



National Transportation Safety Board

Washington, D.C. 20594
Safety Recommendation

Log 2/162

Date: December 5, 1989
In reply refer to: A-89-110 through -120

Honorable James B. Busey
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On September 17, 1988, about 1859 local time, N6586J (86J), a Cessna 172, crashed into a mountain near Adams, Massachusetts.^{1/} The pilot was seriously injured and the two passengers were fatally injured. The pilot was flying by visual flight rules (VFR) from Westerly, Rhode Island, to Bennington, Vermont. At the time of the crash, 86J was on a radar vector from the Boston Air Route Traffic Control Center (Boston Center). The Boston Center controller had allowed the pilot to maintain 3,000 feet; the minimum vectoring altitude (MVA) in the area was between 4,700 and 5,000 feet msl. The last transponder return received by the Boston Center indicated that the airplane was at an altitude of 2,700 feet msl.

The pilot of 86J had encountered difficulty with weather and began circling a field. Because 86J was at a low altitude, reception of its transmissions at Federal Aviation Administration (FAA) facilities was poor, and the flightcrew of Monarch 58 (MON58), a Boeing 757 en route from Orlando, Florida, to Bangor, Maine, at flight level 370, heard 86J's transmissions and relayed instructions from the FAA facilities to 86J. Many people at several locations became actively involved in the final 16 minutes of the flight. Transmissions during the final moments of the flight were also received at the Westover Air Force Base in Chicopee, Massachusetts.

The Accident

At 1843, the pilot of 86J transmitted on the emergency frequency,^{2/} "I'm a little confused right now; I'm in trouble and I'm around Pittsfield Airport; I am clouded in with clouds and I'm circling over a field that is a possible landing site [ah, I request that you put me on radar possibly to verify my position. I have mode C capability]."^{3/} MON58 replied, "Cessna 656J, just

^{1/}For more information, read NTSB Field Accident Report NYC-88-FA-236.

^{2/}121.5 MHz on the very high frequency (VHF) band and 243.0 MHz on the ultrahigh frequency (UHF) band are designated as emergency frequencies and are continuously monitored [guarded] by most FAA and military ATC facilities.

^{3/}All transmissions enclosed in brackets [] indicate transmissions from 86J that were not received at either the Boston Center or Albany Approach. These transmissions were received by the Westover Air Force Base, and presumably received by MON58. Mode C capability allows the controller to see the altitude of the airplane on the radar display.

understand you're in a little bit of trouble navigation wise, you're in ah the Pittsfield area, Pittsfield, confirm." The pilot of 86J replied, ["Yes, Pittsfield, Mass. I'm only about north-east, possibly probably about 10 miles."] The controller working the radar position at the Pawling Sector, Sector 06, at the Boston Center overheard the transmission from MON58 and replied, "656J, this is Boston Center on guard; if you hear, ident." About the same time, the controller working the D-side of Pawling Sector at the Boston Center called Albany Approach Control and said, "...we just had a 656J say he was having trouble or something about he was in the level in ah layers of fog in the Pittsfield area." The controller working the Radar South position at Albany Approach replied, "OK, I'll come up on the frequency and see if I can do anything." He then transmitted, "This is Albany Approach on 121.5. Is there an aircraft near Pittsfield, I believe the sign is 656J, needs assistance?" MON58 replied, "That's affirmative Boston. It's a Cessna 656J; Monarch, who's talking to him and we understand he's got navigational problems and he has mode C capability." The Radar South controller at Albany Approach then said, "All right, if you could pass along to him, tell him to squawk 5227; I'll see if I can pick him up."

MON58 relayed the information to 86J, who repeated the code, and said, "I pushed the ID button." MON58 said, "Thank you, ah, could you give us your altitude, please, your altitude, and confirm your call sign." 86J replied, "My altitude is three thousand feet and I'm circling over a field which is a [good landing site. If I need to I can land.] I estimate that I probably have about thirty minutes of fuel and I decided [that this is a good way out until I get out.]" MON58 replied, "That's affirmative, sir; stay where you are and just confirm your call sign please."

