



Aviation Investigation Final Report

Location:	Minneapolis, Minnesota	Incident Number:	DCA101A001
Date & Time:	October 21, 2009, 17:56 Local	Registration:	N374NW
Aircraft:	Airbus A320	Aircraft Damage:	None
Defining Event:	Air traffic event	Injuries:	152 None
Flight Conducted Under:	Part 121: Air carrier - Scheduled		

Analysis

PILOTS

While Northwest Airlines flight 188 (NWA188) was in cruise flight at 37,000 feet, air traffic control (ATC) directed the flight crew to change radio frequency as the airplane approached one of the sectors in Denver ATC airspace. The first officer acknowledged the frequency change and read back the correct frequency of 132.17 megahertz (MHz). However, the flight crew did not contact ATC on the new frequency. Further, there was no radio microphone keying recorded on the flight data recorder, indicating that the crew made no attempted radio transmissions on any frequency until they transmitted on 132.125 MHz, which was the frequency for Winnipeg ATC. Winnipeg ATC directed the flight crew to contact Minneapolis ATC; the flight was operating with no radio communications (NORDO) for about 1 hour 17 minutes. Because of the proximity of the Winnipeg ATC frequency (132.125 MHz) to the last frequency acknowledged by the pilots (132.17 MHz), it is likely that the first officer began to dial in the new frequency but never completed the frequency change. (To make a frequency change, the pilot had to use a rotary dial to select the desired frequency and then push a button to activate the new frequency on the radio.) Furthermore, the first officer did not attempt to contact the next ATC controller after acknowledging the frequency change. The first officer stated that the last contact with ATC was shortly before they had dinner. Thus, the first officer was likely directed to change frequencies about the time that the captain was absent from the cockpit (due to a restroom break) and the flight attendant was in the cockpit (in compliance with security procedures), which coincided with the time dinner was served. These events may have distracted the first officer from completing the frequency change or attempting to contact the next ATC controller. Additionally, the captain's temporary absence from the cockpit would have removed the redundant monitoring of a second pilot who may have detected the incomplete frequency change or failure to check in with ATC.

Following the captain's return to the cockpit, the pilots became distracted by a conversation regarding changes to the bidding process (the process by which the pilots request their flight schedule for the following month) resulting from the merger between NWA and Delta. The pilots allowed this conversation to monopolize their attention and, thus, lower their capacity to monitor their radio communications, notice the lack of contact, and recognize, via airplane instruments, the flight's progress. Both pilots stated that they heard radio chatter but did not hear a radio call for NWA188. During the pilots' conversation, the pilots opened and operated their personal laptop computers. Postincident investigation revealed that laptops could block the pilots' primary flight and navigation displays depending on their placement, but would most likely not block the upper screen of the electronic centralized aircraft monitor, where "ACARS [aircraft communication addressing and reporting system] MSG" blinks. The computers not only restricted the pilots' direct visual scan of all cockpit instruments but also further focused their attention on non-operational issues, contributing to a reduction in their monitoring activities, loss of situational awareness, and lack of awareness of the passage of time. The pilots missed numerous visual alerts, including ACARS messages sent by NWA dispatch (ACARS does not have an aural alert) and at least nine messages regarding their position (on the multifunction control and display unit and the primary flight displays) as they neared Minneapolis-St Paul International/Wold-Chamberlain Airport without landing data entered into the flight management computer. Airline policy in effect at the time of the incident prohibited the use of portable electronic devices on the flight deck.

Although the pilots indicated that they had one of their radios tuned to 121.5 MHz (the universal emergency frequency), they did not respond to calls from ATC on that frequency. It could not be determined why the pilots did not respond. Possible reasons include: the volume was turned down; the pilots were distracted; or the airplane was outside of coverage for the 121.5 MHz transmitters.

ATC

NWA188 entered the first two Denver ATC sectors uneventfully; as the airplane entered the next two sectors, radio contact was not established. The controllers were preparing for a shift change, and neither sector controller's relief briefing included information that communication had not been established with the NWA188. Although the current ATC practice of using automated information transfers (electronic radar handoffs) in some sectors provides an efficient means for tracking and handing off airplanes between controllers, there are no system-wide procedures for indicating that an aircraft has been directed to switch frequencies or has communicated with ATC. Because of this lack of standardization, NWA188 passed through two Denver ATC sectors without the controllers being aware that it had not made radio

contact. When the flight was finally identified as NORDO by the next sector's controller, almost 30 minutes after NWA188's last transmission, controllers attempted to regain contact with the airplane by calling NWA dispatch personnel and requesting that they attempt to contact NWA188. The controllers indicated during interviews that this technique is commonly used initially for air carrier airplanes instead of transmitting on the universal emergency frequency of 121.5 MHz because of the limited range of sparsely located transmitters. However, when the pilots did not respond to the ACARS messages, one of the controllers made several attempts to contact the airplane on 121.5 MHz, but the pilots did not respond.

