NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C.

In the Matter of:	:	
	:	
THE INVESTIGATION OF THE U.S. AIR FLIGHT 1016, DOUGLAS DC-9-30	:	
	:	
CHARLOTTE, NORTH CAROLINA JULY 2, 1994	:	DOCKET NO. SA-509
	:	
(DCA-94-MA-065)	:	

Charlotte Marriott Executive Park Hotel
Charlotte, North Carolina

Tuesday, September 20, 1994

The above-entitled matter came on for hearing pursuant to notice, at 8:42 a.m., before:

Board of Inquiry

John Hammerschmidt, Member, NTSB
Chairman

Ronald Schleede, Chief,
Major Investigations Division, Hearing Officer

Bud Laynor, Deputy Director of
the Office of Aviation Safety

John Clark, Chief, Vehicle Performance Division,
Office of Research and Engineering

Technical Panel

Gregory Feith, Investigator-in-Charge

Renee Mills, Operations Investigator

Barry Strauch, Human Performance Investigator

Hank Hughes, Survival Factors Investigator

Jim Ritter, Aircraft Performance Engineer

Sandy Simpson, Air Traffic Control Investigator

Nora Marshall, Senior Survival Factors Investigator

Larry Roman, Airport Investigator

John DeLisi, Aircraft Systems Engineer

Jack Young, Powerplant Specialist

Greg Salottolo, National Resource Specialist, Meteorology

Staff:

Alan Pollock, Office of Public Affairs

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C O N T E N T S

P R O C E E D I N G S

(Time Noted: 8:42 a.m.)

CHAIRMAN HAMMERSCHMIDT: Let's please come to order. The National Transportation Safety Board Public Hearing is now reconvened.

We will be going to the next witness, who is Mr. James Koon. Mr. Koon, would you please come forward?

Mr. Koon will be questioned by NTSB investigators Sandy Simpson and Greg Salottolo.

(Witness testimony continued on next page.)

JAMES KOON, TOWER SUPERVISOR, CHARLOTTE CONTROL TOWER, CHARLOTTE, NORTH CAROLINA

Whereupon,

JAMES KOON,

was called as a witness by and on behalf of NTSB, and, after having been duly sworn, was examined and testified on his oath as follows:

MR. SCHLEEDE: Mr. Koon, I would ask you to please state your full name and business address for our record?

THE WITNESS: My name is James Luther Koon. My business address is 5507 Birmingham Parkway in Charlotte.

MR. SCHLEEDE: By whom are you employed?

THE WITNESS: Federal Aviation Administration.

MR. SCHLEEDE: In what position?

THE WITNESS: It's a supervisor of traffic controller at Charlotte Tower.

MR. SCHLEEDE: How long have you had that position?

THE WITNESS: Since May of last year.

MR. SCHLEEDE: Could you briefly describe your education and experience that qualifies you for your present position?

THE WITNESS: I joined the FAA in December of

1979. I graduated from the FAA Academy in April. I've worked as a journeyman controller in level 1, 2, 3, 4, and 5 Air Traffic Facilities.

MR. SCHLEEDE: How long have you been at the Charlotte Tower?

THE WITNESS: Since January of 1990.

MR. SCHLEEDE: Do you hold any other FAA ratings or certificates?

THE WITNESS: Control tower operator and facility rating for each facility I've been at.

MR. SCHLEEDE: Thank you. Ms. Simpson will continue.

MS. SIMPSON: Mr. Koon, the night of the accident, what were your duties and responsibilities?

THE WITNESS: My duties was the overall responsibility for the tower and cab operation.

MS. SIMPSON: What does that entail?

THE WITNESS: Assignment of work, like the landing operation, all the equipment in the tower.

MS. SIMPSON: Are you current and certified on all positions in the tower at Tracon?

THE WITNESS: Yes.

MS. SIMPSON: Prior to and during the accident, how would you describe the tower activities?

THE WITNESS: Normal.

MS. SIMPSON: Normal meaning what?

THE WITNESS: Normal work load, normal equipment, normal staffing.

MS. SIMPSON: Can I have you refer to Exhibit 3-E, please, which is the tower layout. Is this the current layout as the tower is right now?

THE WITNESS: No.

MS. SIMPSON: I'm only concerned about the actual control positions. Can you tell me what is different from the layouts that we have and what is actually current in the tower at this time?

THE WITNESS: The control position, the two locals and the two grounds are in the same location. The clearance delivery center aisle and console have been disassembled and reassembled in a different location. And the supervisor's location is directly opposite where it shows on this diagram by the stairwell.

MS. SIMPSON: So now it's located directly behind the local control east position?

THE WITNESS: That's correct. I believe it's marked a "T" here is where it is now.

MS. SIMPSON: Prior to the accident, where were you physically located and what were you doing?

THE WITNESS: At the supervisor's position there. I was monitoring the local control east.

MS. SIMPSON: Were you monitoring that position from the supervisor's position or from the cab coordinator position?

THE WITNESS: From the supervisor's position.

MS. SIMPSON: How do you communicate with the Tracon supervisor from that position?

THE WITNESS: A TelCon 301 Keyset, I can call those positions.

MS. SIMPSON: While you're talking to the Tracon supervisor, are you able to also monitor the local positions?

THE WITNESS: No.

MS. SIMPSON: While you're monitoring the local east position, are you also able to monitor the local west position?

THE WITNESS: It has the capability of monitoring more than one position at once.

MS. SIMPSON: The night of the accident, were you monitoring more than one position?

THE WITNESS: No.

MS. SIMPSON: Can you briefly describe the weather conditions from the time that you came on duty to the time

of the accident?

THE WITNESS: The weather conditions that night were VFR. There were some areas of precipitation that I perceived off in the distance to the southeast. And shortly before the accident, we became aware of rain on the south side of the airport. Subsequent to that, we were enveloped in precipitation.

MS. SIMPSON: Where was this precipitation developing?

THE WITNESS: It was developing from south to north or from southeast to northwest.

MS. SIMPSON: Could you see this visually out the window or is this via the radar?

THE WITNESS: I could see rain visually impacting the south side of the airport before it impacted us.

MS. SIMPSON: How would you describe the intensity of that rain?

THE WITNESS: It became heavy very quickly.

MS. SIMPSON: Were tower operations ever suspended due to the weather?

THE WITNESS: No.

MS. SIMPSON: Did you ever consider suspending operation?

THE WITNESS: No.

MS. SIMPSON: Prior to the accident, did you observe lightening or any other phenomenon you would associate with severe weather?

THE WITNESS: No.

MS. SIMPSON: The night of the accident, when did you become aware of USAir 1016?

THE WITNESS: When the local west controller advised that the USAir 1016 was on the go around.

MS. SIMPSON: What did you observe?

THE WITNESS: Pardon me?

MS. SIMPSON: What did you observe?

THE WITNESS: I didn't observe the aircraft at all.

MS. SIMPSON: Did you ever see a radar target on the bright?

THE WITNESS: No.

MS. SIMPSON: When did you know that an accident might have occurred?

THE WITNESS: After a period of a few moments when there was no radio contact established nor radar contact established. We strongly suspected that.

MS. SIMPSON: What did you do?

THE WITNESS: We activated the crash, the fire rescue circuit. We broke out two successful arrivals on

runway 18 right. I advised the arrival supervisors that we wouldn't take any more arrivals.

MS. SIMPSON: When did you resume operation? When did you start accepting arrivals again?

THE WITNESS: I was relieved from my position before the arrivals resumed.

MS. SIMPSON: Did you have any departures while you were still a supervisor after?

THE WITNESS: No.

MS. SIMPSON: As the tower supervisor, are you qualified to determine the prevailing visibility?

THE WITNESS: Yes.

MS. SIMPSON: Did you make any observations the night of the accident?

THE WITNESS: Yes.

MS. SIMPSON: What prompted you to do that?

THE WITNESS: The National Weather Service called and inquired as to our visibility. There was some discussion amongst at least some of the tower controllers, and we concluded that we had a mild visibility and forwarded that to the National Weather Service.

MS. SIMPSON: Who were these controllers that you discussed this was?

THE WITNESS: I don't specifically remember. I

know that I spoke with the ground controller, and who are the rest, I can't recall if there were others or not.

MS. SIMPSON: How about the local east position?

THE WITNESS: Was he involved in the discussion?

MS. SIMPSON: Correct.

THE WITNESS: I don't recall.

MS. SIMPSON: How about the local west position?

THE WITNESS: I don't recall that either.

MS. SIMPSON: Did you advise anyone of these observations?

THE WITNESS: I did. I announced the entire visibility was a mile in a loud voice.

MS. SIMPSON: Did you get any acknowledgement?

THE WITNESS: I don't recall a specific acknowledgement from anyone.

MS. SIMPSON: Should you have gotten an acknowledgement?

THE WITNESS: It's normal procedure that the visibility is called in such a manner. And at the time, I fully expected that everyone had heard it.

MS. SIMPSON: Did the local west controller acknowledge in any way?

THE WITNESS: Not that I recall.

MS. SIMPSON: What was the observation that you

made?

THE WITNESS: One mile.

MS. SIMPSON: Was the one mile visibility uniform in all directions?

THE WITNESS: I'm not certain. The instruction on that is a prevailing visibility over at least half the horizon is not necessarily continuous. I can't say that it was throughout the horizon.

MS. SIMPSON: Do you recall any quadrants being higher than one mile?

THE WITNESS: I couldn't recall. I don't know.

MS. SIMPSON: Do you recall if any were lower?

THE WITNESS: No, I don't think any were lower.

MS. SIMPSON: In relation to the accident, approximately when was your observation made?

THE WITNESS: A matter of a few minutes. I'm not sure exactly, but it was within a few minutes.

MS. SIMPSON: And would that be before or after the accident?

THE WITNESS: Before.

MS. SIMPSON: Your one-mile visibility was issued then to the National Weather Service?

THE WITNESS: That's correct.

MS. SIMPSON: Who did the Weather Service call?

What position in the tower?

THE WITNESS: The flight data specialist called the Weather Service.

MS. SIMPSON: Prior to the accident, what were the weather conditions? Did you see lightening?

THE WITNESS: No.

MS. SIMPSON: Was there a low ceiling?

THE WITNESS: I don't recall a low ceiling. I don't believe there was.

MS. SIMPSON: Did the winds change in direction and/or velocity?

THE WITNESS: Not until we were enveloped by this rain.

MS. SIMPSON: And approximately when was that?

THE WITNESS: Again, about the same time as the visibility observation. It came upon us very suddenly.

MS. SIMPSON: Did it have any affect on the tower operations?

THE WITNESS: Well, yes, we were making conversing instrument approaches on runway 18 right and runway 1823. In that situation, the tower assumes responsibility for the separation in giving up consecutive or some missed approaches. So as the visibility decreased, we would no longer assume that responsibility.

We're going to coordinate with the arrival room radar supervisor to discontinue conversion approaches and begin making staggered or simultaneous approaches on runway 18 right and runway 18 left, which is a fair amount of coordination. It's a large work load on their part, and that's where my attention was at at the time.

MS. SIMPSON: Was the tower -- how would you describe the tower work load at the time of the accident?

THE WITNESS: Light to perhaps becoming moderate.

MS. SIMPSON: About how many aircraft was the tower responsible?

THE WITNESS: Between all positions of operation, maybe eight or ten.

MS. SIMPSON: And all positions, meaning all control positions and all positions including flight data clearance delivery?

THE WITNESS: All control positions.

MS. SIMPSON: Did the one mile visibility affect your ability to observe arrivals on runway 18 right?

THE WITNESS: Yes.

MS. SIMPSON: How far could you see for runway 18 right?

THE WITNESS: I don't recall a specific value as far as how far I could see in that direction.

MS. SIMPSON: Could you see the approach end?

THE WITNESS: I believe so.

MS. SIMPSON: In your professional opinion, did the presence of the rain and the visibility warrant that operations be suspended?

THE WITNESS: No.

MS. SIMPSON: Do you have the authority to temporarily suspend operation?

THE WITNESS: No.

MS. SIMPSON: Who has that responsibility or that authority?

THE WITNESS: Our responsibility is such a situation is to forward the weather information to the aircraft. It's up to them to execute an approach or not.

MS. SIMPSON: So you provide pilots with all available information and let them determine it. Is that correct?

THE WITNESS: We normally do that.

MS. SIMPSON: At the time of the missed approached, would you say that the one-mile visibility was still valid?

THE WITNESS: Yes.

MS. SIMPSON: Did you ask that the backup power generator be turned on?

THE WITNESS: I, myself, turned on the ASR-9 engine generator.

MS. SIMPSON: When did you do that?

THE WITNESS: Again, some minutes prior to the accident when the rain began to impact the airport.

MS. SIMPSON: And you stated during one of our conversations, that you swiped the lights in or about the same time that the generator was turned on. What do you mean by the term "swiped the lights?"

THE WITNESS: I don't particularly remember using that term, but it's a fair description of after I turned on the ASR-9 generator. The lights are a series of toggle switches on the line control panel, and that is a fair description of the motion that I made turning them all on.

MS. SIMPSON: What lights would those -- what did you turn on?

THE WITNESS: The center aisle lights, edge lights, tagsway lights, touch down zone lighting, the approach lights.

MS. SIMPSON: What intensity were these turned on to?

THE WITNESS: I cannot recall the intensity settings that I made.

MS. SIMPSON: Did you refer to the 7110.65 at all

when you turned on these lights?

THE WITNESS: We have underneath the flexoglas that console that the paragraphs and the lighting charts from 7110 right below the light panels. Again, I don't recall whether or not I particularly looked at particular settings for that visibility or not.

MS. SIMPSON: With the prevailing visibility being one mile, what intensity should the lights have been set on, the runway lights?

THE WITNESS: I'm not able to quote that step for you from here. Again, I have the handy reference at the lighting control tower.

MS. SIMPSON: If you would refer to the daily record of facility operation, Exhibit 3-F. It's only there for you to refresh your memory if you need to.

To the best of your knowledge the night of the accident, was the RVR for runway 18 right operational?

THE WITNESS: My normal sequence of events in this situation would be to turn on the SR-9 generator, turn on the lights, and turn on the RVR. I don't recall specifically whether or not I turned on the RVR.

MS. SIMPSON: Was the RVR operational the night of the accident?

THE WITNESS: To my knowledge, it was operational.

MS. SIMPSON: What is your policy as the tower supervisor or the requirements of the FAA to issue RVR information?

THE WITNESS: Whenever the prevailing visibility is one mile or less or whenever there is reportable value.

MS. SIMPSON: Do you insure that your controllers do this?

THE WITNESS: From a normal monitoring and observing positions of operations, yes, I would.

MS. SIMPSON: As the tower supervisor, would you expect your controllers to be able to turn on their own equipment and operate it in the manner in which is required by the FAA and the 7110.65?

THE WITNESS: I would normally expect them to be able to fulfill that function, whatever the conditions dictate.

MS. SIMPSON: In your opinion, what does general supervision mean?

THE WITNESS: Well, I think it seems to be pretty self-explanatory. It's monitoring. It's observing. It's scanning.

MS. SIMPSON: On the night of the accident after you determined the prevailing visibility as one mile, to the best of your knowledge was the flight crew of USAir 1016

issued the RVR for runway 18 right?

THE WITNESS: I don't know.

MS. SIMPSON: I'm sorry?

THE WITNESS: I don't know.

MS. SIMPSON: You stated that at the time of the accident, you were monitoring a local east position. Is that correct?

THE WITNESS: Yes.

MS. SIMPSON: During that time, was the RVR issued to any flight crews?

THE WITNESS: I don't recall.

MS. SIMPSON: Did you make any attempt to insure that the local east was issuing the RVR after the prevailing visibility was one mile?

THE WITNESS: I don't recall any such action.

MS. SIMPSON: Is there any reference in the 7110.65 when to turn on the RVR?

THE WITNESS: Not that I'm aware of.

MS. SIMPSON: Is there any reference in the Facility Operation Administrative Handbook that you are aware of that specifies when to turn on the RVR?

THE WITNESS: Not that I'm aware of.

MS. SIMPSON: Are there any local directives?

THE WITNESS: Not that I'm aware of.

MS. SIMPSON: To the best of your knowledge, is there any FAA or facility document that covers this issue?

THE WITNESS: Again, not that I'm aware of.

MS. SIMPSON: And just a few questions regarding the training ASR-9. When did you arrive again at the Charlotte Airport?

THE WITNESS: In January of 1990.

MS. SIMPSON: Was ASR-9 in operation at that time?

THE WITNESS: No.

MS. SIMPSON: What radar system was in use?

THE WITNESS: SR-4.

MS. SIMPSON: And previously to arriving at Charlotte, had you ever worked with the ASR-9 before?

THE WITNESS: No.

MS. SIMPSON: What training were you given regarding the ASR-9?

THE WITNESS: I was given in I believe it was March of 1990, a combination of classroom and hands-on training on that ASR-9 equipment and presentation.

MS. SIMPSON: Was that at the facility or back at Oklahoma City?

THE WITNESS: In the facility.

MS. SIMPSON: And approximately how many hours would you say that you were trained?

THE WITNESS: In the classroom, I believe, was two hours. And the hands-on, I don't recall how much it was.

MS. SIMPSON: Have you ever been told that the ASR-9 has a limitation regarding the presentation of the depiction of weather data?

THE WITNESS: I don't recall any such instruction.

MS. SIMPSON: Is the training controllers receive any different from the training supervisors receive?

THE WITNESS: Not on this type of matter, it wouldn't be.

MS. SIMPSON: How do you determine what level the precipitation are being depicted on the radar display?

THE WITNESS: Well, they are set to the guidance -- they are set to controller preference and as the presence of weather dictates.

MS. SIMPSON: What level of precipitation is issued to pilots?

THE WITNESS: I don't believe I understand the question.

MS. SIMPSON: When you receive levels 1, 2, 3, or 6, is that issued to pilots in any way at any time or is that a discretion of the controller?

THE WITNESS: The controller may issue weather advisors in terms of levels he receives on the ASR-9.

MS. SIMPSON: Is there any requirement to do so?

THE WITNESS: No, I don't believe so.

MS. SIMPSON: What about weather information that is received verbally from pilots or from personal observations, how is that disseminated?

THE WITNESS: Through a series -- any one of by word of mouth, by our information display system, by forwarding on to flight service station for dissemination of HIWAS, and on ATIS if it's so appropriate.

MS. SIMPSON: Personal observations that the control tower may make, is that given directly to flight crews?

THE WITNESS: Again, it may be depending on what that information was.

MS. SIMPSON: And what type of information would warrant that?

THE WITNESS: I don't know if I could give you a particular example. It would depend on the situation at the time and the professional judgment of the people involved.

MS. SIMPSON: How about extreme heavy rain, would you issue that to pilots?

THE WITNESS: I would normally say heavy rain issue to pilots depending again on the work load of the controller, his awareness of the information at the time and

other varying.

MS. SIMPSON: How about lightening?

THE WITNESS: I would expect again the same way, that would be the issue depending on his work load.

MS. SIMPSON: How about a prevailing visibility of one mile?

THE WITNESS: The same thing.

MS. SIMPSON: How about thunderstorms?

THE WITNESS: Again, the answer is the same.

MS. SIMPSON: Which is?

THE WITNESS: I would expect him to pass that information if he was so aware.

MS. SIMPSON: And do you as a supervisor give performance evaluations to controllers?

THE WITNESS: We don't give over-the-shoulder evaluations on a scheduled basis. We give one if performance dictates.

MS. SIMPSON: Have you ever advised anyone that they failed to issue weather information to pilots?

THE WITNESS: I have insured that controllers give weather information.

MS. SIMPSON: How do you do that?

THE WITNESS: I listen to see if they pass information along.

MS. SIMPSON: Have you ever monitored a controller when you saw lightening or heard thunder or saw a thunderstorm or the prevailing visibility drop below IFR?

THE WITNESS: I don't recall any such scenario.

MS. SIMPSON: Has anyone ever advised you that you failed to issue that information to pilots?

THE WITNESS: I don't recall that either.

MS. SIMPSON: Do you receive sigmets, convective sigmets in center weather advisories in the tower?

THE WITNESS: Yes.

MS. SIMPSON: And what do you do with this information?

THE WITNESS: We have a form that we attach the sigmet to. It gives a fuselage to read with the appropriate sigmet described and initials for each controller who issues that to initial.

MS. SIMPSON: Have there been broadcasters placed on the ATIS?

THE WITNESS: That's correct.

MS. SIMPSON: Do you receive verbal issuances regarding thunderstorms activity from the Atlanta CWSU Meteorologist?

THE WITNESS: We get a weather briefing from the center meteorologist.

MS. SIMPSON: What do you do with this information?

THE WITNESS: That's mostly used for planning our activities or planning air traffic for the day and what to expect and anticipate.

MS. SIMPSON: Did you get one the night of the accident?

THE WITNESS: I don't recall.

MS. SIMPSON: Is there any requirement to broadcast verbal information on ATIS?

THE WITNESS: Again, the answer is what we put on the ATIS is what is deemed appropriate or what is by directive that we put on the ATIS.

MS. SIMPSON: I have no further questions.

CHAIRMAN HAMMERSCHMIDT: Thank you, Ms. Simpson. Mr. Salottolo.

MR. SALOTTOLO: Yes, Mr. Koon. First of all, how do you obtain weather information from the National Weather Service?

THE WITNESS: Via AWIS, which is like an auto rider.

MR. SALOTTOLO: Were you aware of the 1836 National Weather Service observation of a thunderstorm?

THE WITNESS: I don't recall that particular

weather observation.

MR. SALOTTOLO: Are you normally aware of the current weather conditions?

THE WITNESS: Yes. Normally, the flight data specialist broadcast an AWIS on the weather he receives and the supervisor somewhat monitors the AWIS for contacts and clearings and so forth.

MR. SALOTTOLO: If you receive a report from the meteorologist at the Atlanta center regarding thunderstorms over the Charlotte Airport, what actions do you take based on that?

THE WITNESS: We would forward that information through on the ATIS. We would forward it to pilots.

MR. SALOTTOLO: Now is this a requirement in the handbook that this be done?

THE WITNESS: I believe it is.

MR. SALOTTOLO: So it receives the same dissemination as the center weather advisory as far as you're concerned?

THE WITNESS: Yes.

MR. SALOTTOLO: Thank you. No further questions.

CHAIRMAN HAMMERSCHMIDT: Thank you. Let's see, going to the parties, the National Air Traffic Controllers Association.

MR. PARHAM: Thank you, Mr. Chairman.

Mr. Koon, as a supervisor, how many hours a month do you actually work via traffic?

THE WITNESS: I'm required to work at least eight hours in the radar room and eight hours in the tower cab.

MR. PARHAM: Do you always work all positions some time during the month?

THE WITNESS: Yes.

MR. PARHAM: At the night of the accident, was the CIC position combined with the area supervisor's position?

THE WITNESS: The CC -- the cab coordinator was combined with the area supervisor.

MR. PARHAM: CIC. Was the CIC position --

THE WITNESS: I don't believe we have a CIC. We have a CC, cab coordinator, and that was combined to the supervisor.

MR. PARHAM: Who has the responsibility in the tower for making sure that all required equipment is on and working?

THE WITNESS: The tower supervisor.

MR. PARHAM: If the local west controller was not aware that the prevailing visibility had dropped from six miles to one mile, would you expect him to have turned the

RVR on or broadcast an RVR to the arriving aircraft?

