National Transportation Safety Board

Office of Aviation Safety
Washington, D.C. 20594-2000
April 26, 2013

WEATHER STUDY

WPR12LA144

A. Accident

Location: Laverne, Oklahoma
Date: March 20, 2012
Time: about 0830 central daylight time (about 1330 UTC[1])
Aircraft: Boeing 737-7H4, registration: N247WN

B. Meteorological Specialist

Mike Richards
Senior Meteorologist
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Washington, DC 20594-2000

C. Details of the Investigation

The National Transportation Safety Board's meteorological specialist was not on scene and gathered weather data for this investigation from the Washington D.C. office from official National Oceanic and Atmospheric Administration (NOAA)'s National Weather Service (NWS), except where noted. All times are in central daylight time (CDT) on March 20, 2012 - based upon the 24-hour clock. Directions are referenced to true north and distances in nautical miles. Heights are above mean sea level (msl) unless otherwise noted. Distances along the surface of the earth are calculated using the "Great Circle" formula.

Coordinates used for the accident location: 36.7627° North latitude and 100.0122° West Longitude, at FL380[2].

[1] UTC – abbreviation for Coordinated Universal Time
[2] Flight Level (FL) - standard nominal altitude of an aircraft, in hundreds of feet. This altitude is calculated from the International standard atmosphere using 1013.25 hPa (29.92 in Hg) for surface pressure.

Synoptic Conditions

A 250-hectopascal (hPa) analysis chart (figure 1) obtained from the Storm Prediction Center and valid for 0700 CDT identified a portion of a jet stream stretching north from central Texas into Canada. A *jet streak*[3] was identified in the vicinity of the accident location with southerly wind magnitudes greater than 150 knots. According to the International Standard Atmosphere, the 250-hPa pressure level is at 34,000 feet.