At 1847:19, 86J replied, ["Cessna six five eight six Juliet, stationed in Bennington State Airport, Vermont."] MON58 then repeated this information and asked, "...did you copy that Boston?" Boston Center did not reply to this question, but Albany Approach replied by saying, "...I don't have him on radar; he's probably too low for my coverage; he wants to get to Bennington?" About the same time, the Pawling D-side controller at the Boston Center called Albany Approach and asked if it was hearing the guard (emergency) frequency. Albany Approach replied that it was, and that a controller had issued 86J a "squawk" (four-digit transponder code). The Pawling D-side controller asked if Albany Approach saw 86J on radar. Albany Approach replied that it "didn't even see a primary or anything out there; it might be real low." 86J then appeared on the Boston Center radar. The Pawling D-side controller said, "...he's 2,800 feet...." Albany Approach replied that they would look for him.

At 1847:43, the Radar South controller at Albany Approach transmitted on 121.5 to MON58, "...I don't have him on radar, he's probably too low for my coverage; he wants to get to Bennington." MON58 replied, "That's his base...and it's call sign 6586J, and he's got thirty minutes of fuel. He's orbiting over a large airfield, and ah at 3,000 feet, staying in that position until he gets assistance or he'll decide to land there; he can't confirm the field." The Radar South controller at Albany Approach then transmitted, "Boston Center says he might be six miles south of the Grave intersection which would put him in the vicinity of North Adams Airport, and there's also a large mountain peak there, three thousand seven hundred feet. Tell him to use caution." MON58, in turn, transmitted to 86J, at 1848:23, "Understand that Albany Approach thinks you're in the Adams Airfield vicinity. Ah,

the ah field has, ah, a large ah hump on the ah the field, so use caution if you decide to make a forced landing." 86J replied, ["I'm just circling; if you can't get me on radar, then I definitely should make provisions to land."] MON58 transmitted, "Yes sir, they're having difficulty picking you up at the moment; there's no reply on 5227." A few seconds later, MON58 transmitted, "We're listening out sir, so, ah, ah, so don't hesitate to call us if you need assistance." 86J replied, ["...I am going to lower down and check the field out."] MON58 then replied, at 1849:17, "That's affirmative; do a low pass and check the field for any obstructions. Ah, we think, ah, they think you're in the Graves intersection and it's ah possibly Adams or Andrews I think airfield." [The pilot of 86J then said that the landing airport was just a hay field.] MON58 repeated that information, and then called Albany Approach, trying to contact that facility from 1849:44 to 1850:10. At 1850:18, MON58 transmitted, "There's a slight confusion about this field. It's just a hay field; he's orbiting over a large ah hay field not a landing strip." The Pawling D-side controller at the Boston Center then called Albany Approach and said that the Pawling Sector had the emergency on radar. The controller working the Radar North position at Albany Approach answered, "You see anything on a 5227 code?" The Pawling D-side controller at the Boston Center replied, "Affirmative. He's seven miles northeast of Pittsfield...just north of the Dalton Beacon by three miles."

By this time, controllers at several positions at Albany Approach and the Boston Center were involved in communications with each other. At 1850:35 MON58 transmitted, "Gonna make a low pass and check the field out for any obstructions and ah then he's gonna make a forced landing."

The Radar North controller at Albany Approach and the controller working the D-Side of the Gardner Sector at the Boston Center had also been communicating about the position, altitude, and heading of 86J. At 1850:54, the Gardner D-Side controller at the Boston Center said, "Now it looks like he's heading eastbound." The Radar North controller at Albany Approach said, "All right I think we're gonna try to get him to go westbound towards Pittsfield Airport." The controller working the Radar Coordinator position at Albany Approach transmitted to MON58 at 1850:53, "And Monarch, if you could relay to him there is an airport approximately seven miles west of his position, it is known as the Pittsfield Airport."

At 1851:02 MON58 called 86J and said, "Roger, Albany Approach ah recommends an airfield named Pittsfield seven miles west of your present position,...airfield called Pittsfield." The pilot of 86J then transmitted to Monarch, ["We're going to try a course direct west from here and see what we can do."] MON58 replied, at 1852:10, "Ah eight six juliet, say again, please, this is Monarch." 86J again transmitted, ["...we are just headed west and ah we are going to maintain a course of west and you say approximately seven miles we should run into Pittsfield."]

