NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

November 18, 2019

Group Chairman's Factual Report

AIR TRAFFIC CONTROL FACTUAL REPORT

DCA19MA086

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A. ACCIDENT

Location: Trinity Bay, Texas
Date: February 23, 2019
Time: 1239 central standard time (CST)[1]
1839 coordinated universal time (UTC)
Airplane: Atlas Air flight 3591 (GTI3591), Boeing 767-375BCF, N1217A

B. AIR TRAFFIC CONTROL GROUP

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C. SUMMARY

On February 23, 2019, at 1239 central standard time, Atlas Air flight 3591, a Boeing 767-375BCF, N1217A, entered a rapid descent from 6,000 ft[2] and impacted a marshy bay area about 40 miles southeast of George Bush Intercontinental Airport (KIAH), Houston, Texas. The two pilots and one nonrevenue jumpseat pilot were fatally injured. The airplane was destroyed and highly fragmented. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 121 domestic cargo flight, which originated from Miami International Airport (KMIA), Miami, Florida, and was destined for KIAH.

D. DETAILS OF THE INVESTIGATION

On Sunday, February 24, 2019, the air traffic control (ATC) group, NTSB operational factors group chairman, and NTSB meteorology specialist convened at the terminal radar approach control (TRACON) facility, known as I90, in Houston, Texas. The air traffic manager (ATM) provided a briefing on the sequence of events leading up to the accident, a review of the radar replay on the standard terminal automation replacement system (STARS)[3] display, tour of the I90 facility, and a review of ATC audio data. Present at the briefing were the AJI-1 Deputy Director; representatives from AJV-C14, AGC-400, and I90 NATCA; and the event investigation manager

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[1] All times are central standard time (CST) unless otherwise noted.
[2] All altitudes are in feet above mean sea level (msl) unless otherwise noted.
[3]The STARS is an air traffic control automation system. STARS give controllers a complete, precise picture of the airspace, enabling them to manage aircraft they are tracking with radar or the satellite-based Automatic Dependent Surveillance- Broadcast (ADS-B).

(EIM). Following a review of ATC data, the team traveled to the NTSB command post in Anahuac, Texas for the evening progress meeting.

On Monday, February 25, 2019, the ATC group and meteorology specialist reconvened at I90. The group reviewed ATC data, personnel training records, and interviewed[4] the controllers that had been assigned to arrival control (D), final center (I) positions at the time of the accident, and the relief controller for the final center (I) position following the accident. Following a review of additional ATC data, the group traveled to the NTSB command post for the evening progress meeting.

On Tuesday, February 26, 2019, the ATC group and meteorology specialist reconvened at I90. The group reviewed ATC data, personnel training records, and interviewed the controllers that had been assigned to the operations manager in charge (OMIC), operations manager (OM), and the controllers who had been relieved from the combined departure south and departure east (L/E) positions. Following a review of additional ATC data, the group traveled to the NTSB command post for the evening progress meeting.

On Wednesday, February 27, 2019, the ATC group and meteorology specialist reconvened at I90. The group reviewed ATC data, personnel training records, and interviewed the controllers that had been assigned to the combined departure south and departure east (L/E) positions, and the supervisor (SI) and watch supervisor (WS) positions. Following a review of additional ATC data, the group traveled to the NTSB command post for the evening progress meeting. The ATC group reconvened and worked on field notes.

On Thursday, February 28, 2019, the ATC and meteorology specialist reconvened at I90. The group interviewed the controller that had been assigned to the watch supervisor (WS) position at the time of the accident. Following the interview, the group traveled to the NTSB command post and then moved to the wreckage location. The ATC group finalized and approved the ATC group field notes and completed the on-site portion of the investigation.

E. FACTUAL INFORMATION

1.0 History of Flight

The data included in this history of flight summary were derived from FAA certified radar data[5], Aircraft Accident Package[6], ATC audio recordings[7], mandatory occurrence report (MOR)[8], and automatic dependent surveillance - broadcast (ADS-B) data[9].

GTI3591 departed MIA at 1133:11eastern standard time (EST) destined for KIAH. ATC services provided by MIA tower and approach control, Miami air route traffic control center

[4] All interviews are included in Attachment 1 – Interview Summaries.
[5] Radar data are included in Attachment 2 – Radar Data.
[6] The FAA's detailed chronological summary of the flight is included in Attachment 3 – Aircraft Accident Package.
[7] ATC audio recordings are included in Attachment 4 – ATC Audio Recordings.
[8] The MOR is included in Attachment 5 – Mandatory Occurrence Report
[9] ADS-B data are included in the public docket for this investigation.