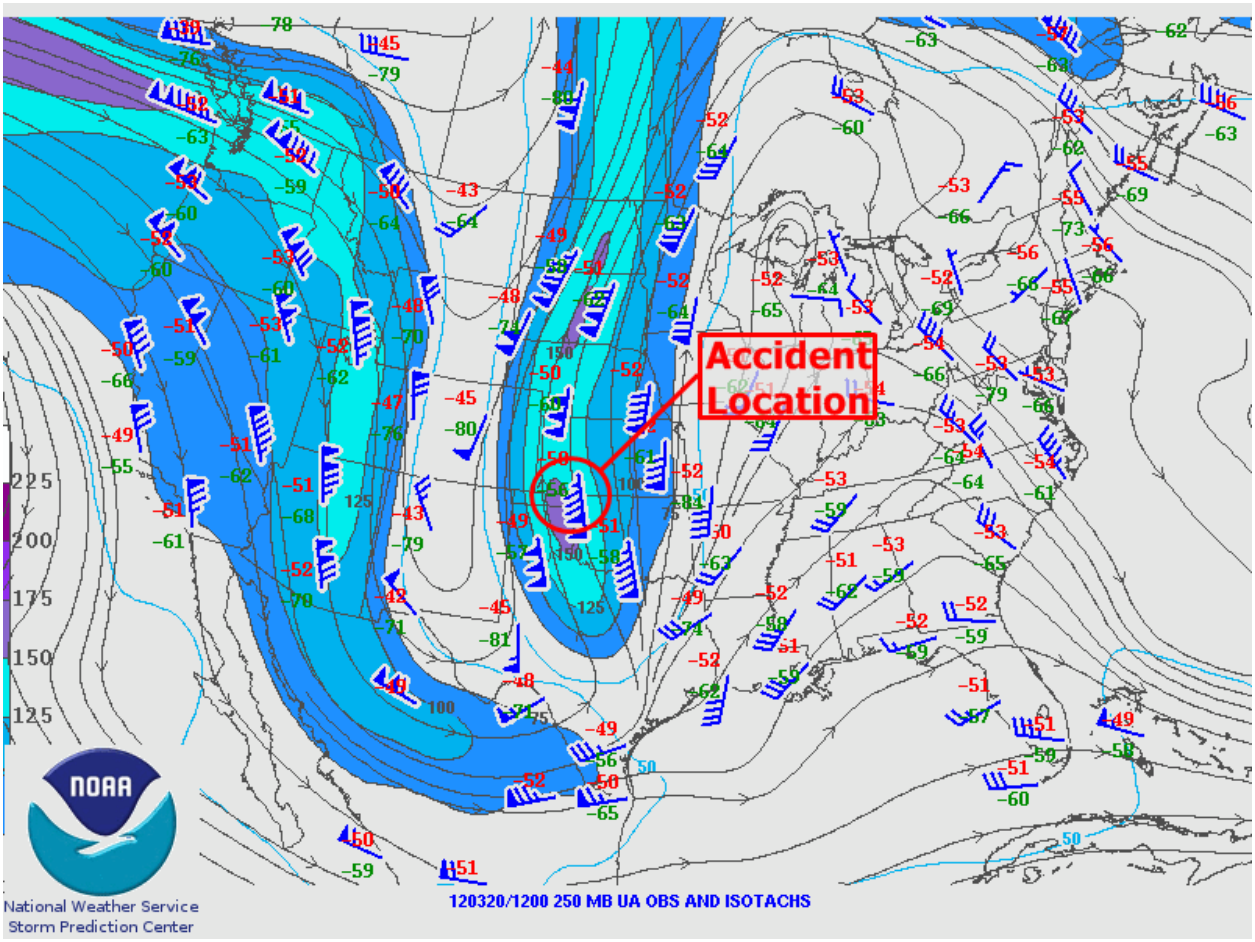

Figure 1 – NWS SPC 250 hPa Analysis Chart for 0700 CDT.

A regional Next-Generation Radar (NEXRAD) mosaic obtained from the National Climatic Data Center (NCDC) for 0830 CDT (figure 2) did not identify any pertinent reflectivity values in the area of the accident location.

[3] Jet streaks are localized regions of very fast winds embedded within the jet stream.