THE WITNESS: All the controllers in the tower are certified and qualified as visibility observers. I wouldn't necessarily expect him to turn it on. However, any equipment if he was aware that needed to be turned on, I would expect he would turn it on if he hadn't already done it.

MR. PARHAM: Would he be required to have turned it on or broadcast it to the controllers if the visibility was six miles?

THE WITNESS: Yes.

MR. PARHAM: Were you familiar with the terminal forecast for the shift that night?

THE WITNESS: I don't recall that particularly.

MR. PARHAM: You don't remember what the terminal forecast was at that time. Do any of the -- I'm trying to clarify what you said about the withholding clearance to a landing aircraft due to weather. Do any of the control tower personnel have the authority to withhold landing clearance or take-off clearance due to weather?

THE WITNESS: No.

MR. PARHAM: You stated that you received at the beginning of the shift a briefing from the Atlanta Center National Weather Service forecast. Is that true?

THE WITNESS: No, I don't believe I did say. I said, normally there is a forecast by the center weather unit. I don't recall particularly receiving one that evening.

MR. PARHAM: If you had received one, what are you required to do with that?

THE WITNESS: Well, we plan our operations accordingly by the weather information that we receive.

MR. PARHAM: Are you required to pass that information on to the control tower personnel?

THE WITNESS: Again, only to the extent that it will impact the operations that he can expect.

MR. PARHAM: Are you required to pass that information on to the Tracon's supervisor?

THE WITNESS: Normally, the Tracon supervisor is already aware of that information.

MR. PARHAM: As the supervisor and a previous controller, are you familiar with the CIC duties and responsibilities and familiar with Charlotte Order 7210.4 dated November 11, 1993? Correction, 7220.4.

THE WITNESS: I know that order. I don't know exactly what paragraph you're referencing.

MR. PARHAM: Are you familiar with the requirements in this order that each controller be advised

of the visibility individually and specifically. That a statement of a blanket clearance is not acceptable?

THE WITNESS: Yes.

MR. PARHAM: I have no further questions. Thank you.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Parham. Honeywell?

MR. THOMAS: I have no questions. Thank you.

CHAIRMAN HAMMERSCHMIDT: Thank you. Airline Pilots Association.

MR. TULLY: I just have a few questions.

Good morning, Mr. Koon. At what point did you become aware that there was a thunderstorm over the field?

THE WITNESS: I didn't have a perception of the thunderstorm as much as I had a perception of rain.

MR. TULLY: You stated earlier that you did not see any lightening. Is that correct?

THE WITNESS: That's correct.

MR. TULLY: Were you aware that lightening was striking in the vicinity of the airport?

THE WITNESS: I heard, I believe, the local east controller say he had observed lightening. My perception was that lightening was saw in the southeast in the distance to some degree.

MR. TULLY: Do you recall having a conversation with the USAir Radar Control with regard to lightening?

THE WITNESS: Yes, I do.

MR. TULLY: And what did you tell U.S. Radar Control about the lightening?

THE WITNESS: U.S. Radar Control will commonly call repeatedly whenever there is any precipitation impacting the airport, and they particularly want to know about lightening. They need to -- as I understand, they have a requirement to clear the ramp of personnel whenever there is lightening locally.

So in an effort to give them a conservative answer and also in an effort to basically have them leave me alone, I answered that there was lightening nearby so they wouldn't keep calling because of our work load.

MR. TULLY: Do you have Exhibit 3-B, page 30?

THE WITNESS: Yes.

MR. TULLY: Pilot 22, 40 and 45, you're having a conversation with the arrival wall coordinator. Is that correct?

THE WITNESS: Yes.

MR. TULLY: What does the arrival wall coordinator say at 22, 40 and 45?

THE WITNESS: He says, "Any lightening?"

MR. TULLY: And what's your answer?

THE WITNESS: I said, yeah, I haven't seen any. Both guys working locals say they are seeing in an unintelligible remark, and I said, I have the engine generators on.

MR. TULLY: The reference to putting the engine generators on was that in part due to the fact that lightening was observed?

THE WITNESS: It was due because of the deteriorating weather situation of the airport.

MR. TULLY: Well, my point is, would heavy rain knock out the electricity or would it be lightening that would knock out the electricity?

THE WITNESS: Again, in part in heavy rain. I did hear the local east controller say there was lightening at southeast.

MR. TULLY: You make a reference to both guys working local, indicating seeing something unintelligible. I presume it's the reference to lightening. When you mention both locals have seen lightening, to whom are you referring?

THE WITNESS: All I particularly remember was local east.

MR. TULLY: You are a certified weather observer;

is that correct?

THE WITNESS: And visibility observer.

MR. TULLY: Visibility observer. Okay. Just a couple of questions about the ATIS, the ATIS-Zulu in particular. I asked Mr. -- I believe it was Vincent yesterday about the weather tower personnel have any knowledge of inbound aircraft with reference to what ATIS they might have. Do you have fly scripts in the tower?

THE WITNESS: Departure strips.

MR. TULLY: Departure strips. My concern is that how would you know to say broadcast an ATIS to an airplane that was inbound to the airport, an ATIS which was generated due to a special weather observation? If USAir 1016 had information Yankee and now he is on the local west control frequency inbound for the airport, how would USAir 1016 be alert to the fact that the ATIS had changed? How would he know that?

THE WITNESS: Normal procedures when a new ATIS is broadcast, controllers make a blanket broadcast that information or whatever is current.

MR. TULLY: Do you know if that occurred with reference to ATIS-Zulu on the night of the accident?

THE WITNESS: I don't recall particularly with Zulu whether it was or not.

MR. TULLY: But you would at least testify that it would be a requirement for controllers to broadcast on all frequencies that the ATIS had changed to Zulu. Is that correct?

THE WITNESS: That was the normal procedure.

MR. TULLY: When you announced -- you make a reference to announcing in a community voice visibility one mile. Do you recall saying that?

THE WITNESS: Yes.

MR. TULLY: What is that reference? Do you shout that out so that all of the tower positions know that visibility is one mile?

THE WITNESS: I say that with that intent. It was my belief at the time that everyone heard it.

MR. TULLY: So you were at least operating on the impression that the local west controller knew the visibility was one mile.

THE WITNESS: At that time, yes.

MR. TULLY: That was your impression?

THE WITNESS: Yes.

MR. TULLY: I have no other questions.

CHAIRMAN HAMMERSCHMIDT: Just to follow up on that last question, again, you may have already addressed this. But when you say tower vis is one mile, are there any

established procedures for an acknowledgement from the controllers working traffic to acknowledge that they heard your remark?

THE WITNESS: No, I don't believe so.

CHAIRMAN HAMMERSCHMIDT: USAir?

MR. SHARP: Mr. Koon, could you give us your recollection of a development of the weather just prior to the accident, just within a couple of minutes before that?

THE WITNESS: There wasn't a lot of development that we perceived at all, except that we were going from good weather to heavy rain in a very short period.

MR. SHARP: Could you define how short a period that might be?

THE WITNESS: A matter of a few minutes.

MR. SHARP: We have nothing further, Mr. Chairman.

CHAIRMAN HAMMERSCHMIDT: Thank you. Douglas Aircraft Company.

MR. LUND: No questions. Thank you, Mr. Chairman.

CHAIRMAN HAMMERSCHMIDT: Pratt & Whitney.

MR. YOUNG: No questions. Thank you.

CHAIRMAN HAMMERSCHMIDT: Association of Flight Attendants.

MS. GILMER: No questions. Thank you.

CHAIRMAN HAMMERSCHMIDT: International Association

of Machinists.

MR. GOGLIA: No questions.

CHAIRMAN HAMMERSCHMIDT: Dispatchers Union.

MR. SCHUETZ: No questions, Mr. Chairman.

CHAIRMAN HAMMERSCHMIDT: Thank you. National Weather Service.

MR. KUESSNER: No questions.

CHAIRMAN HAMMERSCHMIDT: Thank you. Federal Aviation Administration.

MR. DONNER: Just one, sir.

MR. DONNER: Mr. Koon, do you believe that the pilots of flight 1016 were aware of the weather conditions?

THE WITNESS: I believe they were, yes.

MR. DONNER: What do you base that on?

THE WITNESS: They've been told by the final radar controller they had been changed from a visual approach to an ILS approach because of rain on the airport or in the vicinity of the airport. They had been advised by the local west controller of the windshear conditions.

MR. DONNER: Thank you. No further questions.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Donner. Let's see, any more questions from the technical panel? Mr. Feith.

MR. FEITH: Just a few questions, sir.

When you determined the visibility was one mile, was that again before or just at the time of the accident?

THE WITNESS: Some minutes before.

MR. FEITH: Where were you in the tower cab as far as your relationship between the two local controllers? Where were you standing or sitting at that time?

THE WITNESS: I was toward the rear of the tower, somewhat centrally located, again connected to the supervisory console by my headsets.

MR. FEITH: Were you in close proximity to those two local controllers?

THE WITNESS: Not close, no.

MR. FEITH: What would you describe the work load at the time of the accident?

THE WITNESS: Light to perhaps becoming moderate.

MR. FEITH: Is it noisy in the tower cab?

THE WITNESS: Not particularly.

MR. FEITH: So when you made this community announcement about the visibility being one mile, is it a good assumption that you just assumed that everybody got that information?

THE WITNESS: That was my belief at the time.

MR. FEITH: Considering that fact, would you have expected the local positions to then turn on the RVR?

THE WITNESS: I wouldn't necessarily expect them to turn it on, except in the context that if there are equipment or anything that needed to be done that had not been done, they would normally do it.

MR. FEITH: Mr. Ayers stated in earlier testimony that a meteorological impact study was issued for Charlotte on the day of the accident. Were you aware of this report?

THE WITNESS: I don't recall that particularly.

MR. FEITH: If it was issued, how would you have received that information?

THE WITNESS: There is different ways. Sometimes there's a conference call between the radar room supervisors and the Center Weather Service. Sometimes it's forwarded by the area manager into Tracon.

MR. FEITH: Were you aware of that report after the accident?

THE WITNESS: No.

MR. FEITH: Were you ever aware of it up until today?

THE WITNESS: No.

MR. FEITH: Is there any historical problems with the LLWAS system at Charlotte?

THE WITNESS: None that I'm particularly or personally aware of. I know that there are reports of some

problems with it.

MR. FEITH: Do you know of any problems on the day of the accident?

THE WITNESS: No, none.

MR. FEITH: How about any conditions regarding the LLWAS system and its operation, i.e., being that the sensors, boundary sensors being sheltered because of their location?

THE WITNESS: There's nothing that I'm aware of in that regard.

MR. FEITH: Are you aware of it today based on information determined during the course of the investigation?

THE WITNESS: To some degree, from what I've read in the paper.

MR. FEITH: Do you have any sense of how frequently LLWAS alerts are given to pilots?

THE WITNESS: They are normally given when they are on.

MR. FEITH: Is the frequency high, medium, low? I mean, do you get a lot of LLWAS alerts here at Charlotte?

THE WITNESS: I don't know if I can give you a quantity of answers. If conditions are such that there are windshear alerts being generated, then they are certainly --

MR. FEITH: Are you aware of any unsafe condition reports filed on the LLWAS system?

THE WITNESS: Again, I'm not personally aware of them. I think there probably have been some.

MR. FEITH: No further questions, Mr. Chairman.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Feith. Mr. Laynor.

MR. LAYNOR: No questions.

CHAIRMAN HAMMERSCHMIDT: Mr. Clark.

MR. CLARK: Mr. Koon, I think you stated earlier that the heavy rain started or developed very quickly. Were you aware that the local controller east was reporting heavy rain about four minutes before the accident?

THE WITNESS: I don't recall that particularly, no.

MR. CLARK: If he were reporting heavy rain from his observation, should that have been related to you?

THE WITNESS: Well, in the sense that we're all in the same tower and all looking at the same conditions outside the window, he may or may not feel that need.

MR. CLARK: Then from your observations, your judgment, then there was no heavy rain four minutes prior to the accident?

THE WITNESS: I'm not sure if I could say that it

was that time frame. The rain, again, came upon us very suddenly. We had all of a sudden a higher work load in the tower. I don't know exactly in terms of minutes before the accident when it impacted us.

MR. CLARK: But you had no conversations with local controller east about the rain being heavy or developing?

THE WITNESS: No.

MR. CLARK: Then about 30 or 40 seconds later, the local -- let me refer to Exhibit 3-B, page 64. Do you have that page?

THE WITNESS: Yes, I do.

MR. CLARK: The second transcript down, they have "3733 local controller again reported Piedmont 3211 that heavy rain was on the airport." If he is reporting heavy rain on the airport, would it be normal to relay that information to you or to a local controller west?

THE WITNESS: Well, like I said earlier, if we're all looking at the same weather, all of us in the tower together, I don't think he would particularly turn to the person next to him and say, "It's raining heavy."

MR. CLARK: It would be intuitive to him that whatever situation was out there, everybody would be aware of it?

THE WITNESS: Yes.

MR. CLARK: And in a long developing situation, in a four to five minute time frame that certainly everybody in the tower cab or the controller would be aware of that situation?

THE WITNESS: Yes, that would be my feeling.

MR. CLARK: And then each one of you may make your own assessment of whether it was heavy or moderate or light?

THE WITNESS: To some degree, yes.

MR. CLARK: Were you aware from the local controller west position that two aircraft were holding for the storm?

THE WITNESS: In this course of events, I'm aware of that now. I'm not sure if I knew it at the time or where I've learned that since. I'm not sure exactly.

MR. CLARK: You're not sure if you were aware of that developing situation at that time?

THE WITNESS: No.

MR. CLARK: Would that be a normal situation in which a local controller would report to you that he had aircraft holding for a storm?

THE WITNESS: Not necessarily.

MR. CLARK: That's just in the normal flow of business?

THE WITNESS: Yes.

MR. CLARK: When the rain intensified to the north, I think you testified earlier you're not sure if you remember how far you could observe. I think you testified that you could see the end of the runway.

THE WITNESS: As I recall, I believe I could.

MR. CLARK: Could you see the two aircraft holding at the end of the runway at the same time?

THE WITNESS: I think I remember seeing aircraft down there.

MR. CLARK: I have no further questions.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Clark. Mr. Schleede.

MR. SCHLEEDE: Yes, sir. In follow up to one of the questions Mr. Clark asked, did you say that they work load of the time of this accident was high in the tower?

THE WITNESS: No.

MR. SCHLEEDE: Oh, I thought --

THE WITNESS: I said light, but perhaps becoming moderate.

MR. SCHLEEDE: Could you just summarize briefly for us what the responsibilities of the tower are for dissemination of weather to pilots, such as Charlotte Tower?

THE WITNESS: Again, we are responsible for

forwarding any pertinent information on the airport condition, being weather or any other number of things we would forward to the pilots.

MR. SCHLEEDE: This may be redundant to some of the earlier questions, but I need to understand this. Would you consider visibility going from six miles to one mile pertinent?

THE WITNESS: Yes.

MR. SCHLEEDE: How about a level 3 showing up on the ASR-9 on the final approach? Would that be something that would be pertinent to pass to the pilots?

THE WITNESS: As far as description of the levels, I'm not sure. Precipitation would generally be done. As far as levels, that may or may not be done.

MR. SCHLEEDE: May or may not be. Is that discretionary?

THE WITNESS: Discretionary to some degree, considering the work load and the size of the weather. Probably too many things to just sit here and tell you.

MR. SCHLEEDE: Well, I'm not a controller and don't have any experience in it. So help me along here. The transcript reveals that the approach controller told USAir on the 1016 -- and I'm paraphrasing -- may get some rain just south of the field. There might be a little bit

coming off north. Just expect ILS now, amend your altitude, blah, blah, blah.

His testimony was that that was in response to a, I believe -- I may be wrong -- the VIP-3 popping up when the airplane was on downwind. Do you recall that?

THE WITNESS: No, I don't.

MR. SCHLEEDE: Do you recall him testifying to that?

THE WITNESS: No.

MR. SCHLEEDE: If he had seen a VIP-3 at that point, would this be the proper phraseology to use to relay the rain information to the pilot?

THE WITNESS: To my knowledge, it is not a requirement that we describe weather in terms of the levels. The controller may use the levels, but I don't think it's a requirement.

MR. SCHLEEDE: As a supervisor, what do you expect the controllers to do when he sees a level 3 or level 4 on his ASR-9 in the path of the airplane? Do you expect him to describe that with the level or just describe it in a general sense?

THE WITNESS: I would expect him to use his professional judgment and describe it in a way that it can be best used by the pilot.

MR. SCHLEEDE: But I'm asking, what would you expect him to say as a supervisor? What would you expect his phraseology to be to pass that information to the pilot?

THE WITNESS: Again, I would simply expect him to describe it in the best manner that he could. I wouldn't say that precisely he would have to use the levels or not.

MR. SCHLEEDE: Do you know what a level 3 pertains to as far as intensity of rain?

THE WITNESS: I know that the levels correspond to the National Weather Service levels.

MR. SCHLEEDE: And what would that be for level 3?

THE WITNESS: I couldn't quote it to you. The only thing the controllers -- the only thing that ASR-9 would measure is precipitation. It won't measure -- it won't give or term any other phenomenon. I couldn't quote you of what it corresponds to.

MR. SCHLEEDE: So you're not aware of what the rain and precipitation level would be of a level 3 on an ASR-9?

THE WITNESS: None. Not to my immediate knowledge, no.

MR. SCHLEEDE: Are you trained to operate the ASR-9 radar as a controller?

THE WITNESS: Yes.

MR. SCHLEEDE: Have there been any changes implemented in the procedures or policies at Charlotte Towers since the accident?

THE WITNESS: None that I'm aware.

MR. SCHLEEDE: Do you believe that the dissemination of weather by Charlotte Tower to Flight 1016 -- USAir 1016 was in accordance with established procedures?

THE WITNESS: I believe the air crew had the information of the weather of the airport.

MR. SCHLEEDE: My question is do you believe that the dissemination of weather by the approach control and the local controller were in accordance with established procedures for the tower?

THE WITNESS: I can't speak to what the approach controller was doing. The tower controller, to the extent that he had the knowledge, was doing his job. If he didn't know the visibility was one mile, I can't address that far.

MR. SCHLEEDE: Well, regarding that issue, you said, I believe, that you expected or assumed that they had heard your announcement of it being one mile. Have there been any changes in procedures since then to verify that your announcement of one mile or announcement of a visibility is, in fact, received by the appropriate people?

THE WITNESS: I don't believe there has been any

change in published procedures, no.

MR. SCHLEEDE: Do you think there should be some changes in the procedures to insure that the local controller gets the weather information or the visibility information?

THE WITNESS: That would be something that could be -- that I would be agreeable to be addressed. I don't know if I would say conclusively now that it would or would not.

MR. SCHLEEDE: Have you changed your personal procedures to verify that when you pass on restrictions of visibility that they are, in fact, received?

THE WITNESS: I may be more aware of that issue, yes.

MR. SCHLEEDE: Have you changed your procedures in your current operations?

THE WITNESS: I don't know if I've changed. I've made myself more aware.

MR. SCHLEEDE: I'm not sure I understand what you mean, "more aware?"

THE WITNESS: More aware of acknowledgement of any information that I pass to the controllers.

MR. SCHLEEDE: To your knowledge, has there been any critique of the Charlotte Tower operation as a result of

the accident by either regional or headquarter's quality assurance group?

THE WITNESS: Not that I'm aware of.

MR. SCHLEEDE: You're not aware of any visits by any special teams to evaluate procedures and policies since the accident?

THE WITNESS: Again, not that I'm aware of.

MR. SCHLEEDE: Thank you. I have no further questions.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Schleede. Just a very brief question, Mr. Koon. What is the distance from the control tower to the threshold of runway 18 right? What is that distance?

THE WITNESS: I'm not sure. I couldn't quote you that distance from here.

CHAIRMAN HAMMERSCHMIDT: Could you give me an approximate distance?

THE WITNESS: It's probably three quarters of a mile, half mile to three quarters of a mile.

CHAIRMAN HAMMERSCHMIDT: Very good. Any other questions?

(No response.)

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. James Koon, for your cooperation with us. You may step down.

(Witness excused.)

CHAIRMAN HAMMERSCHMIDT: I believe what we will do now is take about a ten minute break before proceeding with the next witness, who is Captain Michael Greenlee. So we'll break for about ten minutes.

(Whereupon, a brief recess was taken.)

CHAIRMAN HAMMERSCHMIDT: Please come to order. The next witness is Captain Michael Greenlee. Captain Greenlee, would you please take the witness stand. Captain Greenlee will be questioned by Ms. Renee Mills and Dr. Barry Strauch.

(Witness testimony continues on next page.)

CAPTAIN MICHAEL GREENLEE, CAPTAIN - FLIGHT 1016,
USAir, INC., PITTSBURGH, PENNSYLVANIA

Whereupon,

MICHAEL GREENLEE,

was called as a witness by and on behalf of NTSB, and, after having been duly sworn, was examined and testified on his oath as follows:

MR. SCHLEEDE: Captain Greenlee, could we have your full name and business address for our record?

THE WITNESS: Yes. Michael Reese Greenlee. Business address is USAir.

MR. SCHLEEDE: What position do you hold with USAir?

THE WITNESS: I'm a captain on the DC-9.

MR. SCHLEEDE: How long have you held that position as captain on the DC-9?

THE WITNESS: Approximately four years.

MR. SCHLEEDE: Could you briefly describe your

education and training experience that qualifies you for your present position?

THE WITNESS: I've been flying for quite a few years. I started flying at a very young age. My father was a pilot. I soloed on my 16th birthday and continued to fly through high school. Went to college at Case Western Reserve University and studied electrical engineering for two years. I continued to fly. After two years, I transferred to Embry-Riddle Aeronautical University in Daytona Beach, where I received my commercial in instrument and multi-engine ratings.

At the same time I was going to school at Embry-Riddle, I began to work for a gentleman down there as a flight instructor at Ormond Beach. I received my certified flight instructor, my instrument instructor and my multi-engine instructor from him.

I flew approximately 700 hours at that point in Piper Aztec giving primarily advanced instructions to instrument students, small engine students and a couple of airline transport students.

At the same time I was in Florida, I worked part time down in Miami for a DC-6 operator. I flew as the first officer down there for a couple of years. In 1979, in late '79, early '80, I believe, I went back up to Ohio, got a job

as a single pilot, IFR charter pilot, primarily flying night freight near Columbus, Ohio. I was also the chief flight instructor for the same company and the director of their charter marketing. That was near London, Ohio.

Shortly after that, I went to work for a company called "Ohio Aviation," which is a beach craft dealership in Dayton, Ohio. A similar job as a charter captain, single pilot IFR once again, but primarily we operated two pilots at that time in a corporate type of charter. I was also in charge of their charter marketing and sales.

In 1981, I joined the Air Force Reserves, the 906 Tactical Fighter Group at Wright Patterson, Dayton, Ohio. Went to pilot training in 1982 in Columbus, Mississippi. I was there for a year. I was a distinguished graduate. I believe second or third out of a class that started out as 68 people and we graduated 42.

Went back to my squadron and spent some time in the back seat of F-4 while I was awaiting assignment. Went to Fighter Lead-in School for ten weeks, which is basic gunnery and basic air to air. Then I spent six months learning how to fly the McDonald Douglas F-4-D. Got back from that and flew regular at the squadron every day until I was hired at USAir in 1985.

Started USAir as a first officer on the 737-3 and

200 aircraft. Stayed there until they split the fleet. They operated the airplanes on a separate bid at one point, and I went to the 737-200. In 1989, I took about a four month break and went to F-16 school for my squadron. Got checked out in the F-16-A block 10 model.