MON58 then contacted Albany Approach and advised that 86J was "...heading toward Pittsfield Airfield now ah he's gonna maintain a heading of west." At 1852:55, MON58 transmitted, "Just confirm that range was seven miles from his position." The Gardner D-side controller at the Boston Center then noted, "He's headed westbound now." In a background discussion, in Albany Approach Control, at 1852:57, someone said, "...get rid of this sucker because whoever got him on radar should be...." Shortly after, the controller working the Final Vector position at Albany Approach asked the Pawling D-side controller at the Boston Center, "If you have him in radar there, why don't we put him over on your frequency?" The Pawling

D-side controller then suggested 121.35, or 128.1, "...put him on 128.1." At 1853:41, the Radar Coordinator at Albany Approach told MON58, "...if you could have 86J, he's in radar contact with Boston Center, frequency 128.1, if you can maintain his present altitude as long as possible." About the same time, the Radar North controller at Albany Approach told the Gardner D-side controller at the Boston Center that the Pawling Sector's "got him in radar also they're going to be working him trying to get him towards Pittsfield...."

At 1853:53 MON58 said, "Roger, Boston, ah, now have you on radar contact, sir, ah, go to frequency 128.1, 128.1, speak to Boston, and stay at your present altitude, stay at your height." The pilot of 86J asked MON58 to repeat the information, which was accomplished. Then 86J repeated the frequency and said, "Okay, changing frequencies now." About the same time, Albany Approach told the Pawling D-side controller at the Boston Center, "You're gonna work him, listen, he supposedly only has about twenty five minutes of fuel now." The Pawling D-side controller acknowledged. During this same time period, Albany Approach told the Gardner D-side controller at the Boston Center, "...Pawling Sector's got him in radar also they're gonna be working him trying to get him towards Pittsfield I believe is what it is." The Radar North controller at Albany Approach had been in communication with the Gardner Sector at the Boston Center. At 1855:32, the Radar North controller said, "...I'm coming off the sixty line...keep an eye on him please...Pawling's going to be working him..." The Pawling D-side controller at the Boston Center then asked the Final Vector controller at Albany Approach who the other aircraft was that was talking to 86J, and learned that it was MON58. The Pawling D-side controller then told the Final Vector controller to have MON58 also switch to frequency 128.1, one of the frequencies available on the Pawling Sector. The Final Vector controller acknowledged. At 1855:06, the Radar Coordinator at Albany Approach transmitted, "And Monarch this is Albany Approach if you could monitor 128.1 just to let them know you are on frequency if you can provide ah Boston Center any further assistance." MON58 acknowledged and then contacted the Pawling controller on 128.1 MHz.

At 1856:05, MON58 transmitted, "86J, this is Monarch. Boston is calling you; would you ident please for them?" The Pawling Radar controller then transmitted, "Okay Monarch, can you hear Boston?" MON58 replied, "Affirmative." The Pawling Radar controller then said, "Okay Monarch, tell 86J to turn five zero, fifty degrees to the left, fifty degrees to his left."

MON58 then established contact with 86J, and at 1856:40 told 86J to "...turn five zero, fifty degrees left." The pilot of 86J replied to Monarch, ["Ah if I turn fifty degrees, that's going to, I am turning right to fifty degree heading right now."] MON58 repeated, "Turn left fifty degrees from present heading, turn left fifty degrees from present heading; maintain your altitude of three thousand feet, please." MON58 paused and then asked, "What's the new heading please, 86J?" The pilot of 86J replied, ["Ah this is 86J. I am currently on a course of north and I am over a village. I didn't understand the transmission and turned to a heading of fifty, started to so I wasn't sure where I was at; right now I am at north, heading of north, and I am over a city."] MON58 then replied, at 1857:24, "Okay, turn on to a heading two two ah eight ah zero initially ah maintain three thousand." 86J then replied, ["Heading of two twenty eight."] MON58 then told the Boston Center, "Roger, I'm turning him onto a heading of two eight zero, and he's tried to overshoot his heading." The Pawling Radar controller replied, "Okay, he appears to be on a northerly track right now with Boston Center; he does

have North Adams Airport in his ten o'clock position two and a half miles right now it should be twelve o'clock two miles North Adams Airport."