FAA Order 7110.65, Air Traffic Control Handbook, Paragraph 10-4-4. Communications Failures states, in part, the following.

Take the following actions, as appropriate, if two-way radio communications are lost with an aircraft. ...

a. In the event of lost communications with an aircraft under your control jurisdiction use all appropriate means available to reestablish communications with the aircraft. These may include, but not be limited to, emergency frequencies, NAVAIDs [navigation aids] that are equipped with voice capability, FSS [flight service station], Aeronautical Radio Incorporated (ARINC), etc. ...

e. If radio communications have not been (re)established with the aircraft after five minutes, consider the aircraft's activity to be possibly suspicious and handle the flight per FAAO JO 7610.4, Chapter 7, Hijacked/Suspicious Aircraft Reporting and Procedures.

Controllers and supervisors interviewed after this incident indicated that an air carrier airplane out of radio contact is not an uncommon occurrence for air traffic controllers, occasionally occurring as often as several times during an 8-hour shift. However, these interviews indicated that the losses of radio contact are usually short in duration and re-established quickly. This likely contributed to the controllers becoming complacent and not advising ATC managers of the loss of radio contact with NWA188 in a timely manner. In this incident, during which the airplane was NORDO for more than 1 hour, failure to quickly advise managers resulted in a delay in the completion of necessary actions and notifications required by the lost-communications procedures.

The NTSB makes the following conclusions regarding this incident.

- The first officer acknowledged but never completed the assigned frequency change due to

interruptions, likely during the time that the captain was absent from the cockpit and the flight attendant was in the cockpit.

- Not completing the frequency change, contacting ATC, and maintaining communications was contrary to Federal Aviation Regulations and airline procedures and was not noticed by the flight crew because they became distracted by a conversation, during which they referenced their personal computers, focusing the pilots' attention on non-operational issues.
- The pilots' conversation and use of personal computers led to reduced monitoring activities, loss of situational awareness, and lack of awareness of the passage of time.
- Sufficient visual cues, including ACARS messages and flight progress alerts, were presented to the flight crew, but the crew did not notice any of them.
- Air traffic controllers did not follow procedures to ensure NWA188 was on the correct frequency, which delayed the identification of NWA188 as NORDO.
- No national standardized procedures exist when automated information transfers are used instead of the paper flight progress strips to nonverbally document and confirm air traffic control information among controllers.
- ATC management did not complete the required notifications for a NORDO airplane in a timely manner as required by Federal Aviation Administration directives.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be: The flight crew's failure to monitor the airplane's radio and instruments and the progress of the flight after becoming distracted by conversations and activities unrelated to the operation of the flight.

Findings

Personnel issues	Monitoring communications - Flight crew
Personnel issues	Monitoring equip/instruments - Flight crew
Environmental issues	(general) - Not specified

Factual Information

History of Flight

Enroute	Air traffic event (Defining event)
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HISTORY OF FLIGHT

On October 21, 2009, Northwest Airlines (NWA) flight 188, an Airbus A320, N374NW, did not communicate with air traffic control (ATC) for approximately 1 hour 17 minutes. While the flight was NORDO (no radio communications), it flew past its intended destination at cruise altitude of 37,000 feet but landed without further incident after radio communication was reestablished. There were no injuries to the 2 pilots, 3 flight attendants, and 144 passengers onboard. The flight was a regularly scheduled passenger flight operating under 14 Code of Federal Regulations (CFR) Part 121 from San Diego International Airport (SAN), San Diego, California, to Minneapolis-St Paul International/Wold-Chamberlain Airport (MSP), Minneapolis, Minnesota. The airplane departed SAN about 1659 central daylight time. (All times in this report are central daylight time.)

The captain was the flying pilot. According to flight crewmember statements taken after the incident flight, the takeoff, climb, and initial cruise phases of flight were normal. The flight crew indicated that the planned route that was programmed into the flight management computer (FMC) was flown during the climb and cruise portions of the flight.

About 1822, the airplane leveled off at its final cruise altitude of flight level (FL) 370 (37,000 feet).

About 1839, the Albuquerque Air Route Traffic Control Center (ARTCC) radar controller completed an automated information transfer (AIT)—an electronic radar handoff (rather than a transfer using a traditional paper flight progress strip)—and radio communications transfer to the next controller of NWA188: the first Denver ARTCC controller. (Information in the sequence of events is based on the Federal Aviation Administration [FAA] ATC transcripts, unless otherwise indicated. Details on the specific sectors within the ARTCCs can be found in the docket for this accident at www.nts.gov.)