Came back in January and checked out as a captain on the DC-9, and have been a captain since then, except for about a six or seven month period when I was in the right seat of the DC-9 due to downsizing.

MR. SCHLEEDE: I believe you mentioned some of your FAA ratings. Could you give us your FAA ratings?

THE WITNESS: I've got an airlines transport pilot rating. And the prior FAA ratings, I went through private commercial instrument, multi-engine CFI, II, multi-I.

MR. SCHLEEDE: Approximately how much total flying time do you have?

THE WITNESS: Between 9,000 and 9,100 hours.

MR. SCHLEEDE: And about how much total would you have in the DC-9?

THE WITNESS: Approximately 2,000 hours, I believe.

MR. SCHLEEDE: How much of that would be as captain?

THE WITNESS: Oh, probably 1,500, 1,600 hours.

MR. SCHLEEDE: Thank you very much, Captain Greenlee. Ms. Mills will continue the questioning.

MS. MILLS: Good morning, Captain Greenlee.

THE WITNESS: Good morning.

MS. MILLS: Thank you for sharing that with us. I would now like to shift your attention to the day of the accident. You'd been flying earlier in the day and picked the aircraft up in Charlotte.

THE WITNESS: That's correct.

MS. MILLS: Did that aircraft have airborne windshear warning?

THE WITNESS: I'm sorry, ma'am? I didn't hear you.

MS. MILLS: Did that aircraft have airborne windshear warning?

THE WITNESS: Yes, ma'am.

MS. MILLS: When you picked up the aircraft in Charlotte, did you perform a ground test of the windshear warning?

THE WITNESS: Yes, I did. When you pick an airplane up in the middle of the day like that, you do what's called an intermediate acceptance check. Basically, check the major things in the cockpit. And the windshear alert system is one of the test items.

MS. MILLS: Would you describe that test for us, please?

THE WITNESS: Sure. The warning consists of two lights and an oral warning, an amber warning or caution light, and a red warning light. There's two of those on each side of the cockpit. There's an oral windshear warning. Then up on the top of the aircraft in the cockpit is a test button. You hold the test button in and you check the lights that they alternate and flash, and then you get the windshear warning over the speaker.

MS. MILLS: Was that test satisfactory?

THE WITNESS: Yes, it was.

MS. MILLS: What was the condition of the airplane prior to your departure from Charlotte regarding maintenance items, minimum equipment items and what not?

THE WITNESS: The aircraft was clean of any minimum equipment items and there were no write ups on the aircraft.

MS. MILLS: You flew the aircraft from Charlotte to Columbia. Please share with us your recollection of all of the events of the flight of 1016 from Columbia to Charlotte.

THE WITNESS: We got down to Columbia and had approximately 40 minutes on the ground. At that time, we

went into the terminal and got something to eat, brought the food back to the airplane. I had my sandwich, and First Officer Hayes ate half of his and saved the rest for Charlotte.

At that time, I got the flight release papers, the weather packet with the note-ems and all the pertinent information for the flight and checked the flight plan and signed it. Everything was normal. Got to the airplane. Did the pre-start check list, down the line, we call it. Then at that point, we had probably ten minutes before departure.

When departure time rolled around, they gave us a count, and we pushed back. We had our clearance and taxied out to the runway. The departure out of Columbia was uneventful. The weather was quite good, as it was throughout the day. We were in primarily visual conditions for the entire flight up to the Charlotte area. I believe we were at 10,000 feet and some scattered clouds and typical summertime hayes as we headed up to Charlotte.

Approximately 40 to 45 miles from Charlotte, I checked the weather and got what I believe was information Yankee at the Charlotte Airport. They were calling, I believe, 5500 feet scattered clouds with eight miles visibility, I believe. The winds were out of the southeast

at, I believe, seven or eight knots. They were operating on 18 right, 18 left and runway 23.

Shortly after that, we did the preliminary landing check list. It consists of setting the airplane up basically for arrival, rechecking the weight, setting the bug speeds, and that type of thing.

We called in range to Charlotte. At probably 35 miles out as we're heading up the 232 degree radial into Charlotte, we contacted approach control. At the time we contacted approach, we were headed at the airport, and I did notice a small cell south, just south of the VOR. The VOR is about two miles south of the end of the runway of 18 right.

Continued to monitor the cell. At one point, we deviated slightly around a fair weather accumulus cloud just for passenger comfort. And then as we headed towards Charlotte, on the radio I asked the controller if he was planning on turning us, because we had a cell out in front of us. And I believe he asked me how far ahead that cell was. I believe it was about 15 miles. He said, well, I'll turn you well in advance of that. And, in fact, we were given a turn to the north to set us up on a downwind to the west of the field in just a few short seconds later.

We began to descend. Probably the first descent

was from 10,000 feet down to 6,000 feet. As we went past the airport, we could look down and see the airport from the west. Nothing had changed much in my perception.

Ultimately, we were told to expect a visual approach. We were vectored. Continued to be vectored north. And, in fact, at one point, we were clear down to 2300 feet, which would have been consistent with a visual as the final approach altitude is 2300 feet.

Just prior to reaching 3,000 feet, I believe the approach controller said, we'll tell you what -- I think he said, we've got some rain to the south and I believe some coming off to the north. So maintain three. As soon as we get you outside the marker, we're going to turn you on for an ILS to 18 right.

At that point, we're still in visual conditions. I acknowledged the clearance and we started our turn. At some point on the approach, I told First Officer Hayes that if we had to go around for any reason, we would go out to the west. We had just come from there. The weather was good. It was clear. And, of course, we had that cell off the end of the runway, and we weren't going to fly runway heading for the reason.

Once we were given our base turns, we could look over and see the airport. First Officer Hayes was flying,

turned the final, and were given clearance for the approach.

At that point, we looked out and could still see the airport. I told First Officer Hayes that we needed to stay heads up for windshear due to the convective activity to the south of the airport. At some point, I saw two other aircraft. I believe I saw them on a TCAS out in front of us.

I was also running the radar to optimize the picture of the cell that was in front of us. I had pretty much scanned the area and determined that that was the only cell. And at that point, I've got the radar tilt to optimize that picture by having about a quarter of the top of the scope with ground return so that we can get a nice picture to the south.

I was operating with the Charlotte VOR on my side to keep situational awareness on where the cell was, because that gives me a distance to the VOR, and First Officer Hayes had the ILS dialed up. We continued. I asked for ride reports from the two aircraft that I had seen on the TCAS. And, in fact, at one point, I believe the tower said that they had a smooth ride.

Went on down. Everything appeared to be normal. We got to the marker. And at some point, I told First Officer Hayes, we had basically finished our briefing, that

we had already started, what the decision height was for 18 right. We continued down. And inside the marker, I'm not sure exactly where, we started to pick up some light rain. The still smooth ride and the speeds were consistent and pretty normal approach.

I remember seeing that the light rain was -- the visibility wasn't quite as good as it had been before, but I had no reason to believe that when we got down it wouldn't be quite easy to see the runway. It did restrict visibility maybe to a couple of miles or something like that.

A few seconds after that and from this point, my timing are a little jumbled. Some time after that, it began to rain extremely hard. I remember I said, here, I'll give you the wipers. At some point there, I turned on the wipers.

I remember looking out the windshield and seeing that well we're not going to see the runway. A second or so later, First Officer Hayes mentioned, well, there's -- I think he said -- one of us said, there's plus 20. Or he said, there's plus ten. Meaning, he saw an increase of ten knots. And I said, "Roger, you're plus 20." And what he meant, our approach speed was the bug plus ten.

So we were already at a 132, and he meant it went up to a 142. I said, confirm that, basically saying the

same thing to Roger, "You're bug plus 20." Just a few seconds after that, I determined that -- we received a couple of wind reports, some steady state winds out of the east, southeast at 19 knots, I believe. And listening to the steady state winds picking up a little bit, still on a smooth ride with the heavy rain, I did hear a windshear alert at some point.

Just after that, I told First Officer Hayes to go around. I was thinking about the obvious visibility, that I knew we weren't going to see the runway at the decision height. And it is my practice in flying the northeast in the wintertime, I don't continue an approach if I know I'm not going to get down and see something at the decision height or the MDA.

So I ordered him to go around. We had a wet runway and strong -- what I believed to be steady state winds out of the east, southeast, and just told him to go around.

At that point, I reported that we were on the go, and I told Phil to take it out to the right. I remembered seeing everything I wanted to see. I saw the power coming up, the nose was coming up towards 15 degrees. And I started voicing the missed approach or go around procedures, which is a practice of mine. You don't do missed approaches

all the time.

So I started going through the procedures, which are max power, flaps 15. And then if we would have gotten to it, positive rate, gear up instead of the spoiler.

I remember voicing max power, and he parroted that and flaps 15. Just a few seconds after that, we just dropped. I've never had a sensation like that of just like having the rug pulled out from under you after such a smooth ride.

We dropped down, and I remember calling, "firewall power." I heard the terrain warning. At that point, I reached up and pushed the throttles towards firewall power, and I took the yoke with my other hand. This all happened pretty quick.

The airplane just continued to sink. At one point, I remember getting the stickshaker and thinking for a moment that that would be good, because this is our emergency procedure to go to firewall power and pull to the incipient stickshaker.

I looked at the air speed at some point, and realized that we couldn't accept the slow speed that we had. It was decreasing very rapidly. Just a fraction of a second later, I looked out at the airplane and I see that the rain has let up and I'm looking up at the trees and a small hill.

And I realize that we're not going to be able to climb over that.

So at that point, my focus was just to keep the nose of the airplane up as best we could and keep the wings level and try and control the aircraft. The first impact that I felt was not very heavy, but I recall it did pitch the nose down some. I pulled the nose back up and then we hit real hard. Real hard impact.

At that point, just kept holding on. And the third impact we came to rest in the street there near the airport. I remember seeing everything and being alert. I remember when we came out from the rain and seeing a split in the trees, going through that, and then making the impacts.

All we could do or all I tried to do was to just and try to continue to control the airplane. Once we came to a stop, I started to unfasten my harness, and I looked over at First Officer Hayes, and he was alert and trying to get out of his seat too.

I turned around and recall looking at the cockpit door and it seemed slightly ajar. I reached back to the right and pushed at the door, and it kind of fell away and there was nothing back there.

At that point, I got up out of my seat and walked

out that direction and got out of the airplane. I stood on the ground for just a second and I turned around, and here comes First Officer Hayes out the airplane and he fell and had said something about that he didn't think he could walk.

Also at that point, I recall seeing the two flight attendants, Rich and Shelly, and Shelly obviously was unable to walk also. So at that point, Rich and I helped Shelly and Phil over across -- there was a road there that we helped them across and sat them down.

Now at some point, Shelly -- who hurt her knee very badly. It was a real nasty looking, I believe a compound fracture. She looked up at me and said that she thought she was going to bleed to death. And I looked down at the wound and told her that -- I just shook my head and told her, no, you're not.

At that point, Rich and I went back towards the airplane. When I got back to the airplane, I remember just looking around. I was a little disoriented, because I was looking behind the cockpit to find the rest of the aircraft and there was just nothing back there, but I could see the path through the woods.

I couldn't find Karen, who was the flight attendant in the back. So I told him to go around to our left, as we faced the aircraft was the cockpit, and I went

around to the right. As I worked my way around the right side of the airplane, I was looking for anybody, that maybe I could help or anything, and I tried to work my way and find the fuselage of the airplane.

All I remember seeing is a huge fireball that was extremely hot and just kind of a rumbling noise from the fire. I kept trying to work my way around that. I'm sure at this point that that was the fuselage, and I never thought to look up to see the tail as I've seen in pictures since that time.

I continued to work my way back, and I saw a few folks that I obviously couldn't help. As I got back into the woods, I found Karen, and she was standing there, and she had obviously burnt her forearms pretty badly, but she was alert and walking. So I walked her around the front of the airplane and kind of pointed her to where everybody else was.

At some point, I met back up with Rich, and someone had heard voices inside the house that was close to the airplane. We went to the front door, and there was another person, a third person, and I'm not sure if it was a passenger or a neighbor. I had thought immediately, oh, there must be somebody home. I knew that parts of the aircraft had hit, and I wasn't quite sure what.

Rich, I believe, kicked the door in, the front door, and we walked inside. There was a door immediately to the right into a garage that had a pane of glass in it. I remember looking at that and seeing that the nose wheel was in there. We heard some voices. We tried to open the door and it wouldn't open very far. Maybe only -- I don't know -- enough to maybe stick your head in there, but it was obvious that it was quite a jumble of things inside that garage.

We couldn't get in, and I don't recall what precipitated us leaving the house, except that there was obviously no way in to those folks through that way. So we went back out of the house.

At that point, I remember walking back towards where people were and looking at people, making sure everyone is -- I was looking for people that weren't conscious and things like that. Everybody pretty much was fairly alert. That's when I saw the first paramedic, I believe, or fireman or something. I think it was a paramedic.

He asked me if I wanted anything, and I remembered from some training in the Air Force that they said if you ever had to punch out and you didn't think that you had internal injuries to drink water and it would help with

shock. I don't know if that's the case, but I told him I wanted two glasses of water, and he produced them real fast, and I drank them, and I did feel better and more alert.

He told me I needed to sit down, but it was about that point that I noticed that my shins where beat up pretty bad, and I had sustained bruises and cuts and other things. I remember initially sitting down and then thinking that if I continue to sit here, my legs are going to get real tight and I'm not going to be able to walk. So I got back up and went back to the airplane.

At that point, I recall seeing, starting to maybe take things in a little more. I saw some power lines down. I saw the house, and I was concerned that there might be some type of explosion or I was concerned that someone would try and move something and cause some type of cave in or something like that.

So I told, I believe, Rich and some other people that were over there, that we better get back from the airplane. At that point, the trucks were there. So we got back from the airplane, and very shortly thereafter, I was put in an ambulance with First Officer Hayes and Shelly Markwith and taken to the hospital emergency room.

MS. MILLS: Thank you for sharing that with us. Let's go back and walk through this then procedurally from

Columbia. Now, you said you got flight papers for the flight.

THE WITNESS: Yes, ma'am.

MS. MILLS: Was that in Columbia or did you get the flight papers in Charlotte for both legs?

THE WITNESS: No, ma'am. I got the papers in Columbia.

MS. MILLS: Did you hear this weather information with First Officer Hayes?

THE WITNESS: Yes, I did. I noticed right off the first flight of the day, that First Officer Hayes would always look at the weather note-ems, just as I did. On the DC-9 when you get the weather note-em information and the weather for the alternates, if there are any, you roll them up and put them on a pedestal in between you. So it's real easy for everybody to access the information.

MS. MILLS: Did the forecast for Charlotte include thunderstorms?

THE WITNESS: I believe that in the forecast at some point, as is almost always the case in the summertime, I think, I believe they showed a slight chance of light rain and a thunderstorm.

MS. MILLS: Did you discuss this at all in your pre-departure briefing?

THE WITNESS: I don't recall one way or the other.

MS. MILLS: Would you recount for us what a pre-departure briefing is supposed to go like?

THE WITNESS: Do you mean the check list items or the briefing that you give to your crew?

MS. MILLS: The briefing that you give to your crew.

THE WITNESS: The briefing that you give to both the flight attendants and the first officer occur on the first flight of the trip. It's customary to come down to the airplane a half an hour or more prior to departure time.

MS. MILLS: Excuse me. I'm talking about the pre-departure briefing that's not on the after start, but on the before take off.

THE WITNESS: Okay. In the brief, usually the initial heading, the first fix and the initial altitude for the flight crew. I'm sorry. I misunderstood what you were asking.

MS. MILLS: Once you departed Columbia, you described the in route weather conditions as being pretty much what they were on your trip over?

THE WITNESS: Yes, ma'am.

MS. MILLS: You were using the weather radar?

THE WITNESS: Yes, ma'am.

MS. MILLS: Would you describe your radar observations that you made in the vicinity of Charlotte, the colors, the gradient, please?

THE WITNESS: When we were probably -- I'm not sure exactly how far when we noticed the cell, but my typical procedure at that altitude would have been to run the antenna tilt up a couple of degrees. When I do see a cell, I'll run it down and scan the cell and keep the antenna down to show some ground contact, so that you don't lose it and them optimize as you look at the weather in question.

I recall it being an extremely small cell. There was some red in the cell. A very uniform shape, round cell.

MS. MILLS: Was there any other colors in it besides red?

THE WITNESS: There was red and possibly a little yellow and green.

MS. MILLS: So, initially, Flight 1016 was cleared for visual approach?

THE WITNESS: I believe that initially we were told to expect the visual. And then on down, I think that's when he said that he descended us to 2300 feet and said, "Expect a visual." And then a few seconds later, he said --

I think he said, "I'll tell you what, USAir 1016, we've got some rain south of the field, and maybe some coming off north. Maintain three and we'll put you on the ILS as soon as we get you outside the marker."

MS. MILLS: Is there a minimum ceiling or visibility for a visual approach?

THE WITNESS: Well, USAir classifies an ILS for category 1 is anything less than three quarters of a mile or 4,000 feet RVR. If they're calling visual conditions at the field, they can clear you for a visual provided you have the airport and runway in sight.

MS. MILLS: What does the weather have to be for the approach to be considered a visual approach?

THE WITNESS: I believe three miles.

MS. MILLS: Does USAir require that a visual approach be briefed?

THE WITNESS: Yes, ma'am. All approaches are to be briefed.

MS. MILLS: Who's to brief this approach?

THE WITNESS: I believe it's the captain's responsibility to comply and have the approach briefed on the checklist. My practice is the pilot flying briefs it, and then I always double check it and make sure that it is complete.

MS. MILLS: What is to be covered in that briefing?

THE WITNESS: For a visual approach, you would brief the airport, the runway of intended landing, the localizer frequency, if there is one, and a localizer course.

MS. MILLS: Was there a briefing that included all these things?

THE WITNESS: Yes, ma'am, there was.

MS. MILLS: Would you go to Exhibit 12-A, please, page 25.

THE WITNESS: Two-A?

MS. MILLS: Twelve -- 12-A. If you look along the left side, it says --

CHAIRMAN HAMMERSCHMIDT: I'm sorry. Ma'am, what page?

MS. MILLS: Page 25. The page numbers are at the top.

MS. MILLS:

MS. MILLS: Now, if you look along the left side, it says "CAM-1" and that would be you?

THE WITNESS: Yes.

MS. MILLS: And it says "approach brief." Directly underneath that, we see "CAM-2."

THE WITNESS: Mm-hmm.

MS. MILLS: "Visual back up, ILS."

THE WITNESS: Right.

MS. MILLS: Is that a complete approach brief for a visual approach?

THE WITNESS: That not in itself. It's not. But at some point, we briefed the localizer frequency and the course.

MS. MILLS: I wasn't able to find that in here.

THE WITNESS: You know, I've looked at that and it wasn't either. But my only explanation is that it could be covered. That's a brief I always make, and it's consistent with the standardization.

MS. MILLS: Okay. Subsequently, Flight 1016 was cleared for an ILS approach. Why was that?

THE WITNESS: That's correct.

MS. MILLS: Why was it -- again, please for us, why was it cleared for an ILS?

THE WITNESS: He said that there was some rain to the south, and then he said, I believe maybe some coming off to the north.

MS. MILLS: Does USAir require that an ILS approach be briefed?

THE WITNESS: Yes, ma'am.

MS. MILLS: Who is to brief the ILS approach?

THE WITNESS: Well, it's the same elements as in the visual approach, but it's more inclusive. You need to brief the final approach altitude, which we were already at, and the decision height or missed approach point. I recall telling First Officer Hayes that a point on final what the decision height was, and you also need to brief the missed approach.

In this case, I told him we were going out to the west, and I would expect an altitude from the controller.

MS. MILLS: Again, I was not able to find this in the CVR. This turn out to the west was a modification to the published missed approach?

THE WITNESS: Yes, ma'am.

MS. MILLS: Why did you choose to modify the procedure?

THE WITNESS: Because there was the cell down on or just south of the VOR. A missed approach with runway heading would have taken us right into the weather.

MS. MILLS: At the time you made that decision, did you choose to share that information with Air Traffic Control?

THE WITNESS: No, ma'am, I didn't.

MS. MILLS: Is the presence of a windshear a

special consideration to be briefed?

THE WITNESS: Yes, ma'am. I told First Officer Hayes that we needed to stay heads-up for windshear. I believe also you might brief if you expected a wet runway, which we did not, or if there were any special procedures for that airport. There didn't happen to be in Charlotte, but in some smaller airports in the northeast where you've got terrain or an extremely short runway, you might have a different missed approach procedure for single engine or something of the sort.

MS. MILLS: At what point in time at altitude are these briefings supposed to occur?

THE WITNESS: Well, they would take place if you knew what approach you were going to receive. They would take place in the preliminary landing check list where the approach brief is the last item. Many times when you arrive in the airport traffic area, you don't know what approach you're going to be briefed.

All we knew at the time we performed the preliminary was that it was going to be 18 right, 18 left or 2-3. So we came down and because of the weather conditions, I expected a visual to 18 right. Then when they consequently cleared us for the ILS, we picked up the remaining items.

MS. MILLS: Is that preliminary landing check to be accomplishing above 10,000 feet?

THE WITNESS: Yes, ma'am.

MS. MILLS: Was it?

THE WITNESS: Yes, ma'am.

MS. MILLS: Now, you mentioned your navigational radios. Do you set the radios up when you brief the approach?

THE WITNESS: I set the radios up -- in the absence of any other circumstances, I would set the radios up when I briefed the approach. In this case, I felt that it was more safe and prudent to keep the VOR set up on my side since we were in visual conditions, to continue to monitor the cell off the end of the runway, to keep situational awareness on that.

MS. MILLS: Would the range markings on the radar set be helpful in doing that?

THE WITNESS: Yes, ma'am.

MS. MILLS: But you felt that you also needed the VOR to aid you in that?

THE WITNESS: Yes, ma'am.

MS. MILLS: What are USAir's procedures with regard to the manner in which radios are to be set up to fly an ILS approach?

THE WITNESS: For an ILS approach in category 1, which would be an RVR of less than 4,000 feet or three quarters of a mile as predicated on both radios set up to the localizer and both flight directors used on the approach.

MS. MILLS: But you've just testified that your radio was on the VOR, and First Officer Hayes, how was he set up?

THE WITNESS: I believe he was on the ILS.

MS. MILLS: Were either of you using the flight directors?

THE WITNESS: No. At that point, we were executing the ILS and visual conditions of better than category 1 conditions.

MS. MILLS: Do USAir flight directors in the DC-9-30 provide windshear escape information?

THE WITNESS: No, ma'am, they don't.

MS. MILLS: So when you were describing the arrival, you flew a right down wind. You arrived on the west side of the airport. And you said that on the down winds, you were able to see the airport?

THE WITNESS: Yes, ma'am.

MS. MILLS: How about on the base, base leg?

THE WITNESS: I don't recall one way or the other.

The conditions were the same. The visibilities were the same. I don't recall if I could see the airport on -- I'm sorry. Did you say base?

MS. MILLS: Yes.

THE WITNESS: I don't recall if I saw it on base, because I would be looking through the right side of the cockpit, and I don't recall if the base was wide enough to see that.

MS. MILLS: On final approach, did you continue to monitor the cells, the thunderstorm cells, with the weather radar?

THE WITNESS: I'm sorry. Could you repeat the question?