At 1858:08, MON58 transmitted to 86J, "Roger, there's North Adams Airfield at your ten o'clock or twelve o'clock position about two miles, two miles ten to twelve o'clock position, North Adams Airfield. Report when you have contact." The pilot of 86J replied, ["Ah, I'm completely in the clouds right now, um, I am on a heading of west, two hundred and seventy degrees, and I am at twenty eight hundred feet."] MON58 then relayed new information from the Pawling Radar controller to 86J that the airport was now in his 2 o'clock position, 2 to 3 miles.

At 1858:48, the Pawling Radar controller at the Boston Center called Albany Approach and asked, "...what's the runway at North Adams?" Albany Approach replied that it was "eleven and two nine." The pilot of 86J then transmitted, ["...dropping altitude to twenty five hundred feet to try to get out of the clouds."] MON58 replied, "Okay, twenty five hundred feet, roger." MON58 then transmitted, "Boston, he's ah descending to twenty-five hundred; he's ah in clouds at three thousand." The Pawling Radar controller at the Boston Center asked, "He's in the clouds at three thousand?" MON58 answered, "...yeah, could you give ah him lower, please?" The Pawling Radar controller replied, "Okay, stand by." The Pawling Radar controller then called Albany Approach and asked, "...what's the MVA ^{4/} right around the North Adams Airport? I got this guy about three miles south of the airport." Albany Approach answered that it was 4,700 and 5,000 feet. Following this exchange, at 1859:30, the Pawling Radar controller transmitted, "...eight six Juliet, ah correction Monarch, the runways are eleven and two nine runway one one and runway two nine at North Adams." MON58 repeated the information, and then asked 86J, "What altitude are you at now?" The pilot of 86J did not reply. The Boston Center received the last radar return from 86J at 1859:31.

Investigation

During the investigation of the accident, the Pawling Radar controller told Safety Board investigators that she first became aware of 86J when she heard other aircraft trying to talk with 86J on the emergency frequency. She then listened to MON58 trying to talk with 86J and heard MON58 telling 86J to squawk 5227. She then entered this code in her code select list.^{5/} She advised Albany Approach that 86J was in radar contact, and then forwarded 86J's position to Albany Approach. She said "that for some reason" she had determined that 86J was being worked by Albany Approach. She then had gone back to her traffic, which she said was 8 to 11 airplanes.

When Safety Board investigators asked what information she had on 86J at 1853:45 when she began calling 86J on frequency 128.1, the Pawling Radar controller

^{4/}MVA--minimum vectoring altitude is the lowest altitude at which an IFR aircraft will be vectored. Limiting factors are terrain height and radar coverage.

^{5/}Entering a code in a code select list provides a controller easier identification of the airplane by allowing associated alphanumeric to be presented on the radar display.

responded that she felt that 86J was disoriented, nervous, circling, and asking for some direction. She said she told MON58 to tell 86J to turn 50 degrees to the left, which would have been a northwesterly direction. She felt that 86J was trying to go in that direction, but was tracking toward the northeast. She therefore questioned the validity of the pilot's instruments. When MON58 advised that 86J wanted a lower altitude and was in the clouds, she recalled being surprised. Up to this time, she thought that 86J was flying VFR and complying with requirements to remain VFR.

The Pawling Radar controller said that when she called Albany Approach, asked what the MVA was, and was told 4,700 feet, she "sank," because "there was obviously something out there," and 86J's mode C return was indicating 2,700 feet. She said the radar target then disappeared and MON58 lost communications with 86J.

The Pawling Radar controller's immediate supervisor, the Area Supervisor, was standing close to where the Pawling Radar controller was seated. He said he had observed 86J tracking northbound. He heard the Pawling Radar controller give the 50-degree left turn order and then heard the controller sitting to the left of the Pawling Radar controller say that the MVA was 4,700 or 5,000 feet. The Area Supervisor recalled that the controller to the left of the Pawling Radar controller said that there were mountains there; the Area Supervisor then told the Pawling Radar controller about mountains being there. The Area Supervisor said he did not know the actual flight conditions that 86J was encountering. When he learned that the airplane was circling a field, however, he assumed it to be in VFR conditions. About the time the Pawling Radar controller asked for the MVA, he said that his thought was, "How can we countermand this?"