At 1839:16, NWA188 checked in with the first Denver controller, and the controller acknowledged.

About 1845:49, the first Denver controller completed an AIT to the second Denver controller and directed NWA188 to “contact Denver center” on frequency 134.12 megahertz (MHz). (All frequencies are in megahertz.) NWA188 acknowledged the transfer with “three four one two, northwest one eighty eight.”

At 1846:28, NWA188 checked in with the second Denver controller with “Denver center, northwest one eight eight is with you, three seven zero.” The controller acknowledged NWA188’s transmission.

About 1856:41, the second Denver controller completed an AIT to the third Denver sector and radioed, “...one eighty eight contact Denver center, one three two point one seven.”

At 1856:56, the second Denver controller again directed NWA188 to “contact Denver center, one three two point one seven.”

At 1857:01, NWA188 responded, “okay three two one seven, northwest one eighty eight.” This was the last ATC communication from NWA188 while in Denver center airspace. Flight data recorder (FDR) data indicate that, after this transmission, there was no radio microphone keying until 2012:46.

NWA188 entered the third Denver sector’s airspace but did not check in on the assigned frequency. The controller initiated an AIT to the fourth Denver sector.

About 1904, the initial third Denver controller was relieved by another controller.

At 1905:31, the oncoming controller in the third Denver sector directed NWA188 to “contact Denver center” on frequency 127.02, the radio frequency for the fourth Denver sector. Twenty-one seconds later, the controller again directed NWA188 to change frequency.

NWA188 entered the fourth Denver sector’s airspace and did not check in on the assigned frequency.

About 1910, the initial fourth Denver controller was relieved by another controller.

About 1912:30, the oncoming fourth Denver controller completed an AIT to the next sector and directed NWA188 to “contact Denver center” on frequency 126.32.

NWA188 entered the fifth Denver sector’s airspace and did not check in on the assigned frequency.

About 1924:16, the fifth Denver controller completed an AIT to Minneapolis ARTCC and directed NWA188 to “contact Minneapolis center” on frequency 124.87. Nine seconds later, the controller repeated the request for a frequency change.

At 1924:32, the fifth Denver controller called NWA188 for a radio check and received no response.

The fifth Denver controller then called the first Minneapolis controller, to inquire if NWA188 had checked in. The Denver controller was advised that the flight crew had not checked in on

the assigned frequency. The Denver controller then told the Minneapolis controller that he would "go find him."

At 1924:55, the fifth Denver controller called the fourth Denver controller and asked that controller to try to contact NWA188.

At 1925:14, the fourth Denver controller made a single radio transmission to NWA188, asking the flight crew to contact Denver ARTCC on frequency 126.32.

At 1926:07, the fifth Denver controller contacted the Denver area 5 front line manager (FLM) and requested that the manager contact NWA company dispatch, ask them to contact NWA188, and direct the NWA188 pilots to contact Minneapolis center on frequency 124.87. The fifth Denver controller then advised the first Minneapolis controller that Denver ARTCC was contacting NWA dispatch and that NWA188 should be back on the frequency in a few minutes.

At 1930:36 and 1936:42, the first Minneapolis controller attempted to contact NWA188.

About 1932 and 1934, NWA dispatch sent NWA188 aircraft communication addressing and reporting system (ACARS) messages requesting that the flight contact ARTCC.

At 1938:15, the first Minneapolis controller advised the next Minneapolis controller that NWA188 was NORDO and executed an AIT. The first Minneapolis controller then directed NWA188 to "contact Minneapolis center" on frequency 119.87.

At 1939:45, the second Minneapolis controller attempted to contact NWA188.

At 1939:55, the second Minneapolis controller asked another NWA aircraft, NWA196, to attempt to contact NWA188 on that sector's frequency of 119.87.

At 1942:11, NWA196 advised ATC that they had also requested that NWA dispatch ask NWA188 to come up on frequency 119.87.

About 1944, two ACARS messages were sent to NWA188 from NWA dispatch requesting that the pilots contact ARTCC.

At 1946:56, the second Minneapolis controller attempted to contact NWA188.

At 1948:17, the second Minneapolis controller radioed, "northwest one eighty eight uh if you hear Minneapolis center ident." No ident was observed. At 1951:56, the controller again attempted to contact NWA188.

In between the transmissions to NWA188, the second Minneapolis controller coordinated with controllers from other sectors to advise that NWA188 was NORDO and scheduled to land at

MSP. The third Minneapolis controller advised the second controller that he would attempt to contact NWA188 on frequency 121.5.

At 1956:40, the third Minneapolis controller transmitted on 121.5 MHz for NWA188, "contact Minneapolis center" on frequency 119.87.

