather Forecast Office (WFO):

FXUS61 KLWX 191849

AFDLWX

AREA FORECAST DISCUSSION

NATIONAL WEATHER SERVICE BALTIMORE MD/WASHINGTON DC

249 PM EDT TUE APR 19 2016

.SYNOPSIS...

A COLD FRONT HAS CROSSED THE AREA. HIGH PRESSURE WILL BUILD SOUTHWARD BEHIND THE FRONT LATE TONIGHT AND WEDNESDAY. A STRONGER

COLD FRONT WILL APPROACH THE REGION THURSDAY NIGHT INTO FRIDAY. WEAK CANADIAN HIGH PRESSURE WILL RETURN OVER THE WEEKEND.

&&

.NEAR TERM /TONIGHT/...

THE PRIMARY CONCERN TDA HAS BEEN THE FIRE WX CONCERNS. SEE PARA BLO.

BACKDOOR CD FNT HAS MOVED THRU THE RGN. WINDS HV TURNED TO THE NNW AND BECOME SPORADICALLY GUSTY. RH'S ARE IN THE 20S. TEMPS HV

WARMED INTO THE LM80S...WHICH IS WHERE THESE SHOULD TOP OUT. WINDS SHOULD DIMINISH W/ SUNDOWN TNGT. W/ LOW DWPTS TEMPS SHOULD

DROP INTO THE MU40S ACROSS MOST OF THE AREA...L50S IN THE CITIES.

&&

.AVIATION /18Z TUESDAY THROUGH SUNDAY/...

ALTHO CLDS HV SPREAD OVR MUCH OF THE FCST AREA THESE ARE STILL HIGH. VFR CONDS XPCTD THIS EVE THRU THU. A CD FNT WL MV THRU THE

RGN THU NGT/FRI...PTNLY BRINGING RA AND LWRD CIGS TO THE TAF SITES.

VFR CONDITIONS EXPECTED FROM SAT AND INTO MON WITH HIGH PRES DOMINATING THE WEATHER CONDITIONS OVER OUR REGION.

&&

.MARINE...

SCA IN EFFECT FOR ALL MARINE ZNS THRU WED MRNG AS WINDS HV NCRSD BEHIND THE BACKDOOR CD FNT. NO PROBS FORESEEN WED-THU. A CD FNT WL

CROSS THE WATERS FRI..BRINGING SHRA TO THE WATERS AND PTNLY SCA LVL WINDS.

SUB-SCA CONDITIONS EXPECTED FROM SAT INTO MON AS WINDS WILL REMAIN BELOW CRITERIA DURING THIS PERIOD.

&&

.FIRE WEATHER...

RED FLAG WRNG RMNS IN EFFECT ACROSS THE NERN CORNER OF OUR FCST AREA W/ A STMT IN EFFECT THRU MID EVE FOR EVERYWHERE ELSE IN THE

FCST AREA. WE ARE SEEING A FEW OBS ELSEWHERE THAT ARE AT OR NEAR RFW LVLS ATTM - BUT THESE ARE SO SPORADIC THAT DO NOT FEEL

INCLINED TO UPGRADE ADTNL AREAS.

ANOTHER DRY DAY EXPECTED WEDNESDAY WITH RH VALUES AGAIN DOWN TO 25-30 PERCENT...HOWEVER WITH LIGHT WINDS.

&&

.LWX WATCHES/WARNINGS/ADVISORIES...

DC...NONE.

MD...RED FLAG WARNING UNTIL 8 PM EDT THIS EVENING FOR MDZ005-006- 011-014-505>508.

VA...NONE.

WV...NONE.

MARINE...SMALL CRAFT ADVISORY UNTIL 6 AM EDT WEDNESDAY FOR ANZ530>543.

Winds and Temperature Aloft Forecast (FB) – the winds aloft data for the area was as follows:

WINDS ALOFT FORECASTS

DATA BASED ON 191200Z

VALID 191800Z FOR USE 1400-2100Z. TEMPS NEG ABV 24000

FT	3000	6000	9000	12000	18000	24000	30000	34000	39000
ACY	3415	3328+07	3136+01	3135-04	3141-17	3055-26	297841	299350	299361
RIC	3214	3318+10	3332+03	3134-02	3038-16	2942-25	296539	297249	297361