During this period, two other supervisors were behind the Pawling Radar Sector at the Boston Center. One of them, the Area Manager-In-Charge, mentioned that "there were hills out there." The other supervisor, from an adjacent sector, had come to the Pawling Sector for the purpose of warning them about Mount Greylock in the area. He told the Pawling Radar controller and her supervisor, "Don't forget about Mount Greylock," and then added that its height was 3,900 feet. He recalled getting an acknowledgment from the controller's supervisor but not from the Pawling Radar controller. He said that he felt that things were tense enough at this point without having a supervisor from another area bothering them, so he "got the heck out of there."

Discussion

The Safety Board believes that a correct decision was made to allow the Boston Center to assist 86J because Boston Center had radar contact with 86J and Albany Approach did not have radar contact when the decision was made. The airspace assigned to the Pawling Sector was above and close to airspace assigned to Albany Approach. Although 86J was in Albany Approach's airspace, the Pawling Sector was the logical sector to assist 86J because it communicates frequently with Albany Approach and it had radar contact with 86J.

When Albany Approach, an automated radar terminal systems (ARTS) facility, began assisting 86J, the Albany Radar South controller instructed the computer to assign a VFR code to the aircraft. The computer selected one of the codes in the 5200 series, which is reserved for VFR aircraft. The Radar South controller then issued the code selected, 5227, to the pilot of 86J. The minimum safe altitude

warning (MSAW) at Albany Approach was functioning; however, the VFR computer codes inhibit VFR aircraft from activating the MSAW alarm at ARTS facilities. Had 86J remained in radar contact with Albany Approach, Albany Approach would have been trying to assist 86J without the redundancy of the MSAW alarm. On the date the accident occurred, Boston Center, an air route traffic control center (ARTCC), did not have an en route minimum safe altitude warning (E-MSAW) adapted for the geographic area in which the accident occurred. Had the E-MSAW been available, 86J would have activated the alarm because VFR computer codes do not inhibit VFR aircraft from activating the E-MSAW alarm in ARTCC facilities; the Boston Center controller then would have been obligated to issue a low altitude safety alert. A VFR aircraft being assisted by a terminal facility could activate an MSAW alarm if the controller instructed the computer to assign a code that did not inhibit the alarm. Such instruction requires one additional keystroke, the same as when a controller requests a code for an IFR aircraft. The low altitude alert is a valuable feature of the ATC system; the Safety Board believes that when a terminal radar facility offers assistance to a VFR aircraft that is equipped with mode C capability and is in an emergency status, the controller should request an uninhibited computer code so that the VFR aircraft has an opportunity to receive a safety alert based on an MSAW alarm.

Handbook 7110.65, Air Traffic Control, provides procedures and guidance for controllers. Chapter 9, Paragraph 9-2, "Emergencies," tells the controller to obtain enough information to handle the emergency intelligently.

Base your decision as to what type of assistance is needed on information and requests received from the pilot because he is authorized by FAR 91 to determine a course of action.

Paragraph 9-10 states that minimum information required for handling in-flight emergencies is (1) aircraft identification and type, (2) nature of the emergency, and (3) pilot's desires. The controller is told to obtain additional information after initiating action; a list of 14 items is provided. The Pawling Radar controller knew some of these items because 86J was in radar contact. Two important items for this set of circumstances, however, were not known: the pilot-reported weather, and the pilot capability for IFR flight. The Safety Board notes that neither the Pawling Radar controller nor the Area Supervisor attempted to obtain this information.

Chapter 9, Paragraph 9-24, "Radar Assistance to VFR Aircraft in Weather Difficulty," states:

If a VFR aircraft requests radar assistance when it encounters or is about to encounter IFR weather conditions, ask the pilot if he is qualified for and capable of conducting IFR flight.

* * * * *

If the aircraft has already encountered IFR conditions, inform the pilot of the minimum safe altitude. If the aircraft is below the minimum safe altitude and sufficiently accurate position information has been received or radar identification is established, furnish a heading or radial on which to climb to reach the minimum safe altitude.