(ARTCC), Jacksonville ARTCC, and Houston ARTCC (ZHU) were routine and uneventful. Figure 1 is a Google Earth graphic that depicts the flight route of GTI3591 from the time the aircraft departed MIA until the last radar target prior to the accident.

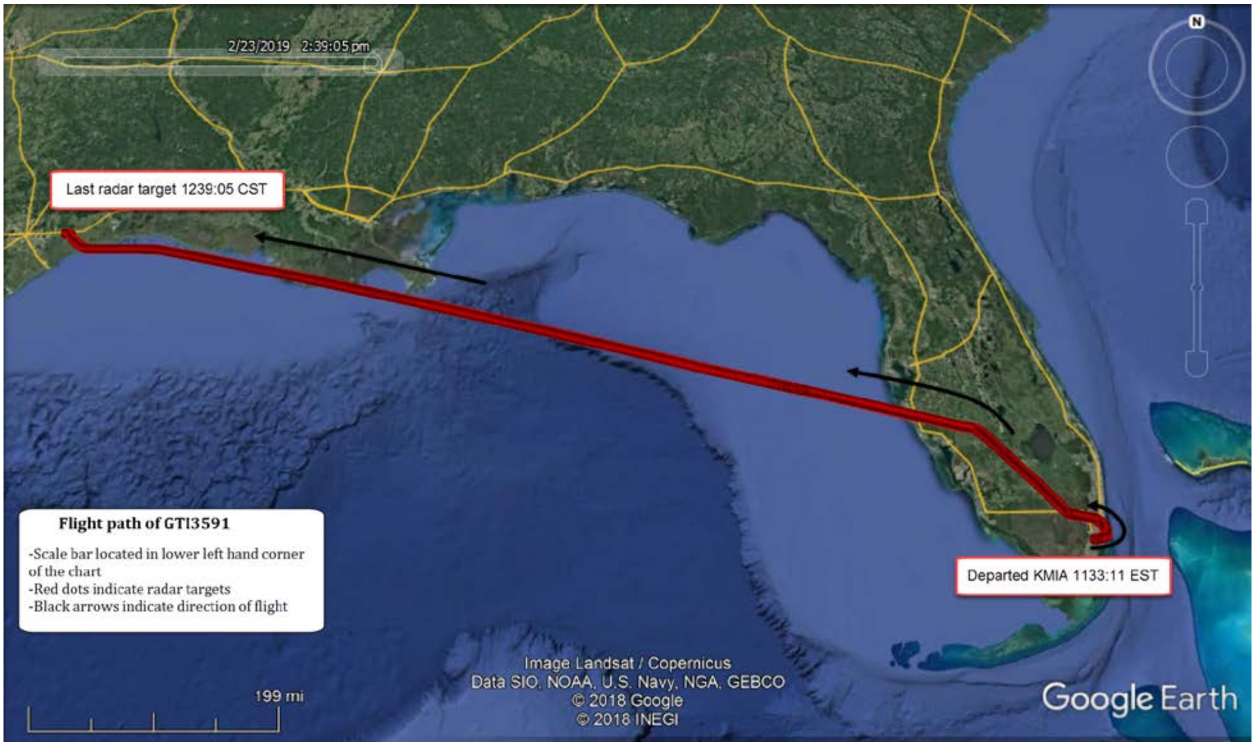

Figure 1. Radar graphic depicts the flight route of GTI3591 from MIA to last radar target.

About 1218, the ZHU controller issued the pilot of GTI3591 a clearance to descend via the LINKK ONE arrival[10] and the altimeter at Beaumont. The pilot read back the clearance and altimeter.

About 1225, the pilot of GTI3591 reported he was beginning his descent. The ZHU controller acknowledged.

About 1230, the ZHU controller instructed GTI3591 to contact Houston Approach (I90) on 119.62. The pilot acknowledged the frequency change.