MS. MILLS: On final approach, did you continue to monitor the rain shower activity with the weather radar?

THE WITNESS: Yes, ma'am.

MS. MILLS: How did they appear at that time?

THE WITNESS: It appeared to be just the same. The cell south of the field did not appear to be moving, and it appeared to look just the same as it had when we were south of the airport coming in.

MS. MILLS: Where were they?

THE WITNESS: Ma'am?

MS. MILLS: Where were they located, the cells?

THE WITNESS: The single cell was down, it seemed to be just south of the VOR, maybe a mile or so.

MS. MILLS: Do you recall First Officer Hayes saying something about "it being on this side?"

THE WITNESS: No, ma'am.

MS. MILLS: I think what we're going to do is ask him. Let's see here. Does USAir provide pilots with clearance distance, criteria as far as maintaining clearance from thunderstorm or rain areas?

THE WITNESS: Yes, ma'am. At that low altitude, the distance would be five miles.

MS. MILLS: When you were on the end of the runway, how far would you have done?

THE WITNESS: Well, that would be -- the runway is approximately two miles long and the VOR is about two miles south and just south of that. So that would be approximately five miles from the end of the runway.

MS. MILLS: Are you familiar with the USAir training publication, Fly Crew View?

THE WITNESS: Yes, ma'am.

MS. MILLS: Do you recall the windshear guide that was produced in the March-April-June issue?

THE WITNESS: Yes, ma'am. As a matter of fact, I had that on board the airplane that day. I had just picked

it up.

MS. MILLS: From that, do you remember a table that gave probability of windshear with listed conditions?

THE WITNESS: Yes, ma'am.

MS. MILLS: Do you recall the probability of windshear encounter with red shadow on the radar?

THE WITNESS: No. Do you have a copy of it?

MS. MILLS: Yes. It's Exhibit 2-F, page 35. So it gave a probability of windshear with heavy precipitation or red on the radar.

THE WITNESS: Yes, ma'am.

MS. MILLS: How did that list that?

THE WITNESS: That's high.

MS. MILLS: So based on that and other things you've learned about windshear in your training, did you consider diverting or delaying?

THE WITNESS: At that point based on cues that I had, we were going to stay heads-up for it, and provided with the smooth rides of the aircraft in front of it, and the fact the cell was apparently maintaining its position, I saw no reason at that point to abort the approach based on our observations and the cues that we had available to us.

MS. MILLS: Do you recall the discussion of windshear in this publication indicating that some windshear

is not survivable?

THE WITNESS: Yes, ma'am.

MS. MILLS: Well, going onto the approach, do you recall seeing the runway at the final approach fix?

THE WITNESS: I don't recall one way or the other.

MS. MILLS: Was the approach stable?

THE WITNESS: Yes, ma'am.

MS. MILLS: Was the airplane fully configured?

THE WITNESS: I believe it was, yes. There were a lot of things on the approach that I don't recall that are standard and that I do all the time. For instance, I didn't recall putting the gear down, although, in fact, we did. Things that you do every day repeatedly were things that I didn't remember, as well as something that happened that was non-standard or out of the ordinary.

MS. MILLS: Do you recall making a 1,000 foot call?

THE WITNESS: Yes, ma'am.

MS. MILLS: Did you see the runway when you made that call?

THE WITNESS: I don't recall.

MS. MILLS: Did you get an airborne windshear warning at any time during this approach?

THE WITNESS: No, ma'am.

MS. MILLS: Did you get any kind of annunciation that would have made you believe that it had failed?

THE WITNESS: No, ma'am.

MS. MILLS: Did you hear other aircraft tell ATC that they would prefer to wait rather than take off?

THE WITNESS: No, ma'am, I don't recall. However, I believe after reviewing the transcripts, that just as we were checking on the frequency that there was a discussion to that nature, and we caught maybe the tail end of it.

MS. MILLS: At what point did you stop seeing the runway?

THE WITNESS: At the same time the extremely heavy rain started. I think that's when we stopped seeing the runway, but I'm not really sure at this point. I recall when the rain began, I remember looking out and feeling that this won't -- you know, everything is smooth, and we shouldn't have any trouble seeing the runway at this point. And it was just a few seconds later that it started to really rain hard.

MS. MILLS: What was your altitude at this point?

THE WITNESS: I don't recall. I recall calling for the go around between around 1200 feet.

MS. MILLS: How would you characterize this rain?

THE WITNESS: I'm sorry?

MS. MILLS: How would you characterize this rain?

THE WITNESS: Extremely heavy. The windshield wipers had no effect. It was surprising.

MS. MILLS: Did you select the ignition?

THE WITNESS: No, I did not.

MS. MILLS: Is it a procedure to do so?

THE WITNESS: Yes, it is.

Q And earlier you said you recalled First Officer Hayes saying, "Plus ten?"

THE WITNESS: Yes, ma'am.

Q And you, yourself, calling, "Plus 20?"

THE WITNESS: Yes, ma'am. That was essentially saying the same thing.

Q What did you do at that point?

THE WITNESS: I'm not sure exactly where that occurred on the approach. But I recall within a few seconds after the rain became extremely heavy, it was something we hadn't planned on seeing, and I just made my decision then that we were not going to continue with the approach.

Q So, go ahead and tell us then what drove your conclusion to go around?

THE WITNESS: Well, as any situation, you take the cues that are available and make a decision. The heavy rain, the fact that I knew there was no sense in going down

to the DH and the fact that we had a wet runway with an extremely heavy cross wind, and just quite honestly, conditions that we had not planned on, I was not going to continue the approach. We were going to just get out of there.

Q At what altitude did you go around?

THE WITNESS: I recall making the call at 1200 feet. I recall seeing that, and I recall seeing "bug plus 10" on the speed as we initiated the go around procedure.

Q Describe for us the missed approach procedure?

THE WITNESS: The full missed approach procedure is max power, flaps 15, positive rate gear up, and then stow the spoiler. I believe that we talked through max power, flaps 15, and I recall seeing a climb on the altimeter; however, I don't recall seeing on the VSI. It was just a few short seconds later, that we were dropping.

Q How does this procedure vary in the presence of a windshear?

THE WITNESS: I believe that in the presence of a shear that the procedure says if you are experiencing an increasing performance shear, that a normal go around can be accomplished. At that time, we didn't believe we were experiencing a windshear. When you experience a windshear, it's a separate procedure from the normal go around, and

that would be firewall power, and pull the nose up. And in the DC-9's case, it would be 15 degrees or the incipient stickshaker, whichever would allow you to get the nose up higher.

Q So in a normal missed approach, it's pitch up to a maximum 15 and a --

THE WITNESS: It would be a pitch up to V-2 in the DC-9. In many cases, it's about 15 degrees, depending on your load, but you would pitch up to V-2.

Q But in a windshear escape, it is definitely a 15 initial --

THE WITNESS: Yes, ma'am.

Q And then whatever it takes?

THE WITNESS: Yes, ma'am.

Q So at this point in your mind, you were executing a normal missed approach?

THE WITNESS: Yes, ma'am.

Q Once again, tell us as you can best recall, what First Officer Hayes did during this initial phase?

THE WITNESS: I recall looking over, and before I made the radio call, seeing that all the trend information was what we wanted. He started a turn. The nose was coming up, and the power was coming up, all pretty much simultaneously.

Q When he called for power, what terminology did he use?

THE WITNESS: I believe "max power."

Q Did you trim the throttles for him?

THE WITNESS: No, I never got to that point.

Q Does USAir teach any techniques for setting throttles in a missed approach?

THE WITNESS: I'm sorry?

Q Does USAir teach any technique for setting throttles in a missed approach?

THE WITNESS: Not per se, but the non-flying pilot is responsible for monitoring the engine instruments and assisting the pilot flying with flaps in gear and throttles if necessary.

Q Do you recall any delay from the time First Officer Hayes called for flaps 15 and to them being set to 15?

THE WITNESS: No, ma'am, I do not recall a delay there.

Q You and First Officer Hayes previously agreed to turn right in the event of a missed approach. And you stated that he started to turn right away.

THE WITNESS: Yes, ma'am.

Q Do you recall giving First Officer Hayes an order

during the missed approach to "down," "push it down?"

THE WITNESS: No, ma'am, I do not recall that statement. However, I have had access to the cockpit voice recorder, and I have seen that statement.

Q Now immediately following that order in the cockpit voice recorder, while executing the missed approach, do you recall what was there in the cockpit voice recorder? Did you find it necessary at that point in time to notify ATC of your intentions to modify the missed approach?

THE WITNESS: I told them we were on the go. I believe he came back and said, "Roger. Runway heading, climb maintain three." And I said, that we're taking a right turn here after that.

Q So you had given First Officer Hayes an order to manipulate the airplane in some manner, and then you direct your attention to Air Traffic Control?

THE WITNESS: Yes, ma'am.

Q Why do you think you might have told First Officer Hayes to push it down?

THE WITNESS: That would be speculation on my part. I can speculate. I don't recall making the statement. There have been a few times in the past several years when I've had to make a similar statement. And at those points, they refer to making a missed approach where

you weren't going to climb very high as in this case.

You have a light airplane and you go max power and get the nose up to 15 degrees, and at that point, you need to start thinking about level off, because the airplane will climb quite well with being light with that kind of power.

So I've made that comment in response to that, as the pilot non-flying on a few occasions before to remind the person flying that we've got to level off here not too much longer. Possibly sensing or seeing an over rotation with a slow air speed. At some point, I see the air speed get quite low, and I don't recall where that is.

So, it would just be speculation for me to say what that comment was.

Q How close to the ground were you at this point?

THE WITNESS: I don't recall how close we were. I recall seeing a climb initially, and then things happened quite quickly. I believe from the point when I recall hearing the cockpit voice recorder, from the point that we realized that there was a shear, that the rug had been pulled out from under it, it was approximately five seconds or something of that nature.

Q Would you say at that point in time, you had windshear cues?

THE WITNESS: At the point that the bottom dropped

out, I felt a severe windshear that required the emergency procedure.

Q Plus 10, plus 20, is that a windshear cue?

THE WITNESS: It's a windshear cue. But in that case and as in the case of the manuals, a ten knot entries, which is what we experienced, was not sufficient to believe you'd need the emergency procedure. That's something that I've experienced flying around on a fairly regular basis of five or ten knots in windy conditions or some other type of circumstance and flying in the northeast and the southeast.

Q Does your windshear training teach you to trade air speed for altitude?

THE WITNESS: Yes, it does.

Q Is "push it down" consistent with that?

THE WITNESS: Not at that point. And I don't believe at that point, we felt that we were in a windshear situation.

Q After seeing this, was what you saw on your primary flight instruments consistent with your expectations?

THE WITNESS: At which point?

Q After the statement to "down, push it down?"

THE WITNESS: I don't recall making the statement, and I'm not sure what I saw at that point. I recall saying,

"Fifteen degrees, nose up." And at some point, I recall saying, "Ten degrees, nose up," or just above that. And those are my only recollections of the pitch of the aircraft until I looked outside and saw visually.

Q Well subsequent to this, do you recall acquiring visual contact with the ground?

THE WITNESS: Yes, I did, after we kind of came out of the bottom.

Q Do you recall hearing the ground proximity warning?

THE WITNESS: Yes, ma'am.

Q And in response to that, what were your actions?

THE WITNESS: Like I said, I don't recall. I'm not real sure on the sequences in my mind, because it all happened very quickly. I recall everything pretty much happening at the same time. I called "firewall power" and got the power up at some point. And I'm not sure if it was just a fraction of a second prior or a fraction of a second after that I heard the AGPWS.

Q Well, at this point in time, why don't we go to your training on windshear in ground school. How is your knowledge of windshear knowledge avoidance and coping technique evaluated?

THE WITNESS: In ground school?

Q Mm-hmm.

THE WITNESS: Our ground school windshear training consists of some films on windshear. I believe there's a film put out by United that talks about a 727 encounter on take off. I recall a substantial block of time during recurrent about windshear. I don't recall a lot of the particulars at this point.

Q Do you recall any testing, any evaluation with regard to this?

THE WITNESS: During recurrent training, at the end of each block, you have questions that they ask and at the table you've got a little multiple choice buttons, and you'll have several questions that you have to pick the answers to. If someone were to answer incorrectly, then they stop and go through it and go over it to make sure everybody knows what the answer is.

Q But there's no written test that's scored and turned in or anything like that?

THE WITNESS: No, ma'am.

Q Was what you just described what you received in upgrade or in your recurrent?

THE WITNESS: I'm sorry, the training?

Q Yes.

THE WITNESS: That would be in recurrent.

Q Did they give you any training with regard to windshear and upgrade?

THE WITNESS: The training in upgrade we had was in a simulator. I'm sure some of the same films are initial for the DC-9. Then also in the simulator, you have some windshear scenarios that you practice.

Q Do you remember what cues were given to you in the simulator that indicated that a windshear was imminent?

THE WITNESS: I can remember some of the scenarios. I don't remember each one that I've had on the PCs and PTs. The one most vivid is a visual approach. Lots of turbulence. And you're hearing cues from the instructor, who's simulating being a traffic controller, of aircraft ahead of you, and weather cells in the area, and things like that.

Q When you were last in recurrent, did you receive a windshear training event?

THE WITNESS: In recurrent or in the simulator?

Q Your records show that you had a proficiency check in January of 1994?

THE WITNESS: Yes, ma'am.

Q Did you see a windshear in that simulator period?

THE WITNESS: I don't recall one way or the other.

Q But you've been here since 1985?

THE WITNESS: Yes, ma'am.

Q So you've had a number of simulators. You've seen a number of windshear events?

THE WITNESS: Yes, ma'am.

Q Could you give us a percentage roughly of how many times you were the pilot flying versus the pilot not flying?

THE WITNESS: In my recollection each time you do these training events, each pilot is given the opportunity to be the pilot flying.

Q With regard to this windshear training now and that you've been through this, does it seem adequate?

THE WITNESS: In discussing with friends of mine at other carriers, it seems to be pretty much the standard in the industry.

Q Based on your experience that you've just gone through, would there be anything that you would add to it?

THE WITNESS: Not at this time, no.

MS. MILLS: Captain Greenlee, thank you for your participation. I have no further questions of this witness.

CHAIRMAN HAMMERSCHMIDT: Thank you, Ms. Mills. Dr. Strauch.

DR. STRAUCH: Yes, thank you.

DR. STRAUCH: Captain, in the windshear scenarios that you encountered in the USAir simulator, did you

experience any scenario that was as severe as what you experienced in Charlotte on July the 2nd?

THE WITNESS: No, sir.

DR. STRAUCH: Were there other differences between those scenarios and what you experienced in the accident flight?

THE WITNESS: I really don't. Other than the fact that we had a pretty smooth ride, I don't recall anything being that severe.

DR. STRAUCH: Were you able to recover safely in the scenarios that you encountered in the simulators?

THE WITNESS: Yes, I was.

DR. STRAUCH: Did you receive assistance from your first officer or captain, depending on your position in traversing the windshears in the simulator?

THE WITNESS: Yes. There's procedures that the pilot not flying would call out air speeds and decent rates and things like that.

DR. STRAUCH: Were those procedures carried out in each simulator session?

THE WITNESS: Yes.

DR. STRAUCH: Were those procedures carried out on the accident flight?

THE WITNESS: No, sir. I believe in the five

seconds or so that we had, no, they weren't.

DR. STRAUCH: What do you attribute that to?

THE WITNESS: Well, I thought a little bit about that. It was my perception for quite a while, until I heard the cockpit voice recorder, that time seemed to -- that my timing was -- that I had about 20 seconds or so to make these decisions.

Once I heard the cockpit voice recorder and realized that I believe less than five seconds had lapsed from the time that the rug was pulled out from under us, at that point, I went to firewall power and grabbed onto the airplane and basically tried to survive the encounter.

DR. STRAUCH: Do you recall about how many windshear encounters you experienced in the SIM?

THE WITNESS: No, I'd say probably about as many SIM sessions as I've had.

DR. STRAUCH: So is it safe to say that in each SIM session, be it each one SIM session where there was a windshear, did you expect it?

THE WITNESS: Usually, it is set up at some point in the simulator session. You don't know exactly how it's going to be, but you're going to see a windshear at that point. You may complete the approach and go around and see it there or some such thing like that.

DR. STRAUCH: So it's safe to say that you had some expectation in the SIM that you would encounter a windshear?

THE WITNESS: I have expectations that things are not going to go well in the simulator as far as emergencies and procedures like that every time I go into the simulator, yes.

DR. STRAUCH: Do you have those same expectations in the aircraft?

THE WITNESS: Yes, I do.

DR. STRAUCH: What were your expectations about the weather in Charlotte when you were departing from Columbia?

THE WITNESS: When I was departing from Columbia, my expectations were that they would be as we saw in the weather in the forecast. But you -- in a sense, you're constantly flight planning, if you will. That you deal with weather as it changes and evolves in front of you and on your way in route.

DR. STRAUCH: Did the weather evolve on your flight from Columbia to Charlotte?

THE WITNESS: Well, we saw the cell south of the field, and that was not -- we didn't have one when we departed Charlotte, but that was not a surprise to see a

cell like that at that point in the year.

DR. STRAUCH: So is it safe to say that your expectations of the weather were based on the fact that you had just traversed that air space on the flight from Charlotte to Columbia?

THE WITNESS: Not necessarily. If the implication was that my attitude was that well, geeze we just left, and so we're going to see the same thing. No, I never do. I take each segment of flight as it comes and look for the cues and use the cues that are given to me and the reports and the radar and make judgments based on that.

DR. STRAUCH: Can you go over those cues on the flight from Columbia to Charlotte as to what kind of weather you were expecting?

THE WITNESS: Well, at the points in flight at crews, we were above a haze layer with some scattered clouds. We could still have ground contact. As far as expectations, the weather that you get when you leave a particular destination basically it's for your flight planning. It's for are you going to need an alternate, things like that, and for what to look for and expect, but it's not something that you hang your hat on.

You're always looking out and you're expecting what you see and what you hear from the folks in front of

you and what your radar is. What we saw when we went into the Charlotte area was I would say not unexpected.

DR. STRAUCH: Was there a certain point in the flight when what you saw was different than what you expected?

THE WITNESS: Sure. At the point when the rain began to rain extremely heavy.

DR. STRAUCH: And not before?

THE WITNESS: No, everything before that looked pretty much what we had expected to see.

DR. STRAUCH: Captain, in the transcripts of both ATC and CVR, your clearance was changed or rather the controller told you to expect a different kind of an approach than what you were anticipating. And that is, he changed you from expect a visual, to expect an ILS. What changes in the cockpit did that ATC transmission precipitate?

THE WITNESS: Well, like I had mentioned, I told First Officer Hayes what the decision height was, but in that case, in visual conditions, he was already dialed up to the ILS and had the localizer tuned. So at that point and being at the final approach altitude, there were no changes that needed to be made.

DR. STRAUCH: Do you remember at what point in the

flight you told the first officer what the decision height was? The reason I ask that is because I didn't see that.

THE WITNESS: I understand that. It was on final.

DR. STRAUCH: Could you explain why that's not in the CVR transcript?

THE WITNESS: No, I have looked briefly at it. I've seen a few things that are covered up by different things, by ATC calls and things like that. I'm not really sure. I just recall making the statement on final approach.

DR. STRAUCH: At 1836.59 in the CVR transcript and that's Exhibit 12-A.

THE WITNESS: What page is that?

DR. STRAUCH: That will be page 26 of Exhibit 12-A. The approach controller says at the end of the transmission, and I quote, "Just expect the ILS now. Amend your altitude and maintain 3,000." You are RDO1. You were transmitting to ATC. Is that correct?

THE WITNESS: Yes, sir.

DR. STRAUCH: So your response is, "Okay. We'll maintain 3, and we're coming right down, U.S. 1016." Why do you not mention there anything about expecting the ILS?

THE WITNESS: I'm sorry. I don't understand the question.

DR. STRAUCH: In your read back to the controller,

you only mentioned the altitude clearance. You didn't say anything to the effect of, "Okay. We'll now expect the ILS."

THE WITNESS: I don't know. That's not standard phraseology. And at that point, I'm just acknowledging everything and I'm really not seeing a problem with what he's asking us to do.

DR. STRAUCH: Now a few minutes later at 2238 -- oh, I'm sorry, 1838 -- there is some conversation within the Charlotte approach control. Let me refer you to Exhibit 3-B, page 27. At 1836, and this is written in the transcript of 2236 --

THE WITNESS: I'm sorry. What page would that be on?

DR. STRAUCH: That's page 27 of Exhibit 3-B. At 2236.21-Zulu or 1836 local, the statement by "FC" -- I assume the supervisor -- "We're going to go IMC here pretty quickly." Conversing. Later on down the page, and the time is 2238.02-Zulu or 1838.02 local, FC says, "Okay. Tell Craig I've got the engine generators on. We're going to go IMC very quickly. Raining very hard." Were you aware of this conversation?

THE WITNESS: No, sir.

DR. STRAUCH: Let me refer you to the next page,

page 28. At 2238-Zulu or 1838, there's a conversation between USAir Ramp Control and the cab supervisor.

THE WITNESS: I'm sorry, 2238 and what?

DR. STRAUCH: Forty-seven, 2238.47. "Can you tell me where the lightening is striking locally? This is at USAir, I'm sorry." And then further down, they say, "It's within a couple of miles, yeah, or closer." Were you aware of this conversation?

THE WITNESS: No, sir, I was not.

DR. STRAUCH: Did you see lightening?

THE WITNESS: No, sir.

DR. STRAUCH: Had you been aware that the controller saw lightening?

THE WITNESS: No, sir.

DR. STRAUCH: If you were aware, would that have changed your expectations of the weather in Charlotte?

THE WITNESS: If I would have been aware of it, it wouldn't have mattered of my expectations. If I knew there was a thunderstorm in the field, we would have discontinued the approach.

DR. STRAUCH: So if you knew this information that was going on when this conversation, you would have discontinued the approach at that point?

THE WITNESS: Yes, sir.

DR. STRAUCH: Why is that?

THE WITNESS: Because that's not safe.

DR. STRAUCH: In the CVR transcript at 1838 and it's on page 28 of Exhibit 12-A, you say to the first officer, "It looks like it's sitting right on the..." And I believe this is the transmission that Ms. Mills was asking you about. Do you remember what you were referring to at that point?

THE WITNESS: I believe I was referring to the cell. And I said, "It looks like it's sitting right on the radial or right on the VOR." I don't recall which.

DR. STRAUCH: Do you remember how you perceived the cell?

THE WITNESS: I perceived that it was still unchanged, just a single small cell sitting south of the field.

DR. STRAUCH: My question is, did you see it visually or on the radar?

THE WITNESS: I don't recall one way or the other. I recall seeing it on the radar. I don't recall if we looked at it visually or not.

DR. STRAUCH: And some seconds later -- I'll refer you to page 29 of Exhibit 12-A. At 1839.20, you tell the first officer "chance of sheer."

THE WITNESS: I believe I said we'll have to stay heads-up for windshear.

DR. STRAUCH: And I believe you say that a little bit later about the heads-up. The heads-up statement is on page 33. Approximately two minutes later at 1841.05. At 1839.20, you tell the first officer, "chance of shear." What did you base this on your perception that you thought there would be a chance of shear?

THE WITNESS: I based it on the fact that there was convective activity in the area.

DR. STRAUCH: As the pilot in command, what did you expect the first officer to do as a result of your alerting him to this?

THE WITNESS: I expected that we would both, which we did, continue to monitor air speed and approach a path. In essence, a glide slope.