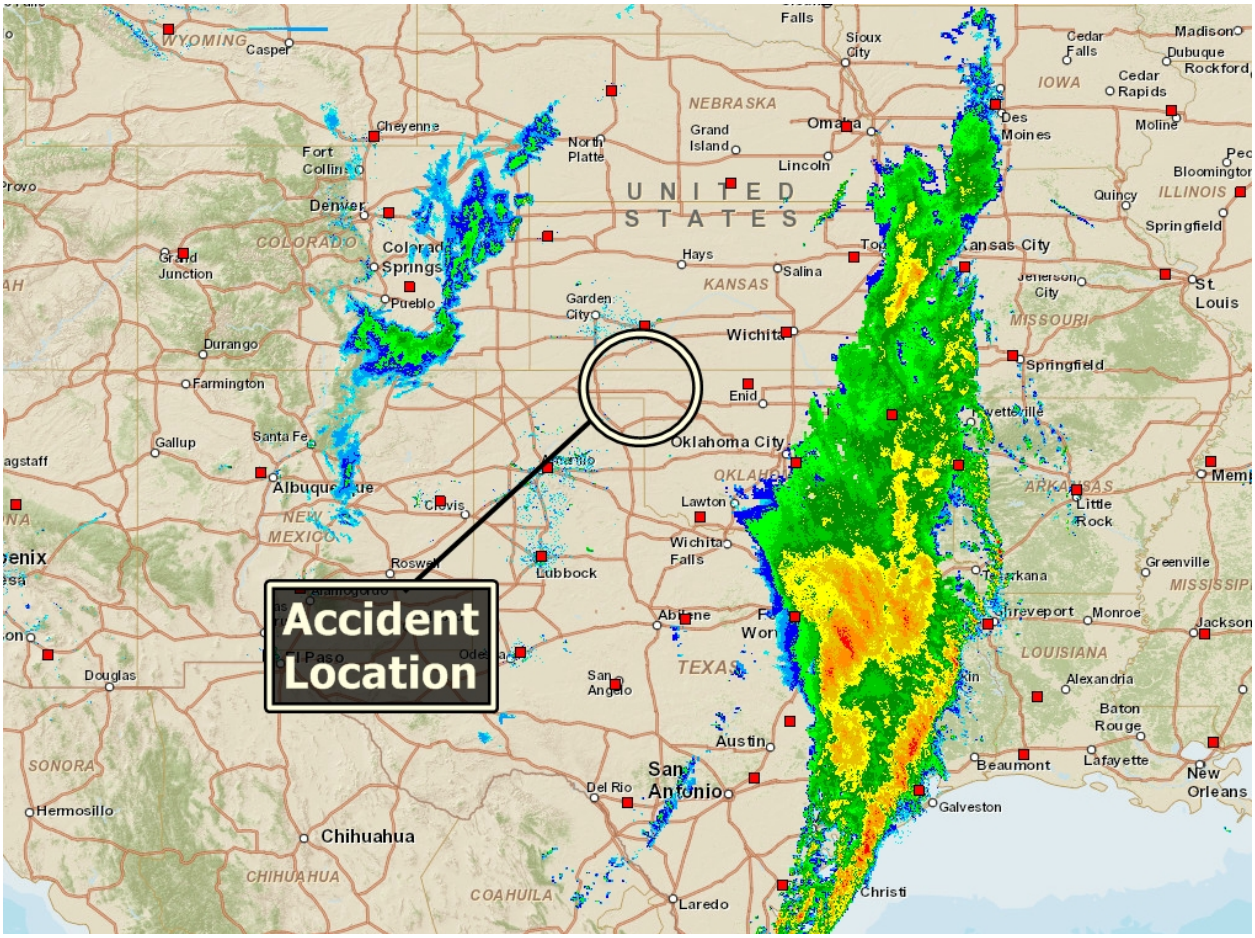

Figure 2 – NCDC NEXRAD mosaic from 0830 CDT.

Upper Air Data

Atmospheric data were retrieved from a rawinsonde launch in the hour prior to 0700 CDT from Dodge City, Kansas (DDC; station identifier 72451)[4]. DDC was located approximately 60 miles north of the accident site. The sounding data are presented in figure 3.

The DDC sounding indicated almost the entire troposphere was stable or conditionally unstable. The wind profile indicated a south-southeasterly wind of 126 knots near 30,000 feet. The wind increased in magnitude to 138 knots and *veered*[5] slightly through 36,000 feet. Above this level, the wind decreased in magnitude to 46 knots and continued to veer slightly to the south-southwest through about 40,000 feet. Calculations by the Rawinsonde Observation Program (RAOB) indicated the potential for significant clear-air turbulence between about 36,000 and 40,000 feet.

[4] Obtained from the University of Wyoming.
[5] A "veering" wind is a wind that turns clockwise with increasing height.