The pilot of GTI3591 checked in with the I90 arrival controller (D), reporting at 17,800 ft, descending via the LINKK ONE arrival and that they had the automatic terminal information service (ATIS[11]) broadcast information "sierra". The arrival controller informed the pilot that the current ATIS information was "tango,"[12] and instructed him to fly the runway 26 left (26L)

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[10] LINKK ONE is a standard terminal arrival (STAR). A STAR is a preplanned instrument flight rule (IFR) air traffic control arrival procedure published for pilot use in graphic and/or textual form. STARs provide transition from the en route structure to an outer fix or an instrument approach fix/arrival waypoint in the terminal area. The LINKK ONE STAR chart is included in Attachment 6 – LINKK ONE STAR.
[11] ATIS provides advance noncontrol airport/terminal area and meteorological information to aircraft.
[12] Audio of ATIS information Tango is included in Attachment 7 – ATIS Recording.

transition. The pilot acknowledged the instructions. Figure 2 is a Google Earth graphic that depicts the location of GTI3591 when the pilot checked in with the arrival controller. Radar data indicated the flight was approximately 85 miles southeast of IAH.

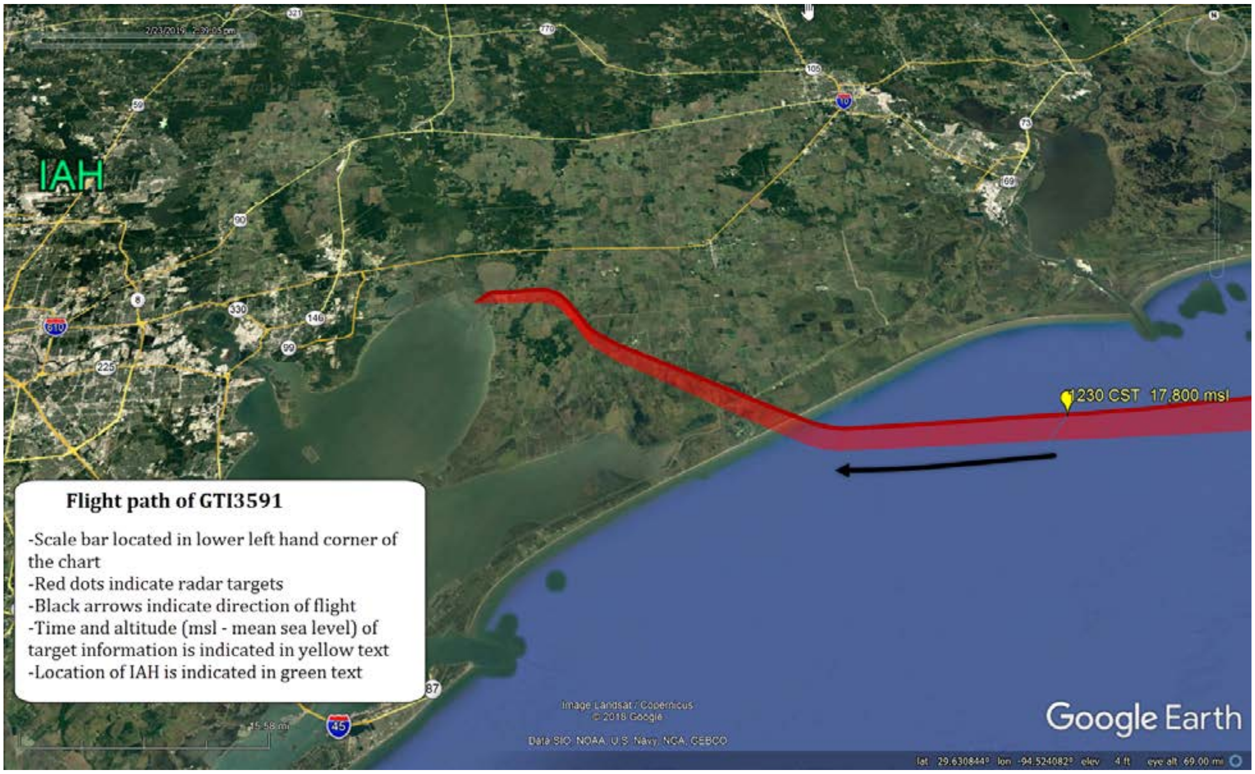

Figure 2. Radar graphic depicts the location of GTI3591 when the pilot checked in with 190 arrival controller.

About 1234, the arrival controller advised the pilot of GTI3591 there was light to heavy precipitation west of VANNN[13] moving eastbound, and as they got in closer [to the airport] if they wanted vectors around the weather they [190] would be able to accommodate that. The pilot thanked the controller for the heads up. Radar data indicated the flight was approximately 65 miles southeast of IAH and at 14,000 ft.