DR. STRAUCH: So in other words, you weren't expecting any change in the execution of the approach, but you were just giving him information to prepare him in the possibility of encountering a shear?

THE WITNESS: That's correct.

DR. STRAUCH: Did you discuss what air speed to fly the approach at?

THE WITNESS: Yes, sir, we did. We decided to fly

it at bug plus ten. I believe the bug speed or reference speed was 122, and we were at 132 knots.

DR. STRAUCH: Did you see in the CVR transcript where this discussion takes place?

THE WITNESS: It would probably be in the preliminary landing check list.

DR. STRAUCH: I didn't see it there, Captain.

THE WITNESS: I remember. All I can tell you is I remember making that. It's also consistent with the way I operate the cockpit.

DR. STRAUCH: Now, you're carrying ten knots extra of air speed. That was because of the convective activity that was in Charlotte?

THE WITNESS: No, you would carry five knots standard. You also carry half the steady state wind, over 20 knots, which is not a factor in this case. You would carry all of the gust if there was a gust. In this case, we carried an extra five knots, and I added five knots to be prudent for an approach such as this. We are allowed to add a total of 20 knots for an approach.

DR. STRAUCH: How often would you estimate in the summertime in the Charlotte air space that you would carry ten knots extra air speed?

THE WITNESS: Fairly often. It just depends on

the conditions that you see at the time for that individual day and that individual approach. I treat each approach as a different event. So, it would just depend on the scenario at the time.

DR. STRAUCH: Within a few seconds -- I'll refer you to the next page, page 30 of Exhibit 12-A -- at 1839.33, as the frequency is changed from approach to the tower, the CVR picks up, "Oh, that's okay. It's probably better off we didn't go anyway."

If you look at the ATC tape, this apparently is USAir aircraft that was about to take off that decided to wait out its take off presumably for of the weather. Do you recall hearing this?

THE WITNESS: I don't recall what the transmission was. I recall hearing some dialogue when I turned on the frequency, which is not uncommon when you change a frequency.

DR. STRAUCH: But you don't recall a dialogue about holding off on a take off?

THE WITNESS: No, sir. And if I had, I believe I would just figure that it was referenced to the fact that a departure aircraft would have to take off and fly right over the VOR.

DR. STRAUCH: At 1841.05 on page 33, you tell the

first officer to stay heads-up. Why did you tell him to do that?

THE WITNESS: Just to stay heads-up for the possibly of, as I briefed before, for windshear.

DR. STRAUCH: Could you explain what that would do staying heads-up in terms of the potential windshear encounter?

THE WITNESS: I would say just an added visualant.

DR. STRAUCH: At this point, were you executing the ILS approach?

THE WITNESS: I believe so, yes.

DR. STRAUCH: What is USAir's procedures in terms of staying heads-up or heads-down for the ILS approach?

THE WITNESS: Are you talking about where we were in the cockpit or are you talking about my statement, which was kind of a rhetorical, you know, let's stay heads-up here. I was not telling him to look outside the cockpit or look inside the cockpit. He was as a pilot flying was on the ILS, and flying basically referenced to his instruments.

As a pilot not flying in a visual environment, my scan at that point, a great deal of it, is outside in visual conditions, because I'm looking for traffic and things like that.

DR. STRAUCH: So your statement is -- your

testimony is that the statement to the first officer to stay heads-up was not please go out of the cockpit now and look outside?

THE WITNESS: No.

DR. STRAUCH: But be alert?

THE WITNESS: No. That's correct.

DR. STRAUCH: You were telling him to be alert for --

THE WITNESS: For windshear.

DR. STRAUCH: Okay. In your testimony to Ms. Mills' questions, you said that your decision to go around was based on several factors. Could you repeat what those factors were?

THE WITNESS: The heavy rain, loss of visibility, the things adding up. I got the steady state cross wind and I believed that there would be a wet runway. We're trained any time that if you see something you don't like, you go ahead and go missed approach. There's no reason to press down to the decision height or MDA, which is a lot of times the case in the wintertime when you get bad visibilities. There's no reason to go down there if you don't know that you're going to see something when you get there.

DR. STRAUCH: Didn't you receive a transmission on the cross winds before you got to that point?

THE WITNESS: I believe we'd received one other steady state winds out of the east, southeast.

DR. STRAUCH: Were you also aware before you began the approach that the runway would be wet?

THE WITNESS: No, I was not.

DR. STRAUCH: At what point did you become aware?

THE WITNESS: I just assumed that when it started to rain on us.

DR. STRAUCH: And you also said that it was because you lost visual contact with the runway?

THE WITNESS: Yes, sir.

DR. STRAUCH: But if you were executing an ILS approach, wouldn't you have waited until decision height?

THE WITNESS: No, not necessarily. I could look out and see that we weren't going to be able to see out. And, furthermore, we were in a position of something was happening that was unexpected. And I felt that the safe and prudent thing to do would to be to get out of there.

DR. STRAUCH: When you began -- when you turned the wipers on for the first officer, what was the rain intensity at that point?

THE WITNESS: I believe it was what I would consider a light rain.

DR. STRAUCH: At what point thereafter did the

intensity change?

THE WITNESS: It didn't seem like very long, but I'm not sure exactly how many seconds.

DR. STRAUCH: If you look at Exhibit 13-A, which is the Aircraft Performance Group Report, it appears --

CHAIRMAN HAMMERSCHMIDT: I don't have that. I'll have to get that.

BY DR. STRAUCH:

DR. STRAUCH: The information would also be in 12-A in the CVR. There was approximately -- I think I have 17 seconds between the time that you called that you put on the windshield wipers and so announced it to the first officer to the time you called for go around. Seventeen seconds seems pretty long considering your description of the intensity of the rain.

How long do you estimate that you were in this intense rain before you gave the command to go around?

THE WITNESS: I don't recall in number of seconds. It didn't seem like that long.

DR. STRAUCH: If you would refer to Exhibit 13-A, page 6. It's the third paragraph on the page. The FDR engine pressure ratio appears to indicate the power increase markedly at approximately 1842.15 or about 21 seconds before the first impact sound. Later on in the paragraph, it

appears that even beyond that occurred about 4.6 seconds before impact. And that gives us 16 seconds or so between max power and the power beyond max power.

Could you describe what the airplane was doing in that 16 seconds, because it seems like an awfully long time?

THE WITNESS: Well, that's a fact. I recall that the airplane began climbing out, and I saw the first cues of what appeared to be a normal go around. I talked to approach control. As I had stated, at some point the rug was pulled out from under us.

DR. STRAUCH: If you would refer to page 38 of -- no, I'm sorry.

CHAIRMAN HAMMERSCHMIDT: Dr. Strauch?

DR. STRAUCH: Yes.

CHAIRMAN HAMMERSCHMIDT: We have gone on for about an hour and a half here. In the interest of Captain Greenlee and I guess all of us, I think at some point here, I would like to take about a ten-minute break. So when you get to the right moment in your questioning, let me know.

DR. STRAUCH: I probably have about ten more minutes, sir.

CHAIRMAN HAMMERSCHMIDT: About ten more minutes? Okay. Thank you. Continue.

BY DR. STRAUCH:

DR. STRAUCH: If you would refer to page 34 of Exhibit 13-A.

THE WITNESS: I'm sorry. Did you say 34?

DR. STRAUCH: Yes. And also page 36. On page 36, admittedly it takes some time to interpret. But if you look at the trace of the control column, it appears as if the control column went from aft to down. I would say just eyeballing it about six seconds or so before impact.

Wouldn't pushing the control column down be counter to USAir's windshear turning procedures? And according to your testimony, you knew at this point that you were in a windshear. Why was the control column pushed down at that point, sir?

THE WITNESS: I don't recall that the control column was pushed down. If you're implying that somehow we pushed the control column down and hit the ground, I can tell you quite factually that did not happen. It's not inconsistent with what I read about shears of this magnitude. The aircraft will pitch down pretty severely when you fly into an extreme tail shear.

I recall pulling up on the control surface. I can't read these charts and graphs. I can just tell you what we saw and what we know that happened.

DR. STRAUCH: Captain, I would like to go back now

to the beginning of your day and get us out of discussion of the flight. According to your statement, you arose at 4:55 a.m.

THE WITNESS: I believe about 5:00.

DR. STRAUCH: At the point of the accident, you had been up for 12 or 13 hours. Were you tired at all?

THE WITNESS: I don't recall being tired.

DR. STRAUCH: You were alert the whole flight and awake and so on?

THE WITNESS: I'm sorry?

DR. STRAUCH: You were alert and awake the entire flight?

THE WITNESS: Yes, sir.

DR. STRAUCH: I would like to ask you some questions now based on USAir's information distributed to pilots on windshear. If you would refer to Exhibit 2-F, page 10. It would be the second paragraph on the page. Where it says and I'm quoting now from the second sentence, "Additionally during high stress situations..."

MR. TULLY: What page is that?

DR. STRAUCH: That's page 10 or it would be page 1826-1.

MR. TULLY: Thank you.

BY DR. STRAUCH:

DR. STRAUCH: "Additionally during high stress situations, pilot instrument scan typically becomes very limited in extreme cases to only one instrument." Do you feel this happened to you or First Officer Hayes?

THE WITNESS: No, I do not.

DR. STRAUCH: Your scan did not deteriorate, degrade because of stress throughout the flight?

THE WITNESS: I don't believe so. When you've got 23,000 hours or so in a cockpit between us, I really don't see that as being the problem.

DR. STRAUCH: If you would go to page 26 of the same exhibit, and there are several page 26s. It's 26 on the bottom, and on the top it's page 65.

THE WITNESS: Sixty-five?

DR. STRAUCH: Yes, at the top, it would be page 65. At the bottom, it's page 26. At the bottom of the last paragraph and this would be starting about six lines up. "In most windshear accidents, several cues, LLWAS, weather reports, visual signs were present that would have alerted the flight crew for the presence of a windshear threat. In all instances, however, these cues were either not recognized or not acted upon."

In point of fact, in this accident, there were LLWAS alerts, there were visual signs, there were reports

from other aircraft. Does this paragraph explain or account for any of the facts that you know them of your involvement in this accident?

THE WITNESS: In fact, the signs -- you mention reports from other aircraft were quite smooth with no shear. The cues that were available to me at the time indicated to me that up until it began to rain very heavy, the cues were not sufficient. When it did, I executed a go around.

DR. STRAUCH: Now, those cues again, were LLWAS reports, weather radar, PIREPS and your own visual observations.

THE WITNESS: That's correct.

DR. STRAUCH: Were these cues equally important to you or was some more important than other?

THE WITNESS: Obviously, the rain was a primary importance, the severity. When you are flying, you are making judgments based upon several cues. And in your experience and your judgment, they add up to indicate a particular course of action and that's what you do.

DR. STRAUCH: What information did you -- that if you had it, would have allowed you to make a decision to abandon the approach of the cues that you mentioned of the information that you had?

THE WITNESS: You said what information did I not

have?

DR. STRAUCH: Yes. That would have said okay, let's go around.

THE WITNESS: Well, that would be kind of a speculation. It would depend on a particular scenario with all the cues available to me to make my decision. If you could ask a specific type of cue, if this, then that, then I could probably answer the question a little better for you.

DR. STRAUCH: Captain, how often in convective activity, have you abandoned approaches?

THE WITNESS: Abandoned approaches?

DR. STRAUCH: Yes, as in your capacity as captain of USAir?

THE WITNESS: I would say several times. I don't recall individual times.

DR. STRAUCH: Have you ever had a situation where a first officer has said, I think we should go around?

THE WITNESS: No.

DR. STRAUCH: When you didn't bring it up?

THE WITNESS: That's correct.

DR. STRAUCH: Did you feel comfortable with First Officer Hayes?

THE WITNESS: Yes, sir, I do.

DR. STRAUCH: What made you feel comfortable with

him?

THE WITNESS: We seemed to form a real good working relationship right away. There was no question in my mind that if he saw something he didn't like, he would bring it up. He flew a good airplane.

DR. STRAUCH: So, therefore, his confidence as a pilot, you felt very confident?

THE WITNESS: Yes, sir.

DR. STRAUCH: Thank you, Captain. I have no further questions.

CHAIRMAN HAMMERSCHMIDT: Thank you, Dr. Strauch. As I indicated, I would like to take about a ten-minute break. And let's try to keep it to ten minutes. Return with the questioning of Captain Greenlee. And then when we conclude with that, we will break for lunch and then resume the afternoon with questioning of the first officer.

Thank you.

(Whereupon, a brief recess was taken.)

CHAIRMAN HAMMERSCHMIDT: Please come to order. Captain Greenlee, I'll remind you you are still under oath. We will now go to the parties for questioning. Beginning with Mr. Donner and the Federal Aviation Administration.

MR. DONNER: Thank you, Mr. Chairman. I just have a few brief questions for Captain Greenlee.

Sir, is it USAir procedure for the pilot not flying to make altitude call outs to the pilot flying on an ILS approach?

THE WITNESS: Yes, it is.

MR. DONNER: And can you recount that procedure for us, please?

THE WITNESS: Yes. You would make a call on any approach out of a 1,000 feet above the ground. And then you would make another call out at 500 feet with the bug speed plus, the sink rate, and whether or not there are any flags on an ILS approach.

MR. DONNER: And did you make those call outs during the approach?

THE WITNESS: I made the 1,000 foot call. And at the 500 foot call, at that point, that was not made because we were -- I was in the go around, getting ready to command the go around.

MR. DONNER: Can I refer you to Exhibit 12-A. I'm sorry, I think that's not the right exhibit. Thirteen-B, I'm sorry. Thirteen-B is a graph depicting your flight data recorder and your cockpit voice recorder recordings and integrating them into one picture.

I believe if you look roughly in the center of the page at time 1842 and 14, is that your go around call?

THE WITNESS: Yes, sir.

MR. DONNER: Can you read what altitude you were at at that time?

THE WITNESS: No, sir, I can't.

MR. DONNER: I believe the line goes right through the G on the word "go" to the right?

THE WITNESS: This would show --

MR. TULLY: Mr. Chairman, could this mike be turned on?

CHAIRMAN HAMMERSCHMIDT: Try it now.

MR. TULLY: This is the second witness to whom Captain Greenlee has indicated he's not able to read the data graph.

MR. DONNER: He hasn't indicated that yet, sir.

CHAIRMAN HAMMERSCHMIDT: Well, the previous questions were off a set of data that Captain Greenlee was not expected to be prepared for, which was, I believe, Exhibit 13-A. And I can understand the problem there. But on this one, he's had a chance to brief himself on this and we have phraseology right on it. So that seems like a reasonable question to me.

MR. TULLY: Okay.

MR. DONNER: Captain Greenlee, can you tell us what altitude you were at according to this chart when you

called for the go around?

THE WITNESS: According to the chart, it shows around 950 feet.

MR. DONNER: Yes, sir. And what's the field elevation approximately at Charlotte?

THE WITNESS: Seven hundred and forty feet. Something like that.

MR. DONNER: That's correct. How high would that put you above the terrain at Charlotte?

THE WITNESS: That would put us at 200 feet.

MR. DONNER: Thank you. Can you recount for us the standard missed approach procedure at Charlotte for the approach to the ILS to 18 right?

THE WITNESS: As I recall, the standard missed approach procedure is runway heading to three, and then you intercept a particular radial of another navigational aid.

MR. DONNER: Are you aware, sir, that a non-standard missed approach procedure voids all of your obstruction and terrain clearance guarantees?

THE WITNESS: Yes, sir, I am.

MR. DONNER: I have no more questions, sir.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Donner. National Air Traffic Controllers Association?

MR. PARHAM: Mr. Chairman, we have no questions.

Thank you.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Parham. Honeywell?

MR. THOMAS: Mr. Chairman, we have no questions. Thank you.

CHAIRMAN HAMMERSCHMIDT: Thank you. Airline Pilots Association.

MR. TULLY: Could I go last, please, around the questioning?

CHAIRMAN HAMMERSCHMIDT: We'll let you go next to the last --

MR. TULLY: Okay.

CHAIRMAN HAMMERSCHMIDT: -- with USAir going last. Douglas Aircraft Company.

MR. LUND: No questions.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Lund. Pratt & Whitney.

MR. YOUNG: No questions.

CHAIRMAN HAMMERSCHMIDT: Thank you. Association of Flight Attendants?

MS. GILMER: Yes. Thanks, Mr. Chairman.

Captain Greenlee, once you've completed your post impact procedures in the cockpit, what is your training for assisting in the evacuation in the cabin?

THE WITNESS: Under a normal aircraft evacuation, there are procedures that I do in the cockpit. The first officer would go back to assist the flight attendants in any way he can. And then I would be, after securing the aircraft, the last one out under a normal evacuation. For instance, smoke or something on the runway. Something like that.

MS. GILMER: Once you completed your duties in the cockpit, then you would assist as needed. Right?

THE WITNESS: Yes, ma'am.

MS. GILMER: And just as a matter of clarification, you stated that you assisted Rich, the A flight attendant, in pulling Shelly, the C flight attendant, from the wreckage?

THE WITNESS: No, ma'am. My statement was that once I was out, I saw all four of us there. I assisted First Officer Hayes as Rich assisted Shelly from the aircraft.

MS. GILMER: Thank you very much. No further questions.

CHAIRMAN HAMMERSCHMIDT: Thank you. International Association of Machinists.

MR. GOGLIA: We have no questions, Mr. Chairman.

CHAIRMAN HAMMERSCHMIDT: Thank you. Dispatchers

Union.

MR. SCHUETZ: Mr. Chairman, we have no questions for Captain Greenlee.

CHAIRMAN HAMMERSCHMIDT: Thank you. The National Weather Service.

MR. KUESSNER: We have no questions, sir.

CHAIRMAN HAMMERSCHMIDT: Airline Pilots Association.

MR. TULLY: Thank you.

I just have a few points to clear up with you, Captain Greenlee. I'll be brief. I just want to clarify your decision to make the missed approach at the point you did. You stated that you executed the missed approach because of the heavy rain and some other cues that indicated you just didn't like this picture. At the time that you elected to make the go around, had you determined that you were under the influence of a microburst windshear?

THE WITNESS: No, sir.

MR. TULLY: So you elected to execute a normal go around procedure at that point?

THE WITNESS: Yes, sir.

MR. TULLY: When it was clear to you that your airplane was in trouble and possibly under the influence of a microburst windshear, what did you do?

THE WITNESS: I had the firewall power and I executed the procedure.

MR. TULLY: Thank you. The other item I would like to clear up is this business of the approach briefing. I would like you to go to Exhibit 12-A, please. Would you please look down at the time of 1835.06 on page 23? And the time of 1836 and 06 on CAM-2, and I believe that would be the co-pilot, it says, "What runway did he say?" And what is your response?

THE WITNESS: Eighteen right.

MR. TULLY: Would you please turn now to page 25. At the time of 1835 and 20 -- well, let's see. I want 1835 and 27. I'm sorry. It's page 24, Captain Greenlee.

THE WITNESS: Okay.

MR. TULLY: I believe Ms. Mills indicated to you that she had examined the CVR transcript and could find no reference to the required approach briefing of inbound course and frequency. Could you please read the statement at 1835 and 27?

THE WITNESS: "All right. That's 111-3 and 181."

MR. TULLY: What do those items refer to?

THE WITNESS: Those are the frequency and the localizer settings.

MR. TULLY: So, in deed, the record does reflect

accurately your briefing of the required elements in bound course and frequency?

THE WITNESS: Yes, sir.

MR. TULLY: Would you please go to page 28. At the time of 1839 and 02 at the bottom and over to the next page, the conversation starts, "If we have to bail out..."

THE WITNESS: Yes, sir.

MR. TULLY: "It looks like we bail out to the right." And I believe the response from the first officer was "Amen."

THE WITNESS: That's correct.

MR. TULLY: Does that indicate it's clear to First Officer Hayes that he's in agreement with your decision to go around to the right in the event there is a reason to go around?

THE WITNESS: Yes, sir.

MR. TULLY: Would you please go back to page 24. At a time of 1835 and 48, do you see where it says "landing data EPER?"

THE WITNESS: Yes, sir.

MR. TULLY: "An unintelligible," and then 87 for 122?

THE WITNESS: Yes, sir.

MR. TULLY: Do you recall Dr. Strauch's question

in regard to the required approach briefing element of V-ref speed?

THE WITNESS: Yes, sir.

MR. TULLY: Does the record reflect that you briefed V-ref speed?

THE WITNESS: Yes, sir. I believe that would -- the thing in the parenthesis would be 82.

MR. TULLY: Would you please go to Exhibit 2-D, page 1.

THE WITNESS: Two-D?

MR. TULLY: Two-D. Do you recognize that page?

THE WITNESS: Yes, sir, I do.

MR. TULLY: I've been keeping track here of some of these approach briefing elements. We can mark them off as we go here, if you like. Do we see in the transcript the name of the approach?

THE WITNESS: Yes, sir.

MR. TULLY: Do we see the inbound course in frequency?

THE WITNESS: Yes, sir.

MR. TULLY: Is it your testimony you were at the final approach fixed altitude when you received the ILS clearance?

THE WITNESS: That's correct.

MR. TULLY: Is it your testimony that you briefed First Officer Hayes on the DH?

THE WITNESS: Yes, sir.

MR. TULLY: Did you discuss an initial altitude with him in the event of a go around?

THE WITNESS: Yes, sir.

MR. TULLY: In addition, it requires some additional briefing elements here for visual approaches. The runway of intended landing. Did you brief him on the runway of intended landing?

THE WITNESS: Yes, sir.

MR. TULLY: And once again, it requires inbound course and frequency. Is that correct?

THE WITNESS: Yes, sir.

MR. TULLY: Continue down the page. It says, this shall be briefed for all approaches if applicable. Was there any applicable information from the airport advisory page?

THE WITNESS: No, sir.

MR. TULLY: Was there any applicable information on breaking action?

THE WITNESS: No, sir.

MR. TULLY: Was there any applicable information on windshear?

THE WITNESS: Yes, sir.

MR. TULLY: Is it not the case then, Captain Greenlee, that you briefed, although not contiguously, every required element of the approach briefing as prescribed by the USAir Flight Operations Manual?

THE WITNESS: Yes, sir.

MR. TULLY: I have no further questions.

CHAIRMAN HAMMERSCHMIDT: Thank you, Captain Tully. USAir.

MR. SHARP: We have no questions, Mr. Chairman.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Sharp.

CHAIRMAN HAMMERSCHMIDT: Any other questions from the technical panel? Mr. Feith.

MR. FEITH: Captain Greenlee, just several questions. In your experience either as a first officer or a captain on the DC-9, have you ever had an airborne windshear alert?

THE WITNESS: No, sir.

MR. FEITH: You had described in previous testimony that at some point you got on the controls during the course of taking corrective action?

THE WITNESS: Yes, sir.

MR. FEITH: Do you recall what point that was?

THE WITNESS: I recall it being just maybe in the

last five seconds or so when it was clear that the airplane was clearly in trouble.

MR. FEITH: Was that prior to you making visual contact with the trees or do you recall?

THE WITNESS: I don't recall one way or the other.

MR. FEITH: And in previous testimony, you had stated that while in bound when you were still probably around 15 miles out, you had observed a cell that you indicated was red.

THE WITNESS: Yes, sir.

MR. FEITH: In the vicinity of the VOR or near the airport.

THE WITNESS: Yes, sir.

MR. FEITH: Do you recall if that was the same cell or did you correlate that with being the same cell, the weather event that you flew into during the course of the approach?