About 1957, another ACARS message was sent to NWA188 from NWA dispatch.

FDR data indicate that, about 2001, the flight mode annunciator (FMA) on the pilots' primary flight display (PFD) reverted from navigation mode to heading mode.

At 2003:02, the second Minneapolis controller coordinated with and transferred control of NWA188 to the fourth controller.

About 2007, 2008, and 2011, ACARS messages were sent to NWA188 from NWA dispatch.

At 2007:41 and 2012:47, the fourth Minneapolis controller attempted to contact NWA188.

At 2012:46, NWA188 transmitted on frequency 132.125 and advised that they had overflowed their destination and needed to turn around and head for Minneapolis. Although the pilots did not know it at the time, the frequency they used was for Winnipeg Area Control Center (YWG), Thunder Bay Low Sector. After establishing NWA188's position over Eau Claire, Wisconsin, at FL370, the YWG controller advised NWA188 that it was on the wrong frequency and directed the pilots to contact Minneapolis center on frequency 123.72.

At 2013:02, the fifth Minneapolis controller requested another NWA airplane to attempt to contact NWA188 on frequency 126.23.

At 2014:06, NWA188 established communications with the fifth Minneapolis controller on frequency 123.72.

At 2014:14, NWA188 radioed, "roger, we got distracted and we've overflowed Minneapolis. We're overhead Eau Claire and would like to make a one eighty and do arrival from Eau Claire."

NWA188 was then given radar vectors to begin arrival into MSP. During the descent, Minneapolis ARTCC controllers queried NWA188 several times concerning the cause of the NORDO. Each time, the pilots indicated that they had "cockpit distractions."

POSTINCIDENT INTERVIEWS

FLIGHT CREW

During postincident interviews, both pilots stated that neither fell asleep during the incident flight. The flight crew stated that the #1 radio was used for ATC communications and the #2 radio was set to the universal emergency frequency 121.50 MHz. (NWA procedure was for the

#3 radio to be set to the ACARS frequency.) The captain programmed the FMC and indicated that he had entered a standard terminal arrival route for MSP but did not enter an anticipated arrival runway. The pilots indicated that, during cruise flight, they had removed their headsets and were listening to ATC over the cockpit speakers. Both heard "chatter" on the radio frequencies but did not recall hearing their call sign.

The pilots indicated that, about 2 hours into the flight, a flight attendant brought meals to the cockpit. During that time, the captain left the cockpit for a lavatory break. For security reasons, the lead flight attendant remained in the cockpit throughout the time the captain was absent. The first officer did not leave the cockpit during the flight.

According to pilot interviews, after completing their meals, the pilots began a conversation regarding the current Preferential Bidding System (PBS) for crew scheduling. The Delta Air Lines PBS system had been recently implemented as part of the integration of NWA and Delta Air Lines. Both pilots characterized the system as confusing. They had received and read the manual and been provided training in the new computer-based system. The pilots' reported that their discussions mainly concerned the captain's bid results for November. He had not received the bid results he had anticipated, and the results he received required him to commute to MSP more often than in the past. When interviewed, the captain indicated that he pulled out his laptop computer to show the first officer his bid results. The captain stated that, with his laptop out, his view of the PFD was not blocked.

The first officer stated that, after 4 to 5 minutes of conversation, he pulled out his laptop computer and placed it on top of the extendable tray table in front of him. The first officer said that both laptops were out and open at the same time. Both pilots stated that the first officer was tutoring the captain in the bidding system and process. They also stated that they did not hear any audible alerts in the cockpit and did not see any ACARS message indications on the Electronic Centralized Aircraft Monitor (ECAM) during the time they had their laptops out. The captain stated that he believed the conversation regarding the bidding procedures lasted about 15 minutes.

The pilots stated that their first indication of anything unusual with the flight was when they received a call from a flight attendant inquiring about their arrival. The captain said that he then looked down at his multifunction control and display unit (MCDU) and saw that there was no flight plan information depicted. Then, the captain looked at his navigation display and saw Duluth to his left and Eau Claire to his right. The first officer said that he then immediately contacted ATC, but neither pilot could remember what frequency was used. ATC gave them a frequency to use to contact Minneapolis ARTCC. The first officer then noticed the ACARS message indication on the ECAM and attempted to retrieve those messages.

FLIGHT ATTENDANTS

All of the flight attendants indicated that the flight was normal from a cabin perspective. The lead flight attendant thought that the crew meals were delivered around 1900. The flight attendants indicated that late flight arrivals were fairly normal into MSP due to on-going

construction and weather delays. About 2015, the aft flight attendant called the cockpit to see when they would be landing so that they could pass the information on to passengers with connecting flights.