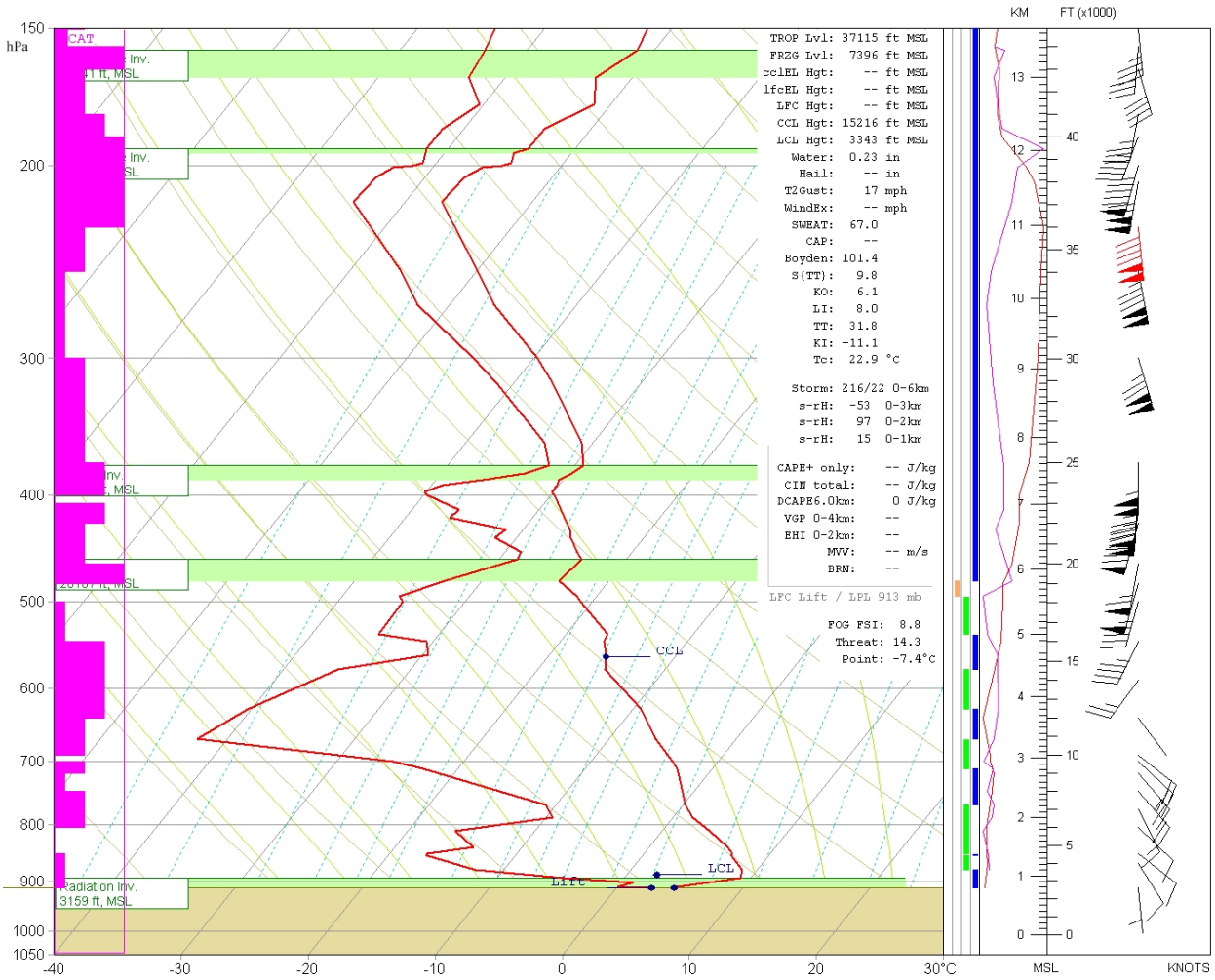

Figure 3 – DDC rawinsonde sounding data in SkewT/LogP[6] format for 0700 CDT, surface to 150 hPa.

Pilot Reports

Publically disseminated pilot reports[7] within about 100 miles of the accident site issued within about 3 hours of the accident time are presented here.

AMA UA /OV 70 E PNH/TM 1235/FL380/TP B737/TB MOD/RM ZAB=

GAG UA /OV KBFK067022/TM 1328/FL340/TP B737/TA M51/WV 165118KT/TB SMOOTH/RM AWC-WEB:SWA=

LBL UA /OV KLBL105009/TM 1330/FL340/TP B737/TA M49/WV 165132KT/TB SMOOTH/RM AWC-WEB:SWA=

DHT UA /OV BGD080050/TM 1405/FL360/TP C680/TB MOD 360-370/RM ZAB=

DHT UA /OV BGD340046/TM 1454/FL340/TP C560/TB MOD/RM ZAB=

[6] SkewT/LogP - A thermodynamic diagram, using the temperature and the logarithm of pressure as coordinates, which allows the plotting of the vertical profile of the temperature, humidity, and atmosphere above a particular point on the earth's surface.

[7] Only pilot reports distributed with the UBKS**, UBOK** and UBTX** headers were considered.

GCK UA /OV GCK/TM 1500/FL380/TP CRJ9/TB CONT LGT OCNL MDT/RM ZDV=

AMA UA /OV BGD/TM 1518/FL330/TP CRJ9/TB MDT=

GCK UA /OV GCK/TM 1553/FL370/TP B737/TB MOD/RM ZKC=

LBL UA /OV LBL/TM 1557/FL280/TP A321/TB MOD/RM ZKC=

A pilot report of note occurred about 125 miles south of the accident location at 0655 CDT. In this report, a Boeing 737 aircraft at FL400 20 miles due north of Childress Municipal Airport (CDS) in Childress, Texas, reported moderate or greater turbulence and remarked that the turbulence was almost severe between FL400 and FL350.