About 1235, the arrival controller instructed the pilot to contact approach on 120.65. The pilot acknowledged the frequency change.

The pilot checked in with the I90 final controller (I) reporting they were at 11,400 ft descending via the LINKK arrival and they had ATIS information "tango". The final controller informed the pilot to expect vectors to runway 26L and asked how he would like to get around the weather; if they wanted to go to the east side of it and join it to the north side or what would they like to do. The pilot responded he would get back with him. Figure 3 is a Google Earth plot that depicts the location of GTI3591 when the pilot checked in with the final controller. Radar data indicated the flight was approximately 55 miles southeast of IAH.

[13] VANNN is an airspace fix located approximately 30 miles east of IAH.

Figure 3. Radar graphic depicts the location of GTI3591 when the pilot checked in with the final controller.

About 1236, the pilot informed the final controller that they would go on the west side. The controller responded that the only problem he had at that moment, was that IAH had a lot of departures, so they would need to “hustle on down” .The controller then instructed the pilot to descend and maintain 3,000 ft and to expedite his descent. The pilot did not respond.

The controller repeated the instructions to descend and maintain 3,000 ft and “hustle all the way down,” and advised the pilot of GTI3591 that he would vector them west of the weather and then northbound for a base leg. At 1236:53, the pilot acknowledged, “…down to three thousand and all the way down…we’re going to delete the arrival [LINKK ONE], we’re going to go straight down….”

About 1237, the final controller instructed GTI3591 to turn left heading 270. The pilot readback the instruction. Radar data indicated GTI3591 was at 9,200 ft and approximately 45 miles southeast of IAH.

About 1238, the final controller informed the pilot that in about 18 miles could turn GTI3591 due north for a base leg to final. The pilot responded that sounded good.

The controller advised the pilot that on the other side of the weather it was clear, and they should have no problem getting the airport [in sight]. The pilot responded “OK.” Figure 4 is a Google Earth graphic that depicts the location of GTI3591 when the pilot responded to the controller’s transmission. Radar data indicated the flight was at 6,200 ft and approximately 40 miles southeast of IAH.