The Boston Center made no attempt to determine whether the pilot of 86J was qualified and capable of conducting IFR flight nor did the controller inform the pilot of a safe altitude and provide a course on which 86J could climb to reach a safe altitude. The Pawling Radar controller did not ask the pilot any questions. The controller did not know the pilot-reported weather or pilot capability for IFR flight. Under the circumstances, these items were the 2 most important of the 14 additional items of information the controller should obtain in an emergency. The left turn of 50 degrees was issued before a safe altitude or minimum vectoring altitude (MVA) was known. The decision to turn the aircraft apparently was based on a series of assumptions. Even after the turn was issued and the MVA became known, the Pawling Radar controller did not provide an appropriate heading and tell 86J to climb to a safe altitude. Instead, the controller attempted to inform the pilot about the runways at North Adams airport.

The Safety Board considers the series of errors by the controller and supervisors to be a serious deficiency in handling emergencies. The controller should not have issued a vector without knowing the pilot-reported weather, capability for IFR flight, and the MVA. Additionally, when the controller discovered the MVA for the area was 4,700 to 5,000 feet, she took no corrective action. Several supervisors were observing, but none mentioned anything about having the pilot of 86J climb on a course to avoid high terrain. One supervisor was wondering how to "countermand the situation." The action taken and the lack of appropriate action were contrary to basic information contained in the ATC handbook. The emergency procedures in this case were not properly executed.

Paragraph 9-24 contains the wording "minimum safe altitude." The Safety Board believes that this wording could become confused with the defined term "minimum safe altitude (MSA)" in the pilot/controller glossary. The MSA is depicted only on approach charts used for instrument approaches or is defined generally in the Code of Federal Regulations, Part 91, and is not the same as the MVA. The Safety Board believes that this wording should be deleted where it appears in paragraph 9-24, and "safe altitude (MEA/MOCA/MVA/MIA)" be inserted to express the intent of the paragraph.

The Pawling Radar controller told investigators that her training had not covered a situation in which a VFR pilot was caught in weather, was asking for help, but was below the MVA. According to the FAA, however, the en route controller option in its Radar Training Facility (RTF) located in Oklahoma City provides instruction to controllers for handling VFR pilots experiencing weather difficulty below the minimum safe altitude (MSA). The Safety Board believes that exercises involving MSAs should be accomplished in the terminal option as well as in the en route option. More importantly, however, an en route radar controller should be concerned with the MVA or the minimum IFR altitude (MIA) and with the correct course of action to pursue if a pilot operating under VFR asks for assistance. The Safety Board therefore believes that future radar control trainees in the en route option at the RTF should receive training for an emergency situation in which a VFR pilot is requesting assistance, is caught in weather, and is below the MVA. The Safety Board also believes this type of emergency situation is important for radar control trainees in the terminal option; the FAA states that such training is not now provided at the RTF.

When the Pawling Radar controller issued the 50-degree left turn for 86J, she in essence issued an altitude of 3,000 feet by not correcting MON58 when MON58 told

86J to maintain 3,000 feet; the altitude was below the MVA and did not comply with procedures in the ATC handbook. The Safety Board believes the FAA should advise all radar controllers and supervisors currently working in both en route and terminal facilities of the importance of following procedures provided in Paragraph 9-10 of the ATC handbook when providing assistance in emergencies. The FAA should also illustrate the importance of following the ATC handbook procedures by providing information on the accident involving 86J. Finally, the radar controllers and supervisors should also be given training on the proper handling of a VFR pilot in weather difficulty below the MVA or MIA.

The ATC handbook permits vectoring below either the MVA or MIA. Chapter 5, Section 6, "Vectoring," informs the controller to vector aircraft "at or above MVA or the minimum IFR altitude except as authorized for missed approaches, radar approaches, departures, Special VFR and VFR operations," with the following note:

VFR aircraft not at an altitude assigned by ATC may be vectored at any altitude. It is the responsibility of the pilot to comply with the applicable FAR's.

The Safety Board believes that the latitude afforded by this paragraph allowed the Pawling Radar controller to believe that her actions were acceptable and that the pilot would be providing his own separation from the terrain. The Safety Board does not believe that a pilot lost due to weather difficulty or in darkness with no visible horizon is in a position to safely provide his own separation from terrain. If a VFR pilot is in weather difficulty and notifies air traffic control of his predicament, the pilot is doubtful of his ability to continue flight by VFR. Consequently, a below-MVA vector from an air traffic controller could be dangerous, as it was in this accident. Therefore, the Safety Board believes that any time a below-MVA vector is issued to a VFR aircraft, or an IFR aircraft under emergency conditions, the phrase "Caution, Terrain Clearance Not Provided" should be transmitted to the pilot.