CDS UUA /OV CDS360020/TM 1155/FL400/TP B737/TB MOD OR GRTR/RM ALMOST SEV FL400-350 AWC-WEB:KZFW=

Satellite Imagery

Geostationary Operational Environmental Satellite (GOES)-13 infrared (10.7µm) data were obtained from an archive at the Space Science Engineering Center (SSEC) at the University of Wisconsin-Madison in Madison, Wisconsin, and processed using the Man computer Interactive Data Access System (McIDAS). GOES-13 imagery from 0830 CDT is presented in figure 4. Cloud-top temperatures in the vicinity of the accident site were approximately -32°C, which, when considering the DDC rawinsonde data, corresponded to heights of approximately 26,500 feet. It should be noted that the satellite data presented in this section have not been corrected for any parallax error.

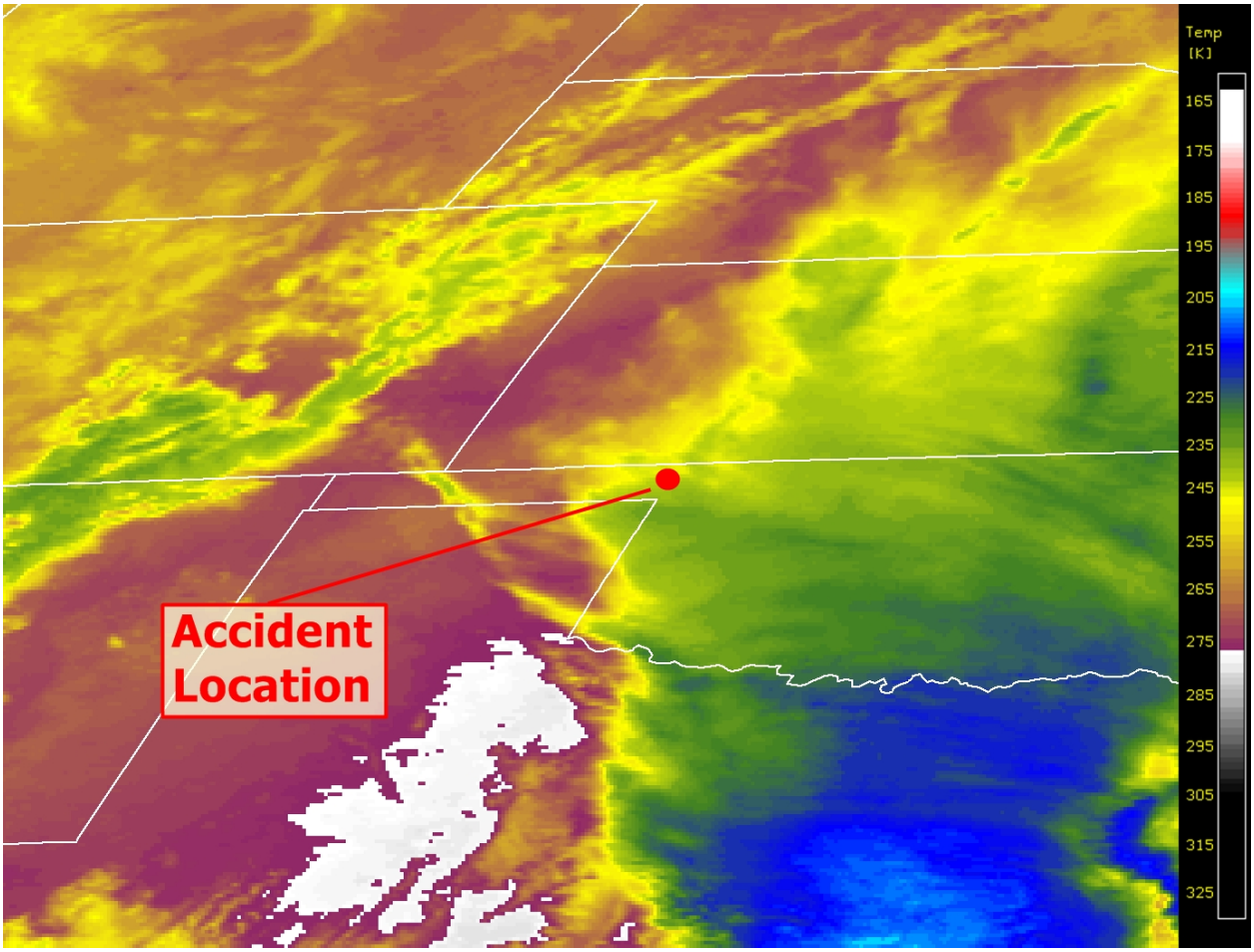

Figure 4 – GOES-13 10.7µm (infrared) color-enhanced imagery from 0830 CDT.

Area Forecast

An Area Forecast that included the panhandle of Oklahoma was issued at 0445 CDT. The Area Forecast forecasted: for the panhandle of Oklahoma – scattered to broken cirrus clouds. After 0700 CDT surface winds were expected to be out of the north at 20 knots with gusts to 30 knots.

FAUS44 KKCI 200945
FA4W
_DFWC FA 200945
SYNOPSIS AND VFR CLDS/WX
SYNOPSIS VALID UNTIL 210400
CLDS/WX VALID UNTIL 202200...OTLK VALID 202200-210400
OK TX AR TN LA MS AL
.
SEE AIRMET SIERRA FOR IFR CONDS AND MTN OBSCN.
TS IMPLY SEV OR GTR TURB SEV ICE LLWS AND IFR CONDS.
NON MSL HGTS DENOTED BY AGL OR CIG.
.
SYNOPSIS...CDFNT NWRN OK-CNTRL TX-NERN OLD MEX FCST 04Z