AIR TRAFFIC CONTROL

All of the ATC controllers interviewed indicated that NORDO flights were “common events,” and the controllers estimated that such flights occurred several times a shift. The controllers stated that they would normally call company dispatch, and the pilots would then establish contact on the appropriate ATC frequency after receiving an ACARS message. In addition, all interviewed controllers indicated that there was no standard procedure or requirement for indicating when communication with an aircraft was established.

The initial third Denver controller stated that he did not remember the event until he reviewed the voice tape. He indicated that when he accepted the AIT for NWA188 he was sequencing traffic into Phoenix and another airplane was requesting a flightpath diversion due to weather. The controller initiated an early AIT with the fourth Denver sector just before beginning his position relief briefing.

The relieving third Denver controller indicated that, when he received the position relief briefing, NWA188 was in handoff status. After seeing the next controller accept the handoff, the third controller made two attempts to radio the change of frequency to NWA188 but received no acknowledgement. When interviewed, he indicated that it was not unusual for air carrier flights not to acknowledge frequency changes. He also indicated that he would normally use 121.5 MHz to try to contact general aviation airplanes, but would use the company dispatch for air carrier airplanes.

The initial fourth Denver controller stated that he had no recollection of the NWA188 event. He stated that recorded information indicated that he had accepted a handoff about 2 1/2 minutes before being relieved by the next controller. He also said it was common practice for air carrier crews not to acknowledge frequency changes.

The relieving fourth Denver controller stated that she did not remember the event until she reviewed the voice tape. She said that, at the time she accepted control of the sector, she did not know if NWA188 was on her frequency because the aircraft was still within the sector’s boundary. She transmitted to NWA188 asking the flight crew to switch frequencies, but because there was no response, she thought that the previous controller had already transferred communication.

According to the Denver area 5 FLM, it took him a few minutes to contact NWA dispatch after the fifth Denver controller informed him that NWA188 was NORDO due to phone delays. He indicated that he did not advise the Denver operations manager in charge (OMIC) nor the Minneapolis area 5 FLM that NWA188 was NORDO because he saw that the airplane had been electronically transferred to Minneapolis, so he assumed that communications had been restored. Although he indicated that the controllers use 121.5 MHz, it was not available in all

sectors.

According to the first Minneapolis controller, after accepting the AIT for NWA188, he informed his FLM (Minneapolis area 5) that NWA188 was still NORDO and that the FLM should contact NWA dispatch. He also typed NORDO in line 4 of the NWA188 ATC data block.

The Minneapolis area 5 FLM then called NWA dispatch. The FLM stated that he did not contact the OMIC to report the NORDO because he expected NWA188 to contact ATC on the proper frequency after he (the FLM) had contacted NWA dispatch, as had happened many other times with NORDO airplanes.

The Minneapolis area 3 FLM stated that she became aware of NWA188 in the area when she overheard the second Minneapolis controller relaying a message to NWA188 through another NWA aircraft. The manager then called NWA dispatch and requested that they contact the airplane using ACARS. She recognized that NWA188 was NORDO and walked over to the watch desk and informed the OMIC that the flight had been NORDO for a while.

The Minneapolis area 3 FLM called NWA dispatch again when NWA188 was 50 miles southwest of MSP. She then returned to the watch desk to advise the OMIC that NWA188 was still NORDO. Another manager was at the OMIC position at that time and indicated that she was not aware that NWA188 had been NORDO. The area 3 FLM again called NWA dispatch and was informed that dispatchers were very concerned because they could not make any contact with the flight.

When the Minneapolis area 3 FLM initially informed the OMIC about NWA188, there was an acting manager staffing the position while the duty OMIC was away from the desk for a short period. The acting OMIC indicated that he wrote that NWA188 was NORDO on a notepad that the OMICs commonly use. The duty OMIC returned about 5 minutes later. The acting OMIC indicated that he had not been alarmed because NORDO occurrences are common. The acting OMIC also indicated that he did not use the OMIC checklist to brief the duty OMIC because he had been acting for only a short time.

The duty Minneapolis OMIC stated that she was not aware that NWA188 was NORDO until the area 3 FLM's second notification to the watch desk. When informed of how long NWA188 had been NORDO, she called the domestic events network (DEN) and advised them of the situation. She believed that the DEN had already been notified; however, hers was their first notification of the event. After notifying DEN, the duty OMIC left the watch desk to continue to coordinate with the FLMs regarding NWA188. After returning to her desk, the duty OMIC advised the DEN of the possible need for a fighter intercept. She then coordinated with the FLMs for the next ATC areas about the possible need for an intercept. A short time later, the DEN called back to coordinate the intercept; however, concurrent with that phone call, the duty OMIC was informed that communication with NWA188 had been restored. After the event, the OMIC determined that NWA188 had entered Minneapolis airspace in a NORDO situation about 20 minutes before she had been initially notified.