MEAs, MOCAs, MIAs, and MVAs, are all minimum altitudes with which the controller is familiar, and are all either wholly or partly based on terrain. None of them however, give specific elevations or heights of terrain. In 1979, the Safety Board made two recommendations that were intended to increase the amount of assistance that a controller could offer to a pilot. The first was to require all terminal facilities located in designated mountainous areas to install and use emergency obstruction video radar maps (EOVM). The second was to design future ARTCC national airspace system (NAS) stage-A radar systems to include the capability of incorporating EOVMs and to require that facilities serving designated mountainous areas be provided with and use the feature as the new systems became available. The FAA complied with the first recommendation and several controllers have been given awards for providing assistance to aircraft through the use of the EOVM. The FAA did not comply with the second recommendation because the Agency did not consider it feasible to develop an EOVM for the NAS stage-A radar system. However, the FAA stated that the capability to display locally programmed obstruction video maps is an established requirement in the advanced automation system (AAS), which is planned for the mid-1990s. The Safety Board has classified both recommendations as "Closed--Acceptable Action."

In addition to the minimum altitudes already mentioned, there is another altitude, familiar primarily to pilots. The maximum elevation figure (MEF), denoted on sectional charts between lines of latitude and longitude, is based on the highest known feature in each quadrangle, including both terrain and obstructions. Although the MEA, MOCA, MIA, and MVA are all essential for providing an ATC service, the Safety Board believes that for an aircraft in an emergency status, the MEF is the most important information a controller could issue to a pilot because the MEF is always lower in a specific geographical area than the minimum altitudes mentioned above. If an aircraft is in danger of colliding with an obstruction or terrain, the pilot's most important consideration should be the altitude that is required to avoid a collision, which is the MEF. The Safety Board continues to believe that controllers should have equipment capable of providing maximum assistance to aircraft in an emergency status. Until the AAS is implemented and EOVMs are incorporated in the en route system, the Safety Board believes that the FAA should provide the capability to display the MEF to en route controllers via the NAS stage-A radar display. If additional information, such as geographic features or airports, is needed but is not on the radar display, another source of information, such as sectional charts, may be a valuable asset to the controller handling an emergency, and should be readily available.

The Safety Board notes from many investigations that some air traffic controllers are apparently hearing what they expect to hear in transmissions, not what is actually said. In this accident, the Radar South position at Albany Approach had transmitted to MON58, "Boston Center says he might be six miles south of the Grave Intersection which would put him in the vicinity of North Adams Airport and there's also a large mountain peak there, three thousand seven hundred feet. Tell him to use caution." When MON58 relayed this information to 86J, the pilot said that the "...field has a large hump on the field so use caution if you do decide to make a forced landing." The Radar South controller should have noted that 86J was not given all the information intended and should have made sure that MON58 relayed the complete information. The Safety Board is concerned that this type of error--a controller failing to identify an oral error or omission in a pilot's response to a controller's transmission--occurs too frequently. The Safety Board believes that the FAA should remind all controllers that a conscious effort must continually be made to identify and to correct communication errors in the responses that pilots make to controllers' transmissions.

The Safety Board's investigation determined, as a result of interviews with FAA personnel at the Boston Center and Albany Approach, that the supervisors had not taken charge of the situation. Their role was that of an observer. The Safety Board asked the FAA what technical training supervisors receive nationwide regarding their specific responsibilities if they observe either a dangerous situation involving actual traffic or observe an error of a controller working actual traffic. In its written response, the FAA stated that "First-line supervisors are not given any technical training as to their specific responsibilities if they observe a controller make a mistake while that controller is working 'live' traffic, or observes a dangerous situation involving live traffic." The Safety Board believes that supervisors should have a preplanned course of action for the correction of errors or dangerous situations that may occur when actual traffic is being worked. A supervisor should not have to deliberate, for instance, if he or she steps in and works the traffic or gives the controller specific instructions. Key decisions such as these should be made

before an actual situation arises. Controllers should likewise have a clear understanding of what action to expect from the supervisor if a dangerous error or situation is noted.