THE WITNESS: Are you asking do I think that we flew under the same cell I was looking at?

MR. FEITH: Right.

THE WITNESS: No, sir, I do not.

MR. FEITH: So the cell that you had initially observed 15 miles out was still in that probably same proximity?

THE WITNESS: Yes, sir.

MR. FEITH: And that this was a different event?

THE WITNESS: Yes, sir, I believe it was.

MR. FEITH: Just switching gears a little bit. As far as your pre-departure paperwork and passenger counts, what's the procedures as far as verifying people sitting in the back versus what the paperwork reflects?

THE WITNESS: I always require an accurate count to verify a weight and balance to make sure it's correct.

MR. FEITH: How do you get that count?

THE WITNESS: From the agent and the flight attendants.

MR. FEITH: Then what does the paperwork reflect? Does it reflect that physical count or is it --

THE WITNESS: Yes, sir. I always make sure that the weight and balance reflects the actual count in the aircraft.

MR. FEITH: What passenger count shows up on your paperwork that comes up from dispatch?

THE WITNESS: It shows -- if it doesn't show the actual count, then I call them. The weight and balance is generally data linked to us. If it shows something other than what we have, then I call them and get it changed before we depart.

MR. FEITH: So you would resolve the discrepancy with a physical count?

THE WITNESS: Yes, sir.

MR. FEITH: Do you know if that count includes infants?

THE WITNESS: I don't know.

MR. FEITH: And typically if the flight attendant does make a count in the back, they count infants in that total count?

THE WITNESS: Sir, I'm not really sure. I believe they will count people in seats. And I'm not sure if it's a lap child, I don't know if that counts for more than one or not. I'm not sure about that procedure.

MR. FEITH: Thank you. I have no further questions.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Feith. Mr. Laynor.

MR. LAYNOR: Just one or two, Captain.

I want to go back to your windshear training program. I think you said you'd been flying for USAir since 1985?

THE WITNESS: Yes.

MR. LAYNOR: Do you remember when a windshear training program was implemented approximately?

THE WITNESS: No, sir, I don't.

MR. LAYNOR: How about when you upgraded to captain of the DC-9, did you have windshear training during that upgrade?

THE WITNESS: Yes, sir, and I can, as a matter of fact, remember that in my initial training of the DC-9.

MR. LAYNOR: So it was before 1990?

THE WITNESS: Yes, sir.

MR. LAYNOR: And I think you said that involved some classroom training and some simulator exercises?

THE WITNESS: Yes, sir.

MR. LAYNOR: Could you put any kind of time, how much classroom training? An hour or five hours?

THE WITNESS: I would believe it would be a couple of hours each recurrent. I'm not really sure.

MR. LAYNOR: That's each recurrent. So since you've been a captain of the DC-9 since 1990, every time you go through a recurrent training, you get some refresher?

THE WITNESS: That's correct. And also through the Flight Crew View and the industry periodicals that I read.

MR. LAYNOR: Typically, how many simulator scenarios might you be given in going through training?

THE WITNESS: I'm not really sure. I would say

since you usually always get one for each pilot, so that he can experience it flying, then there would be two.

MR. LAYNOR: Are you made aware ahead of time that you're going to have a windshear scenario or is it sprung on you as a routine?

THE WITNESS: It's sprung on us at the time usually towards the end, but we have a lot of requirements from the FAA that we have to do in a simulator. Required elements of a check ride. So you know you're going to get it some time.

MR. LAYNOR: So you probably get one simulator of windshear encounter when you go through recurrent training?

THE WITNESS: Yes, sir.

MR. LAYNOR: Do they vary? Are they usually during a landing approach or a take off or go around?

THE WITNESS: I've seen them vary. I've had them both at take off and approach.

MR. LAYNOR: And when you had these encounters, does the simulator incorporate the windshear alerting device that you have in your airplane?

THE WITNESS: I don't recall one way or the other whether I've had an opportunity to see that operate or not.

MR. LAYNOR: You mentioned the Flight Crew View. I notice that this windshear topic was covered immediately

before this accident. Actually, a couple of months. How long before the accident had you received that?

THE WITNESS: That morning.

MR. LAYNOR: That morning.

THE WITNESS: I got it out of my mailbox when I got to Pittsburgh that morning.

MR. LAYNOR: So you had not had the benefit of being able to read it and such. Have you had similar coverage of the windshear issue --

THE WITNESS: Yes, sir.

MR. LAYNOR: -- in previous issues?

THE WITNESS: Yes, sir.

MR. LAYNOR: How are they distributed? Are they just in your mailbox?

THE WITNESS: In my mailbox.

MR. LAYNOR: And is there any follow up on the part of the company training to ascertain how much you digest in the material?

THE WITNESS: In the form of a test?

MR. LAYNOR: Well, in any form.

THE WITNESS: I don't think so.

MR. LAYNOR: One final question. In a number of the previous windshear accidents -- and I'm not stating that it's true here -- but there seems to be a reluctance to go

to maximum power and set power. Is there a reason for this in your training?

THE WITNESS: I would have no reluctance to go to maximum power, no.

MR. LAYNOR: How about just during any routine period of extremist? There isn't any reluctance to go to the power?

THE WITNESS: I never really noticed that.

MR. LAYNOR: Thank you, Captain Greenlee.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Laynor. Mr. Clark.

MR. CLARK: Captain Greenlee, you testified earlier that when you were -- I'm assuming you were inside the outer marker. You could see the weather to the south of the airport. My question is was that a visual observation or weather radar or both?

THE WITNESS: I would suspect that it was a radar observation. I don't recall one way or the other which I was looking at.

MR. CLARK: On the weather radar, could you describe the colors or do you remember?

THE WITNESS: It was pretty much just the same as what we had seen on the way up.

MR. CLARK: When you were 15 southwest?

THE WITNESS: Yes, sir.

MR. CLARK: Looking up, you saw a little bit of red?

THE WITNESS: Yes, sir.

MR. CLARK: And that perception didn't change on the way in?

THE WITNESS: I recall it being small and very symmetric.

MR. CLARK: How do you determine that you're looking out on a weather radar and the weather is south of the airport? Or how do you determine the relativity of what you see on the radar scope to your relative position to the --

THE WITNESS: In that case, I was using the VOR at the field and judging my situational awareness based on the bearing pointer to the VOR and the DME equipment.

MR. CLARK: Did you get a DME to -- you knew the DME to the airport or to the VOR?

THE WITNESS: To the VOR, yes.

MR. CLARK: Subtract off that distance to the airport?

THE WITNESS: Yes, sir.

MR. CLARK: And then look at your range on the weather radar?

THE WITNESS: Yes, sir.

MR. CLARK: With that in mind, did you ever see any weather that was closer -- two miles closer, up towards the approach end or between it?

THE WITNESS: No, sir.

MR. CLARK: No colors appear?

THE WITNESS: No, sir.

MR. CLARK: When the heavy rain hit, as you were approaching that area or just before the rain hit, did you have any indication you were going to be entering heavy rain from the visual perception?

THE WITNESS: No, sir.

MR. CLARK: And nothing showed up on the radar?

THE WITNESS: No, sir.

MR. CLARK: You entered the rain. I think you described you entered the rain, and it was light and then became very rapidly much more heavy.

A It was light initially, and then it became after so many seconds, became heavy almost instantaneous. It wasn't a gradual increase in the severity of the rain. It was an instantaneous dumping it seemed like.

MR. CLARK: Did you look at your weather radar at that time? Would you expect to see when you're right in the middle of weather, do you expect to see that on the radar or

is it --

THE WITNESS: If you were right in the middle, you may not see that at that close.

MR. CLARK: Once you started the go around procedure, who pushed the power up?

THE WITNESS: On the go around?

MR. CLARK: Right.

THE WITNESS: First Officer Hayes did.

MR. CLARK: Who raised the flaps?

THE WITNESS: I did.

MR. CLARK: You raised the flaps.

THE WITNESS: At his command.

MR. CLARK: Do you remember the target E-PUR for a go around?

THE WITNESS: I recall it was 1.93.

MR. CLARK: Would there be -- well, I'll save my questions for him, since he raised the power. As a non-flying pilot then would you be monitoring what he was doing with the power levers?

THE WITNESS: Yes, sir.

MR. CLARK: Would there be a reason that the power level was not set at 1.93?

THE WITNESS: I believe that he pushed them up to the target, and as I saw him pushing them up and the other

things that you look at, the nose coming up, the turn starting, and then communicating with ATC, at some point, we would fine tune that, and I just don't believe we ever got to that point.

MR. CLARK: In the early stages of the go around, was there any sense of urgency on your part?

THE WITNESS: A sense of urgency? As did we feel that there was a threat, that there was a problem?

MR. CLARK: Well, for whatever prompted you to make a go around, was there a sense of urgency that you were -- let me rephrase it. Was there any sense of urgency to hurry with the procedures at that point, to expedite the procedures once you call a go around?

THE WITNESS: I felt that it was a normal go around situation, and I would not hurry a procedure any faster than I normally would execute a missed approach. I don't think it would be safe and prudent to hurry something that you are accustomed to accomplishing. So in my recollection, it was a normal missed approach, a normal go around.

MR. CLARK: So in that sense, in your perception, it was not an urgent situation at that point?

THE WITNESS: At that point, no. I didn't realize a hazard at that point.

MR. CLARK: I have no further questions. Thank you.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Clark. Mr. Schleede.

MR. SCHLEEDE: Yes, Captain Greenlee. In the first part of your testimony, you talked about the pre-flight check of the windshear warning, airborne windshear warning.

THE WITNESS: Yes, sir.

MR. SCHLEEDE: I believe you testified that it checked okay. Had you ever in the line operations encountered a faulty check during that particular pre-flight check?

THE WITNESS: On a few occasions.

MR. SCHLEEDE: And what were the indications?

THE WITNESS: There's a light that says, "windshear fail."

MR. SCHLEEDE: What color is that?

THE WITNESS: I don't recall what color it is.

MR. SCHLEEDE: What was the corrective action for those types of things?

THE WITNESS: I wrote it up.

MR. SCHLEEDE: Was the airplane dispatched?

THE WITNESS: After it was fixed, yes.

MR. SCHLEEDE: Do you recall when the system was installed in the airplane?

THE WITNESS: No, sir, I don't.

MR. SCHLEEDE: In response to a question by Mr. Laynor about that system, I thought I heard you say you had never seen it operate or you never encountered an operation of it in flight. Is that correct?

THE WITNESS: Yes, sir. I've never had to single off in flight, no.

MR. SCHLEEDE: I may have missed your statement about your training. I thought you said you couldn't recall if you had seen it in a simulator.

THE WITNESS: I know it's in the simulator, but I couldn't recall one way or the other when I had seen it or in conjunction with a particular maneuver or simulator session.

MR. SCHLEEDE: When was the last time you went through a simulator session?

THE WITNESS: I believe it was in January.

MR. SCHLEEDE: Did you get windshear encounters at that time?

THE WITNESS: I'm pretty sure I did, but I don't recall one way or the other.

MR. SCHLEEDE: I guess a direct question, well,

what specific training have you received in the use of the airborne windshear alerting system?

THE WITNESS: Well, I've obviously read the manuals. And when they initially installed them, we went over in recurrent. I recall that. Basically, it's a pretty straightforward system.

MR. SCHLEEDE: That was recurrent ground school?

THE WITNESS: Yes, sir.

MR. SCHLEEDE: Another area, what is USAir's training for windshear avoidance for the captain's role when the first officer is flying? Do you take over at any point or --

THE WITNESS: As far as the emergency procedures?

MR. SCHLEEDE: Yes, sir. What is your escape maneuver?

THE WITNESS: It's divided between pilot flying and pilot not flying. So in that case, as I had mentioned in a case where you had the time, you would call out the sink rates and the air speeds.

MR. SCHLEEDE: The first officer in this case would manipulate the controls and the power lever?

THE WITNESS: Yes, sir, in that case.

MR. SCHLEEDE: I'm not sure if you were asked about your training in CRM. What type of training, both

ground and simulator training, have you received in cockpit resource management?

THE WITNESS: My first training in CRM was a three-day course called "Captain's Development," that they started some years back for people who were getting ready or some time in the next six months to a year to check out as captain.

It was basically three days of lectures and films with Dr. Sellers, I believe, a psychologist, about personalities and how to identify certain things, key words. It's been a few years.

The relationship between the captain and copilot to better the communication. We also had people from other parts of the company come in and tell us what their jobs were. For instance, some passenger services and things like that to know what they were doing at the same time while we were doing our job.

The next thing we had was a one-day course. It was specifically CRM oriented with lectures and some films about some aircraft accidents that were both pro and con, where they had been good or bad CRM. We also had some exercises in team building and things like that. That was attended at the time by pilots and there was some flight attendants there. There were also some people from some

companies in the area that were associated with the airline.

There were also some notebooks that we had. We get it now in recurrent. There's a block of time in recurrent. And also, we have what's called a line oriented flying training, where one of my simulator sessions each year is devoted to flying a line type of trip instead of going in and accomplishing certain mandatory maneuvers that you have to do once a year. That middle simulator is dedicated to the crew resource management. You're filmed and you watch how you interact with certain problems with the first officer and things like that.

MR. SCHLEEDE: And how often have you gone through that?

THE WITNESS: I've had one LOFT. I was scheduled for one in late July, and I had one last year.

MR. SCHLEEDE: These three days and one-day courses you talked about are all ground school type of settings?

THE WITNESS: Yes.

MR. SCHLEEDE: So you've been through one LOFT scenario. What about you mentioned recurrent, is there anything beyond the LOFT in recurrent training?

THE WITNESS: In each recurrent, we have a separate block for CRM. And there's separate instructors

that come in for that.

MR. SCHLEEDE: And that's in the simulator?

THE WITNESS: I'm sorry. That's in recurrent training in grounds school.

MR. SCHLEEDE: In grounds school, okay. A completely different subject. The subject of the passenger load and infant counts. I think you said you weren't sure how that was done by the cabin attendants on counting infants or the lap babies?

THE WITNESS: That's correct.

MR. SCHLEEDE: Are you saying you don't know what the procedure is or you don't know how they do it? Do you know what the procedure is for it?

THE WITNESS: I believe that they count people in seats.

MR. SCHLEEDE: Does the cockpit become aware if there's unticketed infants in the back?

THE WITNESS: No, sir. It wouldn't change operationally how the flight was conducted. But, no, we're not given that information.

I happen to -- I like to stand in the doorway when people come on. So I would have information if I saw somebody get on without a seat or something like that.

MR. SCHLEEDE: But it's not a procedure for the

lead flight attendant to report to you of unticketed --

THE WITNESS: No, not to my knowledge.

MR. SCHLEEDE: I'm sorry. Back to the training again. You mentioned cabin attendants at this one ground school. Do you have any specific training in recurrent that involves resource management with the cabin attendants, coordination with the cabin attendants in emergency procedures?

THE WITNESS: We talk about some problems. There's also a tape that we see in recurrent that was done in response to a problem they had on an airplane that was a direct result of bad communication between back and front. So we see it's a reenactment of an incident.

MR. SCHLEEDE: Another subject. About your testimony on the USAir policy for avoidance of thunderstorms, low altitude. I believe you mentioned the five mile criteria.

THE WITNESS: Yes, sir.

MR. SCHLEEDE: How in practice do you comply with that when you're operating to avoid thunderstorms by five miles?

THE WITNESS: I comply with the procedure.

MR. SCHLEEDE: In using your airborne radar or --

THE WITNESS: The airborne radar and if I see --

visually seeing things or talking to somebody ahead of me, or if I get a heads-up from a -- there are times when we will get a heads-up from a controller and he says, "we're seeing this" or "we're seeing that," I would take that into consideration.

MR. SCHLEEDE: Along that line, what type of information would that be from a controller? Would it be a level, report of a VIP level?

THE WITNESS: Yes, generally it's a report of something. We're showing a level whatever.

MR. SCHLEEDE: If you receive a report of a VIP level 4 on your final approach course near the outer marker, would you consider that a thunderstorm that you have to avoid?

THE WITNESS: Absolutely.

MR. SCHLEEDE: How about a level 3?

THE WITNESS: Absolutely.

MR. SCHLEEDE: If you'd been advised that there was a level 3 on final at Charlotte, would you have changed your approach decisions?

THE WITNESS: Yes, sir.

MR. SCHLEEDE: One last area about your Air Force training or the Air Force relationship. Are there any differences in a general sense between the Air Force and

USAir attitudes regarding standardization and evaluation check list compliance?

THE WITNESS: No, sir. As a matter of fact, more and more in the last few years our check lists have begun to resemble the type of check lists that we use in the Air Force. And, in fact, in the Reserves, since most of the pilots in the squadron are airline pilots.

MR. SCHLEEDE: Did you in the Air Force receive aviation physiology training?

THE WITNESS: Yes, sir.

MR. SCHLEEDE: Did that training include descriptions of illusionary effects of acceleration?

THE WITNESS: Yes, sir. And as a matter of fact, I'm the safety officer at the squadron, at my squadron. I've studied several accidents involving primarily F-16 aircraft that resulted in accidents.

MR. SCHLEEDE: In relation to acceleration and allusions of the sensory organs?

THE WITNESS: Yes, sir.

MR. SCHLEEDE: What are you taught or aware of that you do to avoid becoming a victim of such allusions?

THE WITNESS: Well, you're taught as when you're taught basic instruments to stay on the gauges. The problem that is recurrent and some of the fighter accidents is that

the instrument flying in a fighter is just not as easy.

The reason being in the F-16, for instance, you have a very small attitude indicator. You have a heads-up display, which is good, but a lot of times at night or in poor visibilities with different things, you get glare on the hub and things like that.

The accelerations are much greater in the airplane. And you're also turning your head a good deal. And that is contributed to several type of accidents. What happens is a person loses their situational awareness because of some of these accelerations and never regains it.

There have been instances of people trying to rejoin on trains at night and in the clouds during the day and problems like that. In the transport type aircraft, you have a huge attitude staring you right in the face, and you don't have the accelerations. And you also typically have much more experience in instrument flying than you would in the fighter community.

A lot of high-time fighter pilots might have 3,000 hours or 4,000 hours, but not a whole lot of weather experience, because you just don't fly a lot of times in bad weather in the fighter community.

MR. SCHLEEDE: This may not be a fair question.

Do you know what the potential allusion would be for pitching the aircraft up and accelerating longitudely forward?

THE WITNESS: There could be -- typically, the allusion could eventuate a particular feeling. But in this case, with the amount of instrument time that you have and really not the types of accelerations experienced in some of the Air Force accidents, I wouldn't think it was a factor.

MR. SCHLEEDE: Thank you very much, Captain Greenlee.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Schleede. Captain Greenlee, I have just five quick questions for you.

Now, the first is a repeat of a question that Dr. Strauch asked, but I would like to ask it again. Would you say that flight crew fatigue played any role whatsoever in this accident?

THE WITNESS: No, sir.

CHAIRMAN HAMMERSCHMIDT: Thank you. Now, the second question I have is in reference to your go around technique and training. Have you ever been trained that when you brief in the cockpit during your approach that you will make a turn away from the runway heading, that you should communicate that intention in advance to the Air Traffic Control tower?

THE WITNESS: Yes, you should.

CHAIRMAN HAMMERSCHMIDT: And you may have already answered this, but what was the reason on this approach that that was not accomplished?

THE WITNESS: It was in the interest of safety of flight. Well, I'm sorry. Do you mean why didn't we tell the approach controllers we were going to the right until we did it?

CHAIRMAN HAMMERSCHMIDT: Earlier on.

THE WITNESS: I don't know. It did not get done.

CHAIRMAN HAMMERSCHMIDT: Of course, you are a DC-9 pilot who is employed by USAir Incorporated. Have you ever felt any pressure from USAir to keep on schedule?

THE WITNESS: No, sir.

CHAIRMAN HAMMERSCHMIDT: In your flying experience, since let's say flying for USAir, how many times have you been given a windshear alert by Air Traffic Control from an LLWAS reading? Well, let me ask you first, how often has that happened just in general?

THE WITNESS: That happens fairly often.

CHAIRMAN HAMMERSCHMIDT: Of those times, how often have you discontinued your approach due to that alert?

THE WITNESS: In the absence of when approaches have been discontinued, generally a decision is made prior

to being on the approach, because you see the weather or what they're talking about between you and the airport or something like that. I don't recall the number of times that we discontinued.

CHAIRMAN HAMMERSCHMIDT: Well, let me ask you a different way. About how often have you continued your approach even though a windshear alert was issued by Air Traffic Control?

THE WITNESS: There have been times we've continued the approach with windshear alerts issued. I don't remember how many.

CHAIRMAN HAMMERSCHMIDT: You wouldn't guess say 50 percent or something in that neighborhood?

THE WITNESS: No, I don't know.

CHAIRMAN HAMMERSCHMIDT: I guess my last question is as captain of Flight 1016, is there anything you would like to add to the public record given this opportunity?

THE WITNESS: No, sir.

CHAIRMAN HAMMERSCHMIDT: Any other questions from anyone?

(No response.)

CHAIRMAN HAMMERSCHMIDT: Captain Greenlee, thank you very much for your cooperation and your testimony. You've been the most articulate witness. You may step down

and you are released from the public hearing.

(Witness excused.)

CHAIRMAN HAMMERSCHMIDT: The time is 12:45. Let's break for lunch and reconvene at 2:00.

(Whereupon, at 12:45 p.m., the hearing was recessed for lunch, to reconvene at 2:00 p.m.)

A F T E R N O O N S E S S I O N

CHAIRMAN HAMMERSCHMIDT: Let's proceed. Philip Hayes is our next witness.

F/O PHILIP HAYES, F/O - FLIGHT 1016, USAir, INC., PITTSBURGH, PENNSYLVANIA

Whereupon,

PHILIP HAYES,

was called as a witness by and on behalf of NTSB, and, after having been duly sworn, was examined and testified on his oath as follows:

MR. SCHLEEDE: Mr. Hayes, would you please give us your full name and business address?

THE WITNESS: My name is James Phillip Hayes, Atlanta, Georgia.

MR. SCHLEEDE: And by whom are you employed?

THE WITNESS: USAir.

MR. SCHLEEDE: And what position do you hold at USAir?

THE WITNESS: I'm a pilot.

MR. SCHLEEDE: How long have you held that position?

THE WITNESS: Seven years.

MR. SCHLEEDE: Would you briefly describe your training and education that qualifies you in your current position with USAir?

THE WITNESS: Yes, sir. I began flying when I was about 17 years old in Atlanta. I was a senior in high school. After high school, I attended DeKalp College and took flying lessons, as I could afford to. Eventually, I went to Sparton School of Aeronautics in Tulsa, Oklahoma. And there I received my commercial, instrument, and multi-engine and flight instructor ratings.

I returned to Atlanta and got a job with the Cessna Dealership there instructing. I instructed for about three years, flying single pilot IFR 135 operation, single engine and multi-engine aircraft. After I left the Cessna Dealership, I worked for a small freight operation flying again single pilot IFR 135. After that, I went to work for a tire company flying Mitsubishi MU-2 as a co-pilot and then captain. I then worked for a land development company and was a co-pilot on a Citation jet. From there, I went to work for an oil company in Atlanta as a chief pilot. I worked there about a year and a half. I went to work for a lumber company. Again, single pilot, twin-engine aircraft. From there, I went to work for a health care

company, and I flew as captain on a Mitsubishi Diamond jet.