NWRN AR-ERN TX-XTRM SRN TIP TX-NERN OLD MEX.
.

OK
PNHDL...SCT-BKN CI. AFT 12Z WND N 20G30KT. OTLK...VFR.
CNTRL-ERN...BKN040 OVC080-100 TOP FL300. VIS 3SM NMRS -TSRA. CB TOP FL350. OTLK...MVFR CIG SHRA TSRA.
RMNDR...BKN100-120 LYRD FL300. 18Z SCT030-040 OVC080. WDLY SCT -SHRA/-TSRA. CB TOP FL350. OTLK...VFR SHRA.

Turbulence AIRMETs

An Airmen's Meteorological Information (AIRMET) advisory for moderate turbulence between FL220 and FL430 was issued at 0525 CDT and was active for the accident location at the accident time.

WAUS44 KKCI 201025 AAA
WA4T
_DFWT WA 201025 AMD
AIRMET TANGO UPDT 2 FOR TURB VALID UNTIL 201500
.
...SEE SIGMET WHISKEY SERIES...UPDT
.
AIRMET TURB...OK TX AR LA MS ND SD NE KS MN IA MO WI LS MI IL AND CSTL WTRS
FROM 30N INL TO 20ENE YQT TO 110SW LEV TO 120SSW LCH TO 80E BRO TO 90W BRO TO DLF TO 90S MRF TO ELP TO INK TO 30ESE TBE TO 50W LBL TO 40E SNY TO 50SSW BFF TO 50NNW ISN TO 30N INL
MOD TURB BTN FL220 AND FL430. CONDS CONTG BYD 15Z THRU 21Z.

SIGMETs

A Significant Meteorological Information (SIGMET) advisory for occasional severe turbulence between FL330 and FL380 was issued at 0526 CDT for an area west of the accident location. This SIGMET was valid until 0926 CDT. Figure 5 provides a graphical depiction of this SIGMET.

WSUS04 KKCI 201026
WS4W
_DFWW WS 201026
SIGMET WHISKEY 1 VALID UNTIL 201426
OK TX KS CO NM
FROM 30ESE GLD TO 40SSE AMA TO 50SW TCC TO 40SSE DEN TO 30ESE GLD **OCNL SEV TURB BTN FL330 AND FL380**. DUE TO WNDSHR ASSOCD WITH JTST. RPTD BY ACFT. CONDS CONTG BYD 1426Z.