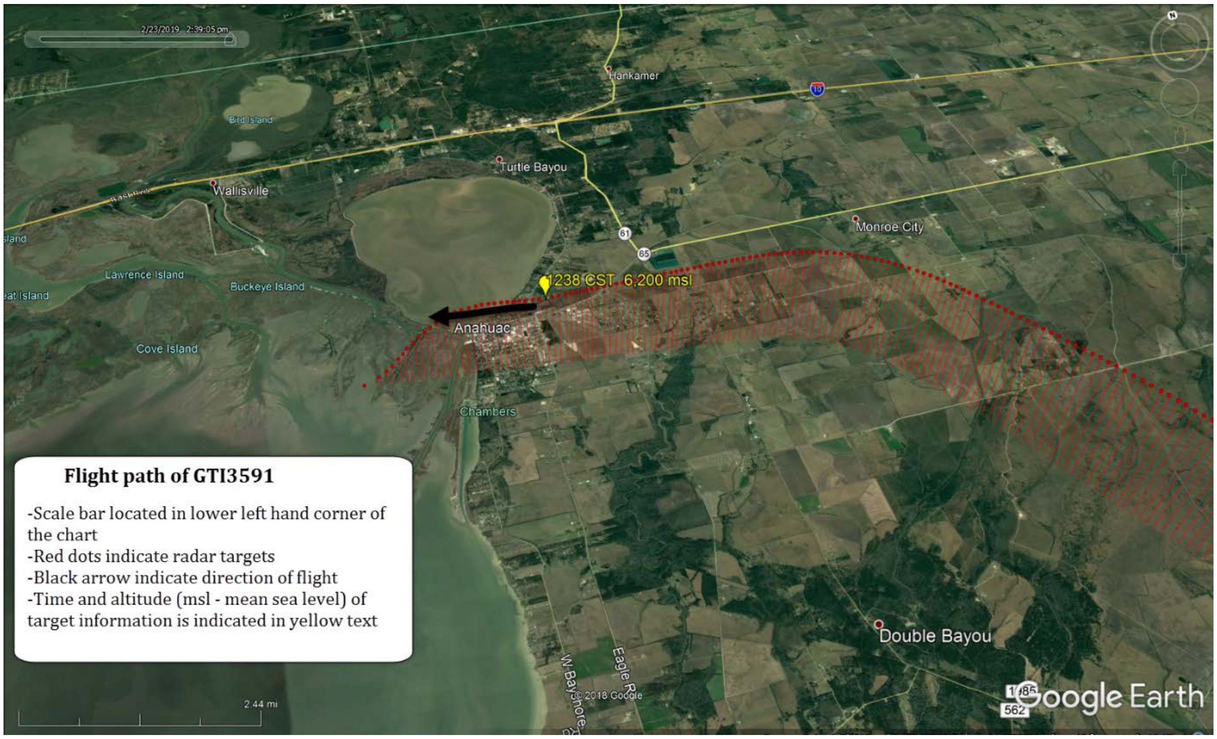

Figure 4. Radar graphic depicts the location of GTI3591 when pilot broadcasted last transmission to controller.

At 1239:05 radar data indicated that the last target received on GTI3591 was at 175 ft and approximately 40 miles southeast of IAH. Figure 5 is a Google Earth graphic that depicts the location of the last radar target on GTI3591.

About 1239, the final controller asked GTI3591 what altitude he was leaving. The pilot did not respond. The controller attempted to contact GTI3591 three more times on the assigned frequency, but he did not receive a response from the pilot. The controller then attempted to contact GTI3591 on guard frequency[14], but the pilot did not respond. The controller broadcasted over the assigned frequency to GTI3591 that radar contact was lost.

The final controller stated during the interview that "*He noticed the altitude portion of the data block indicated "XXX[15]" and he first thought it was normal because the flight was in an expedited descent, but it [XXX on the data tag] lasted too long. He asked the pilot to "say altitude" and the pilot did not respond… he recalled reaching out multiple times to contact the pilot. He saw the data tag change from "XXX" to "CST[16]," and then to no data tag….*" See Attachment 1 – Interview Summaries for the complete interview summary.

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[14] Although the frequency in use or other frequencies assigned by ATC are preferable, emergency frequencies 121.5 MHz and 243.0 MHz can be used for distress or urgency communications. 121.5 MHz is guarded by direction finding stations and some military and civil aircraft. Both 121.5 MHz and 243.0 MHz are guarded by military towers, most civil towers, and radar facilities (Airman Information Manual, section 6-3-1, b).

[15] "XXX" displayed in the altitude field portion of the radar data tag may indicate that the Mode C altitude report may be unreliable or corrupt.

[16] "CST" displayed in the altitude field portion of the radar data tag may indicate a lost beacon target.