After that I worked for Oxford Industries. They are the six largest, a peril manufacturer. I worked there for three years before I was hired at Piedmont Airlines.

MR. SCHLEEDE: What ratings do you hold, FAA ratings?

THE WITNESS: I currently hold an ATP, and I have a type rating in the MU-300 Diamond jet, and I was certified as a flight engineer.

MR. SCHLEEDE: Are you type rated in the DC-9?

THE WITNESS: No, sir.

MR. SCHLEEDE: Approximately, how much total flying time do you have?

THE WITNESS: Total time is about 13,000 hours.

MR. SCHLEEDE: And how much time do you have as a DC-9 pilot?

THE WITNESS: About 3200 hours.

MR. SCHLEEDE: Did you fly any other aircraft while you flew for USAir or Piedmont and USAir?

THE WITNESS: When I was hired at Piedmont, I started as a flight engineer. I flew in that position for about two and a half years. I transitioned to the co-pilot position of the 737-200 in April of 1990. Then transitioned to the DC-9 in August or September of 1990. And I have been

in that position ever since.

MR. SCHLEEDE: As a first officer?

THE WITNESS: As a first officer.

MR. SCHLEEDE: What airplane was the flight engineer with?

THE WITNESS: The 727.

MR. SCHLEEDE: Thank you. Dr. Strauch will continue the questioning.

DR. STRAUCH: Mr. Hayes, I'm going to first ask you some questions about USAir in general and its training before we get to the accident flight. You said you were hired by Piedmont Airlines. When was that?

THE WITNESS: October 1987.

DR. STRAUCH: How many years did you fly for Piedmont before they were acquired by USAir?

THE WITNESS: The merger took place in August of 1989.

DR. STRAUCH: When did USAir's procedures, when were they implemented for all pilots, including Piedmont pilots?

THE WITNESS: I don't recall exactly. But there was what they called a mirror image program to switch over procedures from Piedmont to USAir.

DR. STRAUCH: At the time of the accident, did you

feel comfortable with flying USAir's procedures?

THE WITNESS: I would say so, yes.

DR. STRAUCH: Could you tell from the way the captain was flying whether or not that captain was a former USAir pilot or a former Piedmont pilot?

THE WITNESS: I would have to say no.

DR. STRAUCH: So at this point in time, you feel that it really -- whatever differences there are, are transparent to you as a first officer?

THE WITNESS: Yes.

DR. STRAUCH: Could you estimate about how many captains you've flown with for Piedmont and USAir, just ballpark?

THE WITNESS: I couldn't say.

DR. STRAUCH: There's a statement in Exhibit 2-A that a check airman rated Captain Greenlee among the top ten percent of the pilots that he had at seen at USAir. Were you aware of this?

THE WITNESS: No.

DR. STRAUCH: How would you rate Captain Greenlee as a pilot and as a captain?

THE WITNESS: I would say he was a very confident and qualified captain in every respect.

DR. STRAUCH: What kind of cockpit atmosphere you

feel he established?

THE WITNESS: I would say a very comfortable atmosphere. He was just a very likeable gentleman and made me feel comfortable.

DR. STRAUCH: Would you have hesitated at any point to bring up something to Captain Greenlee that he may not have been aware of?

THE WITNESS: Would I have hesitated?

DR. STRAUCH: Yes.

THE WITNESS: No.

DR. STRAUCH: Would you have hesitated to tell him if you disagreed with a decision that he had made?

THE WITNESS: If you would repeat the question.

DR. STRAUCH: If you disagreed with a decision that Captain Greenlee had made in the cockpit, would you have hesitated to bring this up in the cockpit?

THE WITNESS: No, I don't think so.

DR. STRAUCH: Have you been through USAir's CRM program?

THE WITNESS: Yes, I have.

DR. STRAUCH: Could you tell us what phases of it you've been through? And we heard earlier Captain Greenlee's description of the CRM program. So I'm just asking you what phases you've been through?

THE WITNESS: I've been through the one-day course, the first phase. Then the subsequent ground school portion, and I've had one LOFT of CRM.

DR. STRAUCH: Have you participated in CRM programs with other carriers or other companies before your employment by Piedmont?

THE WITNESS: No.

DR. STRAUCH: Were USAir's CRM programs the only CRM programs you participated in?

THE WITNESS: Yes, sir.

DR. STRAUCH: Similarly, have you been through windshear training in other companies, other than Piedmont and USAir?

THE WITNESS: I came from a corporate background. So my windshear training basically consisted of reading various periodicals that carried windshear information and so forth in it. So I would say my training started earlier.

DR. STRAUCH: Did any of the material that USAir distributed with regard to windshear procedures, windshear alertness and so on, how did that compare with the material that you had gotten prior to your employment with USAir and Piedmont?

THE WITNESS: If I understand the question, how did I find their information?

DR. STRAUCH: Well, how did it compare? Was it more complete, less complete, more up to date?

THE WITNESS: Oh, I would have to say it was more complete, yes.

DR. STRAUCH: And you participated in simulator training with windshear presented, haven't you?

THE WITNESS: Yes, I have.

DR. STRAUCH: About how many times have you been presented with windshear scenarios in the simulator at USAir?

THE WITNESS: I would say each of my simulator check rides. So as a co-pilot, I'm required to have one a year. So each year. Of course, as an engineer, I wasn't exposed to it, I guess you would say.

DR. STRAUCH: But once you became a first officer, then you were presented with windshear scenarios?

THE WITNESS: Yes.

DR. STRAUCH: Was it always in your check rides or was it in other SIM sessions?

THE WITNESS: Well, each SIM session, I guess I should say. Each yearly SIM session.

DR. STRAUCH: Do you know about how many different windshear scenarios you've been presented with in the simulator?

THE WITNESS: I don't know how many. There are different ones on approach. You encounter the windshear on approach and on departure.

DR. STRAUCH: Was the event that you encountered on July the 2nd in Charlotte similar to the windshear scenarios that you were presented in USAir?

THE WITNESS: Was it similar?

DR. STRAUCH: Yes.

THE WITNESS: I would have to say no.

DR. STRAUCH: And what were some of the differences?

THE WITNESS: Well, typically in a simulator, you have turbulence associated with the event. And with regard to the accident, we encountered a smooth ride all the way.

DR. STRAUCH: So those were some of the differences just in terms of the smoothness of the ride versus turbulence and so on?

THE WITNESS: Well, let's see, smoothness of the ride. On the night of the accident, of course, didn't appear very threatening to myself and Captain Greenlee. So I would say that there's, oh, different -- a more thunderstorm activity, that sort of thing, associated with the ones that you may encounter in the SIM.

DR. STRAUCH: Can you describe your expectation of

what the weather was like in the Charlotte area on your way back from Columbia to Charlotte? In other words, what kind of weather were you expecting?

THE WITNESS: I expected the weather to be pretty good. I would say visual conditions -- again, it's pretty normal in a summertime climate to have the possibility of showers or thunderstorms in the afternoon. So I can't say that I was surprised that there was convective activity, but basically I suppose I expected visual conditions at the airport.

DR. STRAUCH: At what point in the flight was the weather different than what you had expected?

THE WITNESS: I would say at the onset of the heavy rain. I didn't expect that.

DR. STRAUCH: Is it fair to say that before you encountered the heavy rains, you were expecting visual conditions?

THE WITNESS: Pretty much, yes.

DR. STRAUCH: And what were your expectations of the weather based on?

THE WITNESS: Well, Captain Greenlee had gotten the ATIS as we approached the Charlotte area. So my recollection of the ATIS that afternoon was visual conditions. It was 5500 broken, I believe it was, and six

miles.

DR. STRAUCH: As a result of the ATIS, what did you expect to execute? Did you expect to fly?

THE WITNESS: What sort of approach?

DR. STRAUCH: Yes.

THE WITNESS: I suppose I expected a visual approach.

DR. STRAUCH: Didn't the ATIS information call for an ILS approach, the ATIS information, Yankee?

THE WITNESS: It did.

DR. STRAUCH: And yet you were expecting a visual approach?

THE WITNESS: Well, I expected a visual approach. I wasn't surprised by an ILS approach, being given an ILS approach. On our approach to Charlotte as we came up from Columbia, we flew a right down wind to the runway, and I could see the airport and the runway outside my window.

Judging, as I recall, by the traffic around the area at that time, it didn't appear that we were in the middle of a big push. So I suppose I expected a visual approach.

DR. STRAUCH: Did your expectation of the approach -- expectation of the visual approach change at any point in the flight?

THE WITNESS: I would say no, not really.

DR. STRAUCH: Could I refer you to Exhibit 12-A. That's the cockpit voice recorder transcript. The time is 1836.59 local. That would be page 26 of Exhibit 12-A. The approach controller issues a transmission to USAir 1016. At the end of it, he says -- well, the transmission is, "I'll tell you what, USAir 1016," and he ends it with, "Just expect the ILS now. Amend your altitude. Maintain 3,000."

Do you remember receiving this transmission?

THE WITNESS: Yes, I do.

DR. STRAUCH: Then could you explain why you continued to expect a visual approach when the controller said over here that, "USAir 1016 was to expect an ILS approach?"

THE WITNESS: Well, as we approached the airport on the down wind, I expected that we would get a visual approach. Now, having been given the ILS approach, I was not surprised. I remember him saying that there might be a little rain coming off north. So at that point, I expected the ILS. I thought you might have been referring further back.

DR. STRAUCH: How differently would the approach have been executed had it been a visual approach versus an ILS approach from your perspective as the pilot flying? In

other words, what would you have done differently?

THE WITNESS: If it were an ILS approach or a visual approach?

DR. STRAUCH: Well, let's do both. How would an ILS -- how differently would an ILS approach have been conducted from a visual approach? What would you have done differently?

THE WITNESS: Well, actually we did basically everything we would have done had we been told it was an ILS upon entering the Charlotte air space. So, I have to say that basically I don't know that I would have done anything differently.

DR. STRAUCH: Was your approach played out at that time?

THE WITNESS: Yes. Was my approach played out?

DR. STRAUCH: Yes.

THE WITNESS: Yes.

DR. STRAUCH: Do you recall if the captain's was?

THE WITNESS: I'm sure it was. I don't know.

DR. STRAUCH: Which approach play did you have out?

THE WITNESS: The approach play for 1-8-right.

DR. STRAUCH: And where was it in the cockpit?

THE WITNESS: I set it on top of my flight bag on

the right side of my seat.

DR. STRAUCH: Did you have a normal briefing for an ILS approach?

THE WITNESS: Well, as Captain Greenlee stated earlier, I think, we briefed the items for a visual approach. And then upon receiving the clearance from the ILS approach, we briefed the remaining items for that. So, yes.

DR. STRAUCH: In the course while USAir 1016 was on final, there is conversation among air traffic controllers regarding lightening in the vicinity of the tower. Captain Greenlee established that he was unaware of this information. Had you been aware that there was lightening in the vicinity and Captain Greenlee was not aware of it, what would you have done?

THE WITNESS: Well, I would have made the captain aware that there was lightening in the area. I, personally, did not see any lightening in the area that night.

DR. STRAUCH: If you could refer to page 29 of Exhibit 12-A. Again, that's the CVR transcript. At the time of 1839.20, the captain says to you, "Chance of shear." Do you recall that?

THE WITNESS: Yes.

DR. STRAUCH: What did you think when he said

that?

THE WITNESS: Well, I was just aware. Not that I wouldn't have been, but since we had the convective activity on the south side of the airport, I just was aware of any possible indications of windshear.

DR. STRAUCH: Did you alter your execution of the approach in any way as a result of that statement?

THE WITNESS: No, sir.

DR. STRAUCH: Was your alertness anticipation changed in any way?

THE WITNESS: Well, I would have to say you're always alert.

DR. STRAUCH: At this point in the flight, do you remember where you were looking, where your vision was directed?

THE WITNESS: At what point in the flight are you speaking of?

DR. STRAUCH: Where Captain Greenlee says to you, "Chance of shear?"

THE WITNESS: Well, I'm not sure exactly where that is on the approach. It's on final. As I joined the localizer and the glidescope, my attention was focused inside the cockpit. I was flying the airplane. So I was focused on the instruments. I did glance up a couple of

times to see the -- I would say the approach area of the runway, but I was generally focused in the cockpit.

DR. STRAUCH: Do you remember the last time you went heads-up to look outside the airplane?

THE WITNESS: Do I remember the last time?

DR. STRAUCH: Yes. At what point in the flight that was, the last time that you went from heads-down looking inside at the instruments, to heads-up looking outside the window screen?

THE WITNESS: The last time that I looked out the cockpit window in the flight of USAir 1016 was just before the impact. I looked out the front windshield and I could see that we were below the tops of the trees.

DR. STRAUCH: And before that you had been, as you said, primarily heads-down. I guess, almost exclusively heads-down, looking at the instruments?

THE WITNESS: Yes, sir.

DR. STRAUCH: What instruments were you looking at primarily?

THE WITNESS: Well, the localizer, glidescope, and attitude indicator, air speed.

DR. STRAUCH: And throughout the approach, were you satisfied that the airplane was within the parameters that USAir established?

THE WITNESS: Yes, sir.

DR. STRAUCH: At any point did the airplane leave these parameters?

THE WITNESS: Only when we encountered the problem.

DR. STRAUCH: And what did you see? What departure from the acceptable parameters did you see at that point?

THE WITNESS: Well, of course, this is all fairly compressed time. I mean, it's a very short interval. I remember seeing the air speed decrease fairly rapidly. I felt the severe sinking of the airplane, as if it were suspended from a string and somebody dropped it. That was basically the feeling.

DR. STRAUCH: Do you remember about the -- what about the attitude of the airplane?

THE WITNESS: Well, the attitude was normal.

DR. STRAUCH: Throughout the flight?

THE WITNESS: Yes.

DR. STRAUCH: Further down as we get closer to the event on page 33 of Exhibit 12-A and the time is 1841.05, Captain Greenlee tells you to stay heads-up. Do you remember that?

THE WITNESS: I believe I do.

DR. STRAUCH: What did you do as a result of that statement?

THE WITNESS: Well, it didn't mean to me to look outside the cockpit. It meant be aware in case we encounter some sort of situation that we don't like. We're not going to be here long. We're going to go around. We're going to do something different.

DR. STRAUCH: Captain Greenlee described the rain that was encountered as, I believe, the heaviest rain he ever experienced. How would characterize the rain?

THE WITNESS: I never really looked outside the windshield to see the rain. I could see in my peripheral vision that it was raining very heavily, and I could tell from the noise in the cockpit that it was raining very heavily. So I would say that it was extremely.

DR. STRAUCH: Is it fair to say that you didn't expect a rain of this intensity at this point in the flight?

THE WITNESS: Yes, sir. That's very fair to say.

DR. STRAUCH: The radar had been turned on, though, before you entered the Charlotte air space or at some point before you got to this point. Is that correct?

THE WITNESS: Yes, sir.

DR. STRAUCH: Captain Greenlee was manipulating the radar. Is that correct?

THE WITNESS: Yes, sir.

DR. STRAUCH: Could I assume you were satisfied with his use of the radar?

THE WITNESS: Yes, sir, I was.

DR. STRAUCH: Could you explain why this particular rain shower was not detected on your airborne radar?

THE WITNESS: No, sir, I can't give you an explanation for that.

DR. STRAUCH: Captain Greenlee testified that the airborne windshear system did not alert. Is that correct? Do you agree with that that the airborne windshear alerting system did not alert in the aircraft?

THE WITNESS: Yes, sir, I agree with that.

DR. STRAUCH: Has it ever alerted before in aircraft that you've flown?

THE WITNESS: No, sir.

DR. STRAUCH: In USAir's training has the windshear alerting system alerted to you in the windshear scenarios that you've experienced or encountered?

THE WITNESS: I actually don't recall if it has.

DR. STRAUCH: At 1841.58 and on page 34 of Exhibit 12-A, you tell the captain, "There is ten knots right there." What had you just seen and what were you trying to

convey to the captain?

THE WITNESS: Well, I wanted to let him know that I had seen a momentary increase in the air speed indicator. And what I saw was a very quick fluctuation, a movement of the air speed indicator up ten knots and then back to the speed that we were flying.

DR. STRAUCH: And his response to you was, "Okay. You're plus 20." How did you interpret that?

THE WITNESS: Basically saying what I said. He just used the bug speed, where the bug was set on the instrument, which was 122 and I was flying 132.

DR. STRAUCH: Is it fair to say that you've experienced this kind of air speed fluctuation before in the DC-9?

THE WITNESS: Yes, sir, that's fair to say.

DR. STRAUCH: Could you estimate how often you've experienced that?

THE WITNESS: Well, I would have to say in every day flying, it's not out of the ordinary to get fluctuations, because of various weather factors, you know, windy days and so forth.

DR. STRAUCH: So ordinarily, you would attribute the air speed fluctuations to every day flying, encounters and so on?

THE WITNESS: Well, you pretty much have to take each situation. If it's a day in March and it's a typical March day, then you expect to get those. You just have to take each situation really.

DR. STRAUCH: Was there anything unique about this particular air speed fluctuation, given the fact that it was July convective activity in Charlotte?

THE WITNESS: Well, because there was convective activity around, certainly.

DR. STRAUCH: Captain Greenlee asked for a pilot report and the report was the aircraft in front said it was smooth. In addition, you all had been given a pilot report when you switched over, I believe, to the tower. Do you recall hearing the controller give you the ride report?

THE WITNESS: Yes, sir, I do.

DR. STRAUCH: Was that ride report consistent with the other cues you were getting and other information you were getting about the weather on final?

THE WITNESS: I would have to say that it was, given what we had seen until we entered the heavy rain, yes.

DR. STRAUCH: Do you feel that Captain Greenlee did what he could to solicit the proper information about the weather or could he have done more?

THE WITNESS: No, I think he did what he could to

solicit the information.

DR. STRAUCH: On page 35 -- I refer you to page 35 of the cockpit voice recorder, at 1842.22. At this point you were on the go around, you had been through the heavy rain, and Captain Greenlee said, "Down. Push it down." How did you interpret that?

THE WITNESS: Well, at the time I didn't hear him say that. I did hear this when we listened to the cockpit voice recorder. But at the time, I didn't hear it.

DR. STRAUCH: Is there anything you could attribute that to, the fact that you didn't hear it at the time? Was it because you were busy doing something? Were you concentrating on something?

THE WITNESS: Well, I couldn't really speculate. I don't know. I don't know.

DR. STRAUCH: Did Captain Greenlee take the controls at any point from you in this flight?

THE WITNESS: I was not aware that Captain Greenlee had taken the controls. I was under the impression that I was flying the aircraft until the impact. I know that he testified that he took the controls. And I would have to say that I felt no opposing motion or movement to the controls. So I would have to say that we probably were doing the same thing.

DR. STRAUCH: As you were traversing this weather phenomenon, what did you think you were traversing? What type of weather phenomenon did you believe you were in?

THE WITNESS: Well, I would say just a heavy rain shower.

DR. STRAUCH: At any point, did you believe you were in a windshear or a microburst situation?

THE WITNESS: Well, when the air speed decreased and then I felt the sinking sensation, then I felt like we were, yes.

DR. STRAUCH: Now, at that point, what does USAir's windshear training program tell you to do in terms of power and attitude?

THE WITNESS: To go to firewall power, and then rotate the nose to 15 degrees, use a stickshaker as the upper limit of the pitch attitude.

DR. STRAUCH: Did you do that?

THE WITNESS: I believe I did, yes.

DR. STRAUCH: Do you recall maintaining a 15 degree nose-up attitude?

THE WITNESS: I don't recall.

DR. STRAUCH: I would just like to ask you a couple of other questions. Since 1989 up to this accident, USAir had experienced three fatal accidents. What changes

in USAir's procedures did you see as a result of those accidents?

THE WITNESS: What changes in their procedures did I see from those accidents?

DR. STRAUCH: Yes. That you could attribute in some way as a result of those accidents.

THE WITNESS: Well, I would say that I'm probably not qualified to answer that. There's probably somebody who is more qualified to answer that question than I.

DR. STRAUCH: What about training? What changes in training did you see as a result of those accidents?

THE WITNESS: Again, I would just have to say somebody's more qualified to answer that than I.

DR. STRAUCH: Mr. Hayes, I think it's also fair to say in the last few years, USAir has lost quite a bit of money. The estimates are over two billion dollars. What effect has that had on the morale of the pilots in USAir?

THE WITNESS: Well, I would have to say that as far as morale, I don't know. All of us, I would have to say, love USAir and our concerned about the losses. But as far as the morale, I would say morale is okay.

DR. STRAUCH: What is it about USAir that, as you say, makes you and the pilots love the company as you do?

THE WITNESS: Well, we feel it's a good company,

and we feel that it's kind of a big, happy family, I guess you'd say.

DR. STRAUCH: What changes have you seen in training as the result of the financial reverses that the company has experienced?

THE WITNESS: I would have to say to that, none at all.

DR. STRAUCH: Have you seen any changes in maintenance?

THE WITNESS: To maintenance?

DR. STRAUCH: Yes, in the condition of the airplanes when you accept them and their willingness to have you write up problems and so on?

THE WITNESS: Well, I would have to say there's no change in the maintenance that I can see.

DR. STRAUCH: Have you seen any evidence that the company has cut corners as a result of the financial reverse?

THE WITNESS: No, sir.

DR. STRAUCH: Thank you, Mr. Hayes. I have no further questions.

CHAIRMAN HAMMERSCHMIDT: I was just going to indicate that that line of questioning really wasn't within the scope of the planned areas. But nonetheless, we were

able to accommodate it.

Ms. Mills, do you want to ask some more questions?

MS. MILLS: Not too many more.

CHAIRMAN HAMMERSCHMIDT: Okay.

MS. MILLS: Good afternoon, First Officer Hayes. Would you turn to Exhibit 2-D. I think you're going to find that that's an approach plate for 1-8-right. Is it 2-B. Excuse me. It's 2-B, as in Bravo.

Now, would you take that approach plate and just as though you were getting ready to fly an approach in a simulator or out in the line on the DC-9, and ILS approach, brief that approach for us, please.

THE WITNESS: I would verify the page number at the top of the page, the date. Verify the proper runway, field elevation, the localizer frequency and course, the glidescope intersect altitude at the outer marker, the decision height, and then, of course, the missed approach.

MS. MILLS: When you fly ILS approaches, normally, do you always brief them this way or are there different ways to brief approaches?

THE WITNESS: Well, I believe the requirement for visual approach is similar, but not the same element.

MS. MILLS: But an ILS approach is pretty much the way you just outlined?

THE WITNESS: Yes.

MS. MILLS: Now, have you flown with captains that insist that you brief an approach exactly just like you did?

THE WITNESS: Well, I would say so, yes.

MS. MILLS: Is this the way you briefed the approach on the accident flight?

THE WITNESS: Well, originally we expected the visual approach. So we briefed the -- we verified the runway of intended use, and then the ILS frequency and heading. I believe that's all for the visual approach other than the captain saying that since there was convective weather around the area to be heads-up for the windshear.

MS. MILLS: But on other flights, you might have briefed it just like you did for us just now?

THE WITNESS: Yes.

MS. MILLS: The approach briefing is that a check list item?

THE WITNESS: Yes, it is.

MS. MILLS: So you do that in response to something on the preliminary landing check, I believe?

THE WITNESS: Preliminary landing check list; that's right. MS. MILLS: Who runs the check lists normally when you are the flying pilot?

THE WITNESS: When I'm the flying pilot?

MS. MILLS: Mm-hmm.