The FAA also replied that the Center for Management Development conducts all supervisory training, and that "role-play" situations address how to handle general performance and correct on-the-job behavior. This training, however, does not address the need to immediately correct errors that create a danger for actual traffic. The FAA also stated that operational position standards for first-line supervisors were being developed. The operational position standards could be used to establish the specific authority and thrust for what a supervisor's response could or should be in a similar situation, and the Center for Management Development would be an excellent place to demonstrate to supervisors appropriate action for situations similar to the one in this accident. Additionally, the Safety Board believes that FAA air traffic management should consider some of the principles developed for cockpit resource management (CRM). FAA Flight Standards has been encouraging all air carriers to incorporate CRM into their flight programs. To improve communication and interaction between supervisors and controllers, the FAA should consider incorporating CRM principles into its training of supervisors.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Require controllers in terminal radar facilities, when assigning a transponder code to a VFR aircraft in an emergency status, to execute computer commands so that the computer-assigned code will not inhibit the minimum safe altitude warning (MSAW) alarm. (Class II, Priority Action)(A-89-110)

Require controllers in terminal radar facilities, when providing emergency assistance to a VFR aircraft that has been assigned a transponder code which allows a computer status change but inhibits the minimum safe altitude warning (MSAW), to change the computer status of that aircraft so that the MSAW alarm feature is not inhibited. (Class II, Priority Action)(A-89-111)

Provide radar control trainees in the en route option at the Radar Training Facility an emergency situation in which a VFR pilot is asking for assistance, is caught in weather, but is below the minimum IFR altitude. (Class II, Priority Action)(A-89-112)

Provide radar control trainees in the terminal option at the Radar Training Facility an emergency situation in which a VFR pilot is asking for assistance, is caught in weather, but is below the minimum vectoring altitude. (Class II, Priority Action) (A-89-113)

Advise all radar controllers and supervisors currently working in en route and terminal facilities of the importance of following procedures provided in paragraph 9-10 of handbook 7110.65, Air Traffic Control, when providing assistance in emergencies; illustrate the importance of following procedures by providing the account of the accident described in this letter (A-89-110 to

-120); and provide training on the proper handling of VFR pilots in weather difficulty below the minimum vectoring altitude or minimum IFR altitude. (Class II, Priority Action)(A-89-114)

Amend handbook 7110.65, Air Traffic Control, paragraph 9-24, "Radar Assistance to VFR Aircraft in Weather Difficulty," by changing the term "minimum safe altitude" to "safe altitude (MEA/MOCA/MVA/MIA)" so that the term does not become confused with "minimum safe altitude" (MSA) as defined in the FAA's Pilot/Controller Glossary. (Class II, Priority Action) (A-89-115)

Amend handbook 7110.65, Air Traffic Control, to require controllers to transmit the phrase "Caution, Terrain Clearance Not Provided" when issuing a vector to a VFR aircraft, or an IFR aircraft under emergency conditions, that is below the minimum vectoring altitude or minimum IFR altitude. (Class II, Priority Action)(A-89-116)

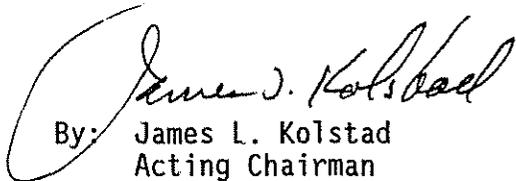
Provide direction and training to all first-line air traffic control supervisors regarding the immediate courses of action that should be taken if they observe a controller under their supervision making an error while working actual traffic that would create a dangerous situation. (Class II, Priority Action)(A-89-117)

Provide the capability of displaying the maximum elevation figure (MEF) to controllers in air route traffic control centers (ARTCC) via the radar display. (Class II, Priority Action)(A-89-118)

Provide information to all air traffic controllers detailing the actions they should expect from first-line supervisors if, in the supervisor's judgment, the controller's actions while working actual traffic have been incorrect and have created a dangerous situation. (Class II, Priority Action)(A-89-119)

Issue a General Notice (GENOT) to all controllers reminding them that a conscious effort must continually be made to identify and correct communication errors that pilots make in response to controllers' transmissions. (Class II, Priority Action)(A-89-120)

KOLSTAD, Acting Chairman, BURNETT, LAUBER, NALL, and DICKINSON, Members, concurred in these recommendations.


By: James L. Kolstad
Acting Chairman