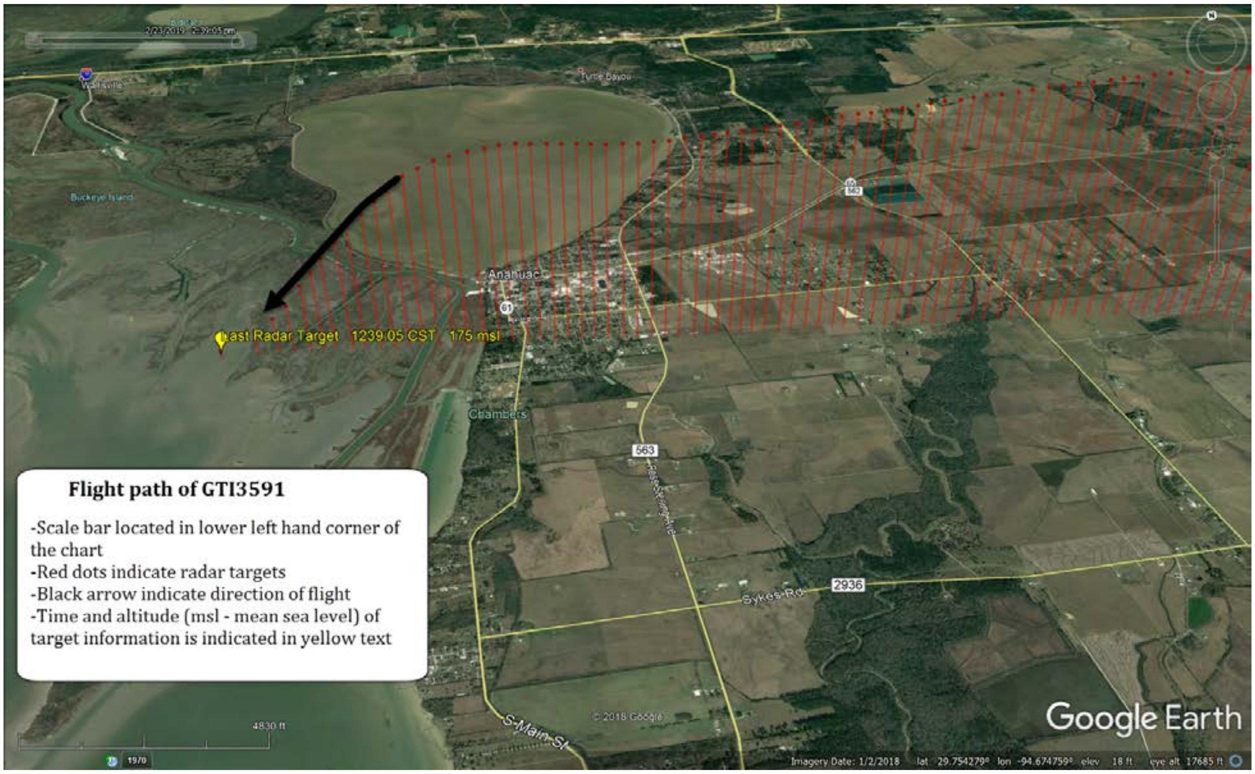

Figure 5. Radar graphic depicts the location of the last radar target on GTI3591.

About 1240, the final controller attempted to contact GTI3591 two more times on guard frequency. The pilot did not respond.

2.0 Radar Data

2.1 Airport Surveillance Radar (ASR)

FAA radar data was provided by I90. The radar source data was obtained from the Houston (HOU and IAH) ASR-9 antennas located in Houston, TX.

The ASR is an integrated primary and secondary radar system that has been deployed at terminal air traffic control sites. It interfaces with both legacy and digital automation systems and provides six-level national weather service calibrated weather capability that provides enhanced situational awareness for both controllers and pilots.

The primary surveillance radar uses a continually rotating antenna mounted on a tower to transmit electromagnetic waves that reflect, or backscatter, from the surface of aircraft up to 60 miles from the radar. The radar system measures the time required for radar to echo to return and the direction of the signal. From this, the system can then measure the distance of the aircraft from the radar antenna and the azimuth, or direction, of the aircraft in relation to the antenna.

The secondary radar uses a second radar antenna attached to the top of the primary radar antenna to transmit and receive area aircraft data for barometric altitude, identification code, and emergency conditions. Military, commercial and some general aviation aircraft have transponders that automatically respond to a signal from the secondary radar by reporting an identification code and altitude. The air traffic control uses this system to verify the location of aircraft within a 60-mile radius of the radar site. The beacon radar also provides rapid identification of aircraft in distress.

2.2 Automatic Dependent Surveillance-Broadcast (ADS-B)

ADS-B data on GTI3591 were provided by the FAA Accident Investigations Office, AVP-100.

ADS-B is a surveillance system in which an aircraft or vehicle to be detected is fitted with cooperative equipment in the form of a data link transmitter. The aircraft or vehicle periodically broadcasts its GPS derived position and other information such as velocity over the data link, which is received by a ground-based transmitter/receiver (transceiver) for processing and display at an air traffic control facility.

3.0 Weather Information[17]

An automated surface observing system (ASOS[18]) was located at IAH, which was about 41 nm west-northwest of the accident location. The aviation selected special weather report (SPECI) current at the time of the accident was:

> [1202 CST] SPECI KIAH 231802Z 32015G24KT 10SM FEW035 SCT060 BKN080 BKN250 22/12 A2992 RMK AO2 T02220117=
>
> The SPECI translated into plain language read:
>
> At 1202 CST, KIAH reported wind from 320° at 15 knots with gusts to 24 knots, visibility of 10 statute miles or greater, few clouds at 3,500 feet above ground level (agl), scattered clouds at 6,000 feet agl, ceiling broken at 8,000 feet agl, broken clouds at 25,000 feet agl, temperature of 22° Celsius (C) and a dew point temperature of 12°C, altimeter setting of 29.92 inches of mercury; remarks: station with a precipitation discriminator, temperature of 22.2°C and a dew point temperature of 11.7°C.