PERSONNEL INFORMATION

The captain, age 53, held an airline transport pilot certificate with airplane multiengine land, Boeing 727, and Airbus A320 ratings; a commercial pilot certificate with an airplane single-engine land and sea ratings; and a flight engineer certificate (turbojet). At the time of the incident, the captain held a first-class medical certificate dated May 5, 2009, with the restriction that he "shall possess glasses for near/intermediate vision."

According to NWA employment and flight records, the captain was hired by Republic Airlines, which later merged with NWA, on November 18, 1985, and had accumulated a total of 18,641 hours, of which 8,196 hours were as pilot-in-command. In the 90 days, 30 days, and 24 hours before the accident, the captain had flown 178.5, 43.6, and 8.2 hours, respectively. He had received his most recent recurrent training and proficiency check on January 25, 2009.

The first officer, age 54, held an airline transport pilot certificate with airplane multiengine land, Boeing 727, and Airbus A320 (second-in-command privileges only) ratings and a flight engineer certificate (turbojet). At the time of the incident, the first officer held a first-class medical certificate dated September 22, 2009, with the restriction that he "must have available glasses for near vision."

According to NWA employment and flight records, the first officer was hired by NWA on January 3, 1997, and had accumulated a total of 13,811 hours, of which 5,345 hours were as second-in-command in the A320. In the 90 days, 30 days, and 24 hours before the incident, the captain had flown 210.7, 23.2, and 8.2 hours, respectively. He had received his most recent recurrent training and proficiency check on December 7, 2008.

Investigators documented both pilots' flight, duty, and rest times for the 3 days before the incident flight. Both pilots had been off duty for the 2 days before beginning the trip. The incident flight was on the second day of a 5-day trip sequence that the pilots were flying together. The first day of the trip involved a single flight leg from MSP that arrived at SAN about 2130 (central daylight time). The crew overnighted at a downtown hotel. Both pilots reported receiving normal overnight sleep and feeling rested when they departed the hotel about 1500 to begin the second day of the trip (the incident leg). This trip sequence was the first time the captain and first officer had flown together.

MEDICAL INFORMATION

The flight crew was administered a field breathalyzer test by airport police upon arrival at MSP. The results were negative. In accordance with 14 CFR Part 121, Appendixes I-J, the captain and first officer submitted to testing by NWA for alcohol and five major drugs of abuse. All tests were negative.

FLIGHT RECORDERS

The airplane was equipped with an L-3 Communications Fairchild Model F1000 FDR. The recorder was in good condition, and the data were extracted from it normally.

The airplane was equipped with a Honeywell model 980-6020-001 SSCVR, 30-minute solid-state cockpit voice recorder. The recording started when the airplane was on final approach to MSP. The discernable conversations throughout the recording were related to operation of the airplane. There were no discussions about the NORDO event. Shortly after arrival at the gate, the crew removed their headsets. Conversations afterward were muffled and difficult to discern.

ADDITIONAL INFORMATION

NORTHWEST/DELTA MERGER

On April 14, 2008, Delta Air Lines announced its intention to merge its operations with NWA. In September 2008, the FAA approved Delta's plan for interim operations and a single operating certificate transition. In October 2008, NWA and its subsidiaries became wholly-owned subsidiaries of Delta Airlines, with plans to be fully integrated by the end of 2010.

Shortly after the FAA approval, the FAA principal operations inspector for each airline created a joint transition team to oversee the integration of flight operations using analysis of the recent US Airways/America West merger to develop an integration plan. In January 2009, Delta and NWA created a team to develop a plan to integrate each airline's flight operation's manual, procedures, and philosophies. This team was made up of Delta and NWA pilots, instructors, management pilots, and representatives from the pilot union. The group divided the integration into phases, roughly matching the phases of flight.

At the start of each integration phase, pilots received manual revisions and an overview of the changes approximately 3 weeks before implementation. In phase one, for example, NWA pilots received a new revised aircraft operating manual volume I in March 2009. Pilots were also required to complete computer-based training modules for each phase. Phase one implementation went into effect on April 1, 2009. Another phases occurred every 2 months after that. At the time of the incident flight, the airline was in phase four of its integration.

A320 ONBOARD COMMUNICATIONS

The Airbus A320 aircraft is equipped with several communication systems which facilitate very high frequency (VHF) and high frequency (HF) radio communication. These systems are accessed through the radio management panels (RMP) and audio control panels located on the center pedestal in the cockpit between the first officer's and captain's seats.