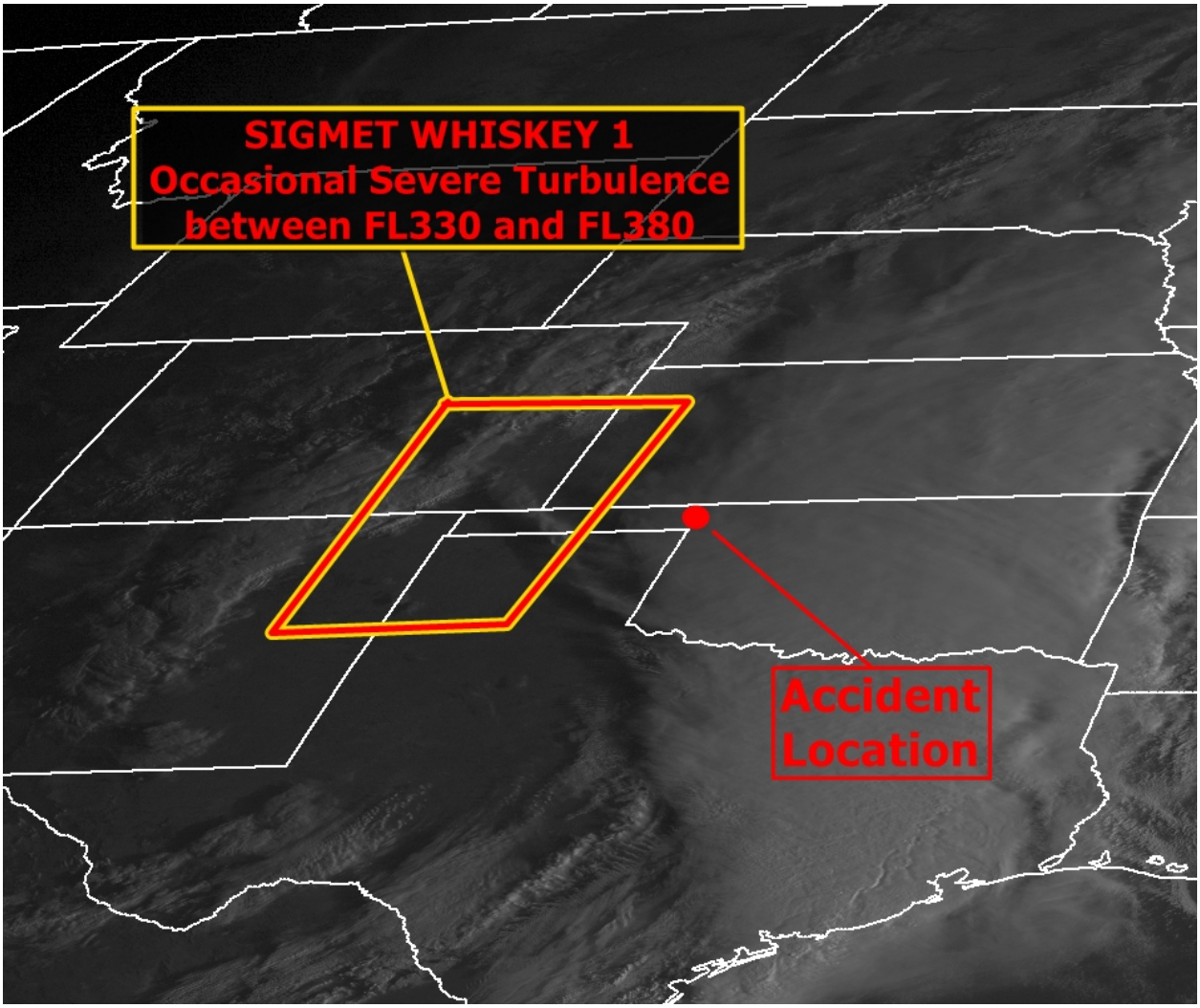

Figure 5 – SIGMET for occasional severe turbulence. Product overlaid onto GOES-13 10.7µm image from 0830 CDT.

Center Weather Advisories/Meteorological Impact Statements

There were no Center Weather Advisories or Meteorological Impact Statements from the Center Weather Service Unit at Kansas City Air Route Traffic Control Center active for the accident location at the accident time.

Submitted by: Mike Richards
NTSB, AS-30