4.0 Air Traffic Control Procedures

4.1 Expeditious Compliance

FAA order 7110.65X, Air Traffic Control, paragraph 2-1-5, "Expeditious Compliance," described when a controller would use "expedite" in an instruction:

> a. Use the word "immediately" only when expeditious compliance is required to avoid an imminent situation.
>
> b. Use the word "expedite" only when prompt compliance is required to avoid the development of an imminent situation. If an "expedite" climb or descent clearance is issued by ATC, and subsequently the altitude to maintain is changed or restated without an expedite instruction, the expedite instruction is canceled.
> c. In either case, if time permits, include the reason for this action.

[17] Additional weather information is included in the Meteorology Factual Report.
[18] The ASOS systems serves as the nation's primary surface weather observing network.

4.2 Issuing Weather

FAA order 7110.65X, Air Traffic Control, paragraph 2-6-4, "Issuing Weather and Chaff Areas" described the procedures for issuing weather to a pilot. The paragraph stated in part:

> a. Controllers must issue pertinent information on observed/reported weather and chaff areas to potentially affected aircraft. Define the area of coverage in terms of:
>
> > 1. Azimuth (by referring to the 12-hour clock) and distance from the aircraft and/or
> >
> > 2. The general width of the area and the area of coverage in terms of fixes or distance and direction from fixes.
> >
> > NOTE—Weather significant to the safety of aircraft includes conditions such as funnel cloud activity, lines of thunderstorms, embedded thunderstorms, large hail, wind shear, microbursts, moderate to extreme turbulence (including CAT), and light to severe icing.
>
> c. Use the term "precipitation" when describing radar-derived weather. Issue the precipitation intensity from the lowest descriptor (LIGHT) to the highest descriptor (EXTREME) when that information is available. Do not use the word "turbulence" in describing radar-derived weather.
>
> > 1. LIGHT.
> > 2. MODERATE.
> > 3. HEAVY.
> > 4. EXTREME.
> >
> > NOTE—Weather and Radar Processor (WARP) does not display light intensity.
> >
> > Phraseology—
> > AREA OF (Intensity) PRECIPITATION BETWEEN (number) O'CLOCK AND (number) O'CLOCK, (number) MILES, MOVING (direction) AT (number) KNOTS, TOPS (altitude). AREA IS (number) MILES IN DIAMETER.
> >
> > Examples—
> > 1. "Area of heavy precipitation between ten o'clock and two o'clock, one five miles. Area is two five miles in diameter."
> >
> > 2. "Area of heavy to extreme precipitation between ten o'clock and two o'clock, one five miles. Area is two five miles in diameter."
>
> d. When precipitation intensity information is not available.
>
> > Phraseology—
> > AREA OF PRECIPITATION BETWEEN (number) O'CLOCK AND (number) O'CLOCK, (number) MILES. MOVING (direction) AT (number) KNOTS, TOPS

(altitude). AREA IS (number) MILES IN DIAMETER, INTENSITY UNKNOWN.

Example—
"Area of precipitation between one o'clock and three o'clock, three five miles moving south at one five knots, tops flight level three three zero. Area is three zero miles in diameter, intensity unknown."

NOTE—Phraseology using precipitation intensity descriptions is only applicable when the radar precipitation intensity information is determined by NWS radar equipment or NAS ground based digitized radar equipment with weather capabilities. This precipitation may not reach the surface.

f. Controllers must ensure that the highest available level of precipitation intensity within their area of jurisdiction is displayed unless operational/ equipment limitations exist.

g. When requested by the pilot, provide radar navigational guidance and/or approve deviations around weather or chaff areas. In areas of significant weather, plan ahead and be prepared to suggest, upon pilot request, the use of alternative routes/altitudes.

i. When forwarding weather deviation information, the transferring controller must clearly coordinate the nature of the route guidance service being provided. This coordination should include, but is not limited to: assigned headings, suggested headings, pilot initiated deviations. Coordination can be accomplished by: verbal, automated, or predetermined procedures. Emphasis should be made between: controller assigned headings, suggested headings, or pilot-initiated deviations.

F. LIST OF ATTACHMENTS

Attachment 1 – Interview Summaries
Attachment 2 – Radar Data
Attachment 3 – Aircraft Accident Package
Attachment 4 – ATC Audio Recording
Attachment 5 – Mandatory Occurrence Report
Attachment 6 – LINKK ONE STAR
Attachment 7 – ATIS Recording
Attachment 8 – ATC Transcript

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