One RMP is located next to each pilot. The RMP is used to select a desired radio for the purpose of viewing and changing the active and standby frequencies and transferring the standby frequency to the active. Each RMP contains the switching controls for the communication radios. Either RMP can tune any of the three VHF radios. The selected radio is

indicated by a green light to the left of the radio key.

A rotary selector located on the RMP is used to select the desired radio frequency. Two liquid crystal display (LCD) windows on each RMP provide a visual presentation of the ACTIVE frequency on the left and the standby frequency on the right. To make the standby frequency the active frequency, the pilot must push the transfer key located between the two LCD windows.

AIRCRAFT COMMUNICATION ADDRESSING AND REPORTING SYSTEM

ACARS is a communications system that provides a data link between the aircraft and a ground-based communication network. Information is sent as a digital signal and can be transmitted over VHF radio, HF radio, or via satellite, depending on aircraft equipment. NWA A320 airplanes are configured to use the #3 VHF radio to tune the ACARS frequency in normal operations.

ACARS messages sent through the company dispatch are distributed through a VHF ground network to ensure aircraft receipt. Frequency tuning and addressing of these messages are performed automatically. All messages delivered to and from the aircraft perform verification between the aircraft and the ground network to ensure the message is delivered. Verification indicates that the message was received by the aircraft. NWA A320 airplanes are configured to display a flashing "ACARS MSG" on the upper ECAM when a dispatch message is received. There is no aural alert. Following this the incident, Delta indicated that they will be modifying the system to allow dispatch to include an aural alert on certain ACARS messages.

SIMULATION OF THE FLIGHT

NTSB investigators reconstructed the incident flight in a NWA A320 simulator. The simulator was configured to recreate and document the alerts available to the flight crew of NW188, based upon the actual flight path of the aircraft, crew interviews, and the ATC filed flight plan. Investigators used a starting point approximately 75 miles from the top of descent and ended as the aircraft passed the last waypoint entered into the FMC. Based upon a review of the Northwest Airlines A319/320 Aircraft Operating Manual - Volume II, and observations by the investigators on the reconstructed flight, the following information was derived:

While at cruise altitude, the flight plan page continued to scroll through the flight plan as the aircraft passed over each waypoint, providing passive clues as to the aircrafts position. When an ACARS message was sent to the airplane, an "ACARS MSG" or "ACARS CALL" visual alert flashed green on the upper ECAM, visible to both pilots. This alert flashed for 30 seconds then turned steady green. Absent crew acknowledgement of the message, the alert remained illuminated for the duration of the simulation. Simultaneous to the green "ACARS MSG" alert was a "MESSAGE WAITING" visual advisory message that appeared on the scratchpad of both pilots' MCDU.

As the aircraft approached 180 miles from MSP, without landing data entered into the FMC, an amber colored "ENTER DEST DATA" alert illuminated on each MCDU scratchpad, along with a

white "MCDU MENU" vertically displayed on the right side of both MCDUs. As the airplane remained at cruise altitude and passed the top of descent, a white "DECELERATE" visual alert message illuminated at the top of both pilots' PFD. When the airplane was 30 seconds from arrival at the final waypoint entered into the FMC, an amber "LAT DISCONT AHEAD" visual alert message appeared on both pilots' MCDU scratchpad. Simultaneous to this message was a white "MCDU MENU" visual alert message that illuminated vertically on the right side of both pilots' MCDUs.

When the airplane arrived at the final waypoint in the FMC, the lateral guidance system of the auto flight system reverted from a navigation mode (NAV) where it was flying to each waypoint in the FMC flight plan, to a basic heading (HDG) mode, where it remained on its current heading for the duration of the simulation. At that time, the FMA (located at the top of each pilots' PFD) lateral guidance alert visually changed from "NAV" to "HDG" on both pilots' PFDs. As the airplane passed the final waypoint in the flight plan, a "PPOS" (present position) message appeared at the top portion of the MCDU flight plan path, a visual "F-PLN DISCONTINUITY" appeared in the body of the flight plan page, and dashes were located where the waypoints had been. These messages remained for the duration of the simulation. There were no aural alerts associated with any visual alerts during the simulation.

PERSONAL ELECTRONIC DEVICES

Delta Flight Operations Policy Manual, Page 3-2.9-10 dated April 1, 2009, states, in part:

Personal Electronic Devices (PEDs)

Crew members are prohibited from using any device not certified for use in the aircraft. Certain devices that are certified are further restricted to prohibit their use on the flight deck. These items include, but are not limited to, personal computers, hand held GPS units, CD players, MP3 players, DVD players, etc.

EXCERPTS FROM FAA ORDER 7110.65, AIR TRAFFIC CONTROL HANDBOOK PARAGRAPH 10-4-4. COMMUNICATIONS FAILURE

Take the following actions, as appropriate, if two-way radio communications are lost with an aircraft:

- a. In the event of lost communications with an aircraft under your control jurisdiction use all appropriate means available to reestablish communications with the aircraft. These may include, but not be limited to, emergency frequencies, NAVAIDs [navigation aids] that are equipped with voice capability, FSS [flight service station], Aeronautical Radio Incorporated (ARINC), etc.
- b. Broadcast clearances through any available means of communications including the voice feature of NAVAIDs.
- c. Attempt to re-establish communication by having the aircraft use

its transponder or make turns to acknowledge clearances and answer questions.

- d. Broadcast a clearance for the aircraft to proceed to its filed alternate airport at the MEA [minimum en route altitude] if the aircraft operator concurs.
- e. If radio communications have not been (re)established with the aircraft after five minutes, consider the aircraft's activity to be possibly suspicious and handle the flight per FAAO JO 7610.4, Chapter 7, Hijacked/Suspicious Aircraft Reporting and Procedures.

Pilot Information

Certificate:	Airline transport; Commercial; Flight engineer	Age:	53, Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 1 With waivers/limitations	Last FAA Medical Exam:	May 5, 2009
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	January 25, 2009
Flight Time:	18641 hours (Total, all aircraft), 8897 hours (Total, this make and model), 8196 hours (Pilot In Command, all aircraft), 178 hours (Last 90 days, all aircraft), 44 hours (Last 30 days, all aircraft), 8 hours (Last 24 hours, all aircraft)		

Co-pilot Information

Certificate:	Airline transport	Age:	54, Male
Airplane Rating(s):	Multi-engine land	Seat Occupied:	Right
Other Aircraft Rating(s):	None	Restraint Used:	
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 1 With waivers/limitations	Last FAA Medical Exam:	September 22, 2009
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	December 7, 2008
Flight Time:	13811 hours (Total, all aircraft), 4500 hours (Total, this make and model), 2350 hours (Pilot In Command, all aircraft), 210 hours (Last 90 days, all aircraft), 83 hours (Last 30 days, all aircraft), 8 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Airbus	Registration:	N374NW
Model/Series:	A320 212	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	
Airworthiness Certificate:	Transport	Serial Number:	1646
Landing Gear Type:	Retractable - Tricycle	Seats:	156
Date/Type of Last Inspection:	April 22, 2009 Continuous airworthiness	Certified Max Gross Wt.:	167300 lbs
Time Since Last Inspection:		Engines:	2 Turbo fan
Airframe Total Time:	23685 Hrs at time of accident	Engine Manufacturer:	CFM
ELT:	Installed, not activated	Engine Model/Series:	CFM56 5A
Registered Owner:	Northwest Airlines, Inc.	Rated Power:	26500 Lbs thrust
Operator:	NORTHWEST AIRLINES INC	Operating Certificate(s) Held:	Flag carrier (121)
Operator Does Business As:		Operator Designator Code:	NWAA

Meteorological Information and Flight Plan

Conditions at Accident Site:		Condition of Light:	
Observation Facility, Elevation:		Distance from Accident Site:	
Observation Time:		Direction from Accident Site:	
Lowest Cloud Condition:		Visibility	
Lowest Ceiling:		Visibility (RVR):	
Wind Speed/Gusts:	/	Turbulence Type Forecast/Actual:	/
Wind Direction:		Turbulence Severity Forecast/Actual:	/
Altimeter Setting:		Temperature/Dew Point:	
Precipitation and Obscuration:			
Departure Point:	San Diego, CA (SAN)	Type of Flight Plan Filed:	IFR
Destination:	Minneapolis, MN (MSP)	Type of Clearance:	IFR
Departure Time:	22:00 UTC	Type of Airspace:	

Airport Information

Airport:	Minneapolis-St Paul Internatio MSP	Runway Surface Type:	
Airport Elevation:		Runway Surface Condition:	
Runway Used:		IFR Approach:	None
Runway Length/Width:		VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	5 None	Aircraft Damage:	None
Passenger Injuries:	147 None	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	152 None	Latitude, Longitude:	44.880611,-93.220718(est)

Administrative Information

Investigator In Charge (IIC):	Sedor, Joseph
Additional Participating Persons:	TR Proven; FAA; Washington, DC Lisa Brockkenbrough; Delta Airlines; Minneapolis, MN Pete Fry; Air Line Pilots Association; Great Falls, VA Candace Kolander; Association of Flight Attendants; Washington, DC Daniela Aguerre; National Air Traffic Controllers Association; Miami, FL
Original Publish Date:	March 18, 2010
Last Revision Date:	July 8, 2024
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=74940

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available [here](#).