THE WITNESS: The captain will do the check list.

MS. MILLS: Does it always work that way?

THE WITNESS: Yes.

MS. MILLS: To continue asking you a little bit about the accident, can you evaluate for me the way the airplane was flying in the rain? Did you notice any difference in the way the airplane handled at all?

THE WITNESS: No, ma'am. The aircraft handled very well. It was very stable, very smooth ride really until we felt the sink.

MS. MILLS: I'm going to jump to a slightly different area. The record keeping shows that you had a LOFT on March 15th. Do you recall if you got any windshear training during that LOFT?

THE WITNESS: No, honestly, I don't remember.

MS. MILLS: Do you get windshear training when you show up for a simulator ride?

THE WITNESS: Yes, ma'am.

MS. MILLS: Could you give me a percentage of the time you act as the pilot flying versus pilot not flying in a windshear event in a simulator?

THE WITNESS: I really expect to encounter a windshear myself each time I fly in a simulator.

MS. MILLS: So then do you get to also perform the duties of the pilot not flying when your partner is flying?

THE WITNESS: Yes.

MS. MILLS: So each of you gets to fly one and then also perform the functions of the pilot not flying?

THE WITNESS: I believe so, yes.

MS. MILLS: Now you mentioned that one of the last times you did this, you remember there being turbulence in the simulator prior to a windshear event. Are there any other cues that you are getting to alert you to the fact that you may encounter windshear in the simulator?

THE WITNESS: You may get multiple air speed fluctuations. And, of course, a turbulence. Those are the two that I can think of off the top of my head.

MS. MILLS: I have no further questions.

CHAIRMAN HAMMERSCHMIDT: Thank you, Ms. Mills. Beginning with the Federal Aviation Administration.

BY MR. DONNER:

MS. MILLS: Mr. Hayes, what altitude do you recall you were at when you initiated the go around?

THE WITNESS: To my best recollection, we were, I would say, between 1100 and 1200 feet on the altimeter.

MR. DONNER: Thank you.

CHAIRMAN HAMMERSCHMIDT: National Air Traffic

Controllers Association.

MR. PARHAM: I just have one quick question.

BY MR. PARHAM:

MS. MILLS: Mr. Hayes, referring to CVR, page 28, I believe it's Exhibit 12-A.

THE WITNESS: What was the page?

MS. MILLS: Page 28, 1838 and 38 seconds. I believe the captain was speaking. It says, "Looks like it's sitting right on the..." -- unreadable. Do you recollect what that was referring to?

THE WITNESS: From my recollection, I would have to say that he was speaking of the VOR. That the convective activity was sitting over the VOR, because we had watched it as we made our approach to Charlotte, and it didn't appear to move.

MR. PARHAM: I have no further questions. Thank you, sir.

CHAIRMAN HAMMERSCHMIDT: Thank you. Honeywell.

MR. THOMAS: No questions. Thank you.

CHAIRMAN HAMMERSCHMIDT: Okay.

MR. TULLY: No questions.

CHAIRMAN HAMMERSCHMIDT: Airline Pilots Associations has no questions. We're going to let you go last, USAir. Douglas Aircraft Company.

MR. LAYNOR: No questions.

CHAIRMAN HAMMERSCHMIDT: Thank you. Pratt & Whitney.

MR. YOUNG: No questions. Thank you.

CHAIRMAN HAMMERSCHMIDT: Association of Flight Attendants.

MS. GILMER: No questions. Thank you.

CHAIRMAN HAMMERSCHMIDT: International Association of Machinists.

MR. GOGLIA: No questions, Mr. Chairman.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Goglia. Dispatchers Union.

MR. SCHUETZ: Mr. Chairman, no questions. Thank you.

CHAIRMAN HAMMERSCHMIDT: Thank you. National Weather Service.

MR. KUESSNER: No questions.

CHAIRMAN HAMMERSCHMIDT: USAir.

MR. SHARP: No questions, Mr. Chairman.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Sharp. Any more questions from the technical panel? Mr. Feith.

BY MR. FEITH:

MS. MILLS: Just a few brief questions for you. If you would turn while you have Exhibit 12-A out, page 31.

Looking at 1840.10, where you make the comment -- or it's identified as you making the comment. "Yes, laying right there, this side of the airport, isn't it?" Do you recall what you were referring to when you made that comment?

THE WITNESS: Well, I don't recall specifically. I would say it was probably the little rain shower between us and the airport.

MS. MILLS: Do you recall if that comment reference was made because you saw it on the weather radar or was that a visual identification?

THE WITNESS: That was a visual identification.

MS. MILLS: Do you recall after this -- because this is approximately three minutes prior to the accident. Do you recall looking out the window then seeing any other rain event or indication of a weather event?

THE WITNESS: No, sir, I don't specifically recall. I think I looked up a couple of times, but only in the direction of the runway. So, no, I don't.

MS. MILLS: And you stated in your previous testimony about the fluctuation of air speed, the momentary fluctuation of air speed up to ten knots, and then the captain called "there's 20." I don't know if I missed it. What did you attribute that to?

THE WITNESS: Well, I would just say that it was a

notation on my part. As I said, there was convective activity around. We had agreed early on to be heads-up for windshear and, of course, our course of action should we have to go around for some reason. So it was just a notation, a piece of information.

MS. MILLS: Is it fair to say that fluctuation in air speed could have been attributed to a weather event?

THE WITNESS: Well, I suppose it could have.

MS. MILLS: Can you just describe -- I know that you've gone through this, and I don't want to elaborate on it too much longer. But during the initiation of the go around, what were your procedures as a flying pilot when the captain called, "Take it around to the right?"

THE WITNESS: When he said let's go around or whatever his words were, I immediately pushed the throttles to the target power setting max power and called "flaps 15." Of course, had we gotten to it, I would have called, "positive rate, gear up," and then store the spoilers.

MS. MILLS: And then at that time, you also executed the bank to the right?

THE WITNESS: Yes. I rotated the nose towards 15 degrees and started a right turn towards the west and towards the right.

MS. MILLS: Now during that portion of the flight,

do you recall where your attention was focused? Was it on any one particular instrument or were you maintaining a scan?

THE WITNESS: Well, I would have to say I was maintaining a scan. I did note the pitch angle and the bank angle.

MS. MILLS: Do you recall what that was?

THE WITNESS: I believe the pitch angle was 15 degrees, and then the bank was between 15 and 20 degrees.

MS. MILLS: During the course of the execution of the airplane flying into and through the rain, do you recall when you were looking at the API, the pitch attitude changing, decreasing or increasing?

THE WITNESS: Well, truthfully, I don't recall.

MS. MILLS: And you stated that you believed that you executed the go around at an altitude of approximately 1100 or 1200 feet?

THE WITNESS: That's correct.

MS. MILLS: Do you recall how you made that judgment? Did you look at the altimeter?

THE WITNESS: To my best recollection, I believe I glanced at the altimeter as I pushed the power up.

MS. MILLS: Do you recall if the captain had come behind you to trim the throttles when you were pushing the

power up?

THE WITNESS: No, I don't recall.

MS. MILLS: You had flown a previous trip that morning?

THE WITNESS: Yes.

MS. MILLS: And you had come out of St. Louis?

THE WITNESS: That's correct.

MS. MILLS: In Exhibit 2-A where the investigators took a statement from you, you prepared a statement. Just for clarification, you had given the times of waking up and sleeping in St. Louis. Were those eastern daylight times or were those based on central daylight time? Just for record clarification for us.

THE WITNESS: I believe they were eastern daylight.

MS. MILLS: Based on the fact that you had flown earlier that day and you had flown a pretty complete day, did you feel well rested?

THE WITNESS: Yes, I believe I did. Yes.

MR. FEITH: I have no further questions, Mr. Chairman. Thank you, First Officer Hayes.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Feith. Mr. Laynor.

BY MR. LAYNOR:

MS. MILLS: Just one or two, Mr. Hayes. Were you using your flight director during the approach?

THE WITNESS: No, sir.

MS. MILLS: You were not. So you weren't using it during go around?

THE WITNESS: No, sir.

MS. MILLS: Have you had any experience with receiving a windshear alert from the windshear alerting system in the aircraft in your previous experience?

THE WITNESS: No, sir.

MS. MILLS: Never received. Do you recall whether the device is part of the simulator that you experience those alerts during your training program?

THE WITNESS: I believe they are.

MS. MILLS: You believe they are. In your training simulator windshear scenarios, what do you think the cue is that prompts you to take the windshear evasive maneuver?

THE WITNESS: If you don't mind, would you repeat the question for me?

MS. MILLS: Well, I was wondering what -- you stated, I think, that you during recurrent training, you normally receive at some point during the training a windshear scenario in your simulator.

THE WITNESS: Right.

MS. MILLS: You're not sure nor was Captain Greenlee whether the simulator has an alerting device with the light and the audio alarm.

THE WITNESS: Right.

MS. MILLS: I wondered what cue prompts you, makes you aware that you are receiving a windshear scenario and prompts you to undertake the evasive maneuver?

THE WITNESS: Well, you get, like I said, multiple air speed fluctuations and turbulence and so forth. And eventually, you recognize that you are encountering a windshear situation.

MS. MILLS: By the decreasing air speed?

THE WITNESS: Yes, sir.

MS. MILLS: Do you initiate a maneuver based on the increasing air speed if you think it's the out flow from a microburst?

THE WITNESS: Well, I would say that was one of the things.

MR. LAYNOR: Thank you, sir.

CHAIRMAN HAMMERSCHMIDT: Mr. Clark.

BY MR. CLARK:

MS. MILLS: Captain Hays, once you were inside the outer marker, were you established on the glidescope and

localizer?

THE WITNESS: Yes, sir.

MS. MILLS: At that time, could you see the end of the runway?

THE WITNESS: Yes, sir.

MS. MILLS: At what point did you lose sight of the end of the runway?

THE WITNESS: After we crossed the outer marker, I believe I recall looking maybe once outside the cockpit. I remember seeing the runway thereafter. I focused my attention on the aircraft. So I didn't look back outside the aircraft anymore from just before we entered the rain really.

MS. MILLS: From the time you never looked out from the time just before you entered the rain or --

THE WITNESS: That's correct, yes.

MS. MILLS: Let me rephrase this then. Did you see the rain starting to develop on the airport?

THE WITNESS: No, sir, I didn't see any rain on the airport. The only rain that I saw was a little thin vail of rain, a thin shower that I could see through to the runway. But, no, I don't recall any.

MS. MILLS: You were on instruments. And so the heavy onset of rain, what first alerted you to that?

THE WITNESS: Well, I could hear it. It was not eye sight. You didn't see it coming. The heavy rain?

MS. MILLS: Yes.

THE WITNESS: No, I didn't see the heavy rain coming, no.

MS. MILLS: You had your head down.

THE WITNESS: I had my head down.

MS. MILLS: So you were alerted when -- you were in it when you first became aware of it?

THE WITNESS: Yes, sir.

MS. MILLS: At a time after the heavy rain started, the captain told you, "you're at plus 20." What did that mean to you?

THE WITNESS: I felt that he was saying the same thing. That he was just verifying what I had said. That I had seen a ten knot increase over the speed that I was flying.

MS. MILLS: And it was step up, and you were making that ten plus 20 or, I mean, ref plus 20 is the indication.

THE WITNESS: No.

MS. MILLS: Well, if I say this wrong, correct me. The plus 20 meant that you were at 20 knots plus your ref.

THE WITNESS: Right.

MS. MILLS: Your original you added ten and then you had a ten knot bump?

THE WITNESS: Yes. Our ref speed was 122, and we were flying ten knots above that at 132. I saw the air speed indicator move very briefly up ten knots and then back to 132. So Captain Greenlee, I felt, was saying basically the same thing that I had said. He verified that, yes, he saw there was a ten knot increase. But he just said it a different way. He just said, "there's plus 20," which is 20 knots above our ref speed.

MS. MILLS: But by that time, you were recovering back to your ref speed?

THE WITNESS: The air speed -- after the brief increase, it just went right back to our original speed.

MS. MILLS: The captain called for a go around, and it was your responsibility to raise the power levers?

THE WITNESS: Yes, it was.

MS. MILLS: Did you raise the power levers at the prompting of the captain or were you raising those on your own at that time?

THE WITNESS: As soon as Captain Greenlee called for the go around, I advanced the throttles immediately.

MS. MILLS: You were primed for that situation at that point?

THE WITNESS: I was, yes, sir.

MS. MILLS: At what point in the go around, from your perception, did the situation become an urgent situation or a critical situation?

THE WITNESS: Well, again, I would say when I saw the rapid decrease in the air speed and then felt the very severe sinking of the airplane, it was very noticeable. I mean, that's something that you would never forget.

MS. MILLS: When that started, was that simultaneous or did one leave the other in your remembrance?

THE WITNESS: Well again, that's a fairly compressed time. I couldn't say.

MS. MILLS: At that time that the air speed was dropping or you were feeling the sinking, what was your course of action? What were you intending to do?

THE WITNESS: When I felt the aircraft -- when I saw the air speed decreasing and I saw or I felt the sinking, I reached -- I believe I had my hand on the throttles, and I started to push the power up, and felt Captain Greenlee's hand on my hand as he called for firewall power.

So, I suppose, we were of the same mind that we realized it was a critical situation. And we, together, I would say, pushed the power to firewall power.

MS. MILLS: Do you have a remembrance of your intention of what attitude to establish, either a pitch or a roll?

THE WITNESS: I remember rolling the wings level, and I would have to say that I don't recall the specific attitude, but I believe it was towards 15 degrees.

MS. MILLS: Do you recall the pitch attitude going below the horizon at any time?

THE WITNESS: No, sir.

MR. CLARK: Thank you. I have no further questions.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Clark. Mr. Schleede.

MR. SCHLEEDE: Yes, sir.

BY MR. SCHLEEDE:

MS. MILLS: I'm sorry to belabor this airborne windshear warning system. But what specific training did you receive on the use of that system?

THE WITNESS: Well, I remember the booklet, I guess you'd say, information about the system. Then I remember training in the recurrent ground school as to the system.

MS. MILLS: When approximately was this done?

THE WITNESS: Honestly, I don't recall.

MS. MILLS: In the past year or when?

THE WITNESS: I would say 12 to 18 months, maybe.

MS. MILLS: And you don't recall using or seeing the system activate in the simulator?

THE WITNESS: No, sir, I don't.

MS. MILLS: Could you describe briefly how it works, from a pilot's perspective what you see when it activates?

THE WITNESS: Well, it's -- I would have to look at the exhibit to tell you exactly. But briefly, it's lights and an oral warning. The amber lights and red lights and an oral warning.

MS. MILLS: Did you see any of those lights during the accident flight?

THE WITNESS: No, sir.

MS. MILLS: Where are they located on the panel?

THE WITNESS: On the glare shield just basically in your eye sight level.

MS. MILLS: Center column, center?

THE WITNESS: Right. Just on the little glare shield there.

MS. MILLS: Have you ever seen those lights illuminate in the airplane?

THE WITNESS: No, sir.

MS. MILLS: How about in the simulator?

THE WITNESS: I don't recall seeing them in the simulator, no.

MS. MILLS: So in your experience, you've never seen those lights operate. You've only learned about it through books and ground school?

THE WITNESS: Yes, sir.

MS. MILLS: Another area regarding the -- I know you've testified on your recollection of your pitch attitude and your following the flight director. Are you aware that the flight recorder data shows that shortly after you received your 15 degrees pitch, that the flight recorder data shows the reduction in pitch and forward movement of the control column?

THE WITNESS: I've been told that, yes.

MS. MILLS: Do you have anything that would enlighten us or any explanation regarding that? Did you recall that or do you have anything that could help us understand those movements?

THE WITNESS: Well, I can say that I don't recall seeing that, and I wouldn't have any idea why.

MS. MILLS: Do you believe your eyes were fixed on the flight director during that period?

THE WITNESS: Well, I don't think so.

MS. MILLS: Do you recall the control wheel forces on the control column?

THE WITNESS: No, I don't recall.

MS. MILLS: One last area, on the airborne weather radar, you may have testified to this and I missed it. Did you see the cell that was closest to the airport on the radar?

THE WITNESS: Yes, sir, I did.

MS. MILLS: At what point in the flight did you first see it and where was it?

THE WITNESS: I remember seeing it as we approached Charlotte from the southwest. I think I remember looking at the radar another time or two, but the weather around the Charlotte area was such that there just wasn't anything other than that out there. So I didn't really look at the radar that much.

MS. MILLS: Did you look at the radar at all when you were on final approach?

THE WITNESS: I don't recall.

MS. MILLS: I'm sorry. I just have one other area. At what point in the accident scenario do you believe you went from a normal go around maneuver to an emergency windshear escape maneuver? At what point in the flight?

THE WITNESS: Well, again, I would have to say

that as soon as I saw the air speed decreasing and then, of course, felt the severe sink of the aircraft, it was at that time.

MR. SCHLEEDE: Thank you very much.

CHAIRMAN HAMMERSCHMIDT: Mr. Clark, do you have another question?

MR. CLARK: Just one more for clarification.

BY MR. CLARK:

MS. MILLS: You made the statement about when you were referring to the weather that laying right there on this side of the airport. Do you recall your position in the flight path at that time?

THE WITNESS: We were on final, as I recall.

MS. MILLS: Yes, on final. And that reference "on this side of the airport," would have been on the north side of the airport, to your reference? Is that what you meant by "this side?"

THE WITNESS: That's correct.

MR. CLARK: Thank you.

CHAIRMAN HAMMERSCHMIDT: Mr. Hayes, I just have a very few questions. Given your schedule on July the 2nd, would you say that flight crew fatigue played any role in this accident?

THE WITNESS: No, sir, I would say none at all.

CHAIRMAN HAMMERSCHMIDT: None at all. Let me ask you a question very similar to one that Mr. Schleede just asked. Was there a point along the overall approach to landing at which you became uncomfortable with the approach?

THE WITNESS: Well, I would have to say that it was when we encountered the heavy rain. We didn't expect to encounter the very heavy rain.

CHAIRMAN HAMMERSCHMIDT: Would you say at that point you were uncomfortable with the approach?

THE WITNESS: Well, I would have to say that because we entered the heavy rain, when Captain Greenlee called for the go around, I was not at all surprised.

CHAIRMAN HAMMERSCHMIDT: Let's see. Another area. Have you ever experienced any pressure on flight crews from USAir to keep the schedule?

THE WITNESS: No, sir.

CHAIRMAN HAMMERSCHMIDT: How often have you continued an approach to landing having been issued a windshear alert from Air Traffic Control? Or what is your experience in that area?

THE WITNESS: Well, I would have to say that it's not that unusual to have some sort of alert or advisory or something. Because, as I say, in the springtime or with the change of season, you have frontal passage and so forth.

So, with the surface winds gusty, that type of situation is not uncommon to encounter that sort of alert.

CHAIRMAN HAMMERSCHMIDT: Thank you. Last question is as first officer on Flight 1016 is there anything whatsoever you would like to add to the public record?

THE WITNESS: No, sir, not at this time.

CHAIRMAN HAMMERSCHMIDT: Any other questions for Mr. Hayes?

(No response.)

CHAIRMAN HAMMERSCHMIDT: Mr. Hayes, you may step down. We thank you very much for your cooperation, and you are released from the public hearing, as well.

(Witness excused.)

CHAIRMAN HAMMERSCHMIDT: Why don't we take a ten-minute break, and resume the questioning at that point.

(Whereupon, a brief recess was taken.)

CHAIRMAN HAMMERSCHMIDT: Let's come to order, please. The next witness is Dr. Judith Orasanu.

Would you please come forward. Dr. Orasanu will be questioned by Dr. Barry Strauch.

(Witness testimony continues on the next page.

JUDITH ORASANU, CREW FACTORS RESEARCHER, NASA AMES RESEARCH CENTER, MOFFETT FIELD, CALIFORNIA

Whereupon,

JUDITH ORASANU,

was called as a witness by and on behalf of NTSB, and, after having been duly sworn, was examined and testified on her oath as follows:

BY MR. SCHLEEDE:

MS. MILLS: Dr. Orasanu, would you please state your full name and business address for our records?

THE WITNESS: My name is Judith Orasanu. I work at NASA Ames Research Center, Moffett Field, California.

MS. MILLS: And what position do you hold at NASA?

THE WITNESS: I'm a principal investigator in the Human Factors Research Group.

MS. MILLS: And how long have you been in that position?

THE WITNESS: I've worked for NASA for about almost four years.

MS. MILLS: Could you briefly describe your experience and education that qualifies you for your current position?

THE WITNESS: I have a Ph.D. in experimental

psychology. I received that in 1975 at Adelphi University. My area of focus was human information processes and psycholinguistics, which is study of language and thinking. For the 20 years since I got my degree, I spent about half of that doing research management for government agencies in Washington, focusing on education and training, specifically problem solving, decision-making type of research.

The other ten years, I spent conducting research. The past five being in team decision making and the aviation environment.

MS. MILLS: Do you hold any FAA aeronautical ratings?

THE WITNESS: No, I don't hold any ratings. I did take flight instruction, both ground school and flying instruction when I began doing this research five years ago.

MR. SCHLEEDE: Thank you very much. Dr. Strauch will continue the questioning.

DR. STRAUCH: Thank you, Mr. Schleede.

BY DR. STRAUCH:

MS. MILLS: Dr. Orasanu, just to elaborate a little bit on what Mr. Schleede just asked you. Did you ever teach at any college or university?

THE WITNESS: Yes, I taught for several years while I was a graduate student and a post-doc from 1970

through 1982. I had a number of different teaching positions as an adjunct instructor while I was doing research in the New York City area.

MS. MILLS: What were some of the universities that you taught at?

THE WITNESS: Herbert Lehman College, Adelphi University, Nassau Community College, Yeshiva University, and the Virginia Polytech.

MS. MILLS: You mentioned you had a post-doctoral fellowship.

THE WITNESS: Yes.

MS. MILLS: Where was that?

THE WITNESS: I was a post-doctoral fellow at Rockefeller University in New York.

MS. MILLS: What other universities have you worked at?

THE WITNESS: I was an Army Science and Engineering fellow for one year at Princeton University, which is where I began to do my aviation research.

MS. MILLS: Could you refer to Exhibit 2-R, 2 Romeo, and it's page 2.

THE WITNESS: Two-R?

MS. MILLS: Yes.

THE WITNESS: I'm sorry, what page?

MS. MILLS: Page 2, paragraph D.

THE WITNESS: Yes.

MS. MILLS: There's a citation there, "Orasanu, J., decision making in the cockpit." Is that you, Dr. Orasanu?

THE WITNESS: Yes, it is.

MS. MILLS: Thank you. Do you have any experience observing air transport flight operations?

THE WITNESS: Yes. Since joining NASA, I have had the opportunity to do numerous jumpseats. We obtained jumpseat passes as part of our research opportunity, and I've probably done 15 or 20 jumpseat rides.

MS. MILLS: Have you done them just in the U.S. or have you done them over seas, too?

THE WITNESS: Both U.S. and Europe.

MS. MILLS: Thank you. In your career at NASA, have you ever observed any airline CRM program either complete or in development?

THE WITNESS: Yes. I have observed four different airlines CRM programs, not necessarily their full programs, which often run three days, but at least portions of those programs. I have reviewed the paperwork, the documentation, the manuals for a number of others.

MS. MILLS: Did you ever observe USAir's CRM

program?

THE WITNESS: A little more than two years ago, I had an opportunity to sit in on one of their classes while the program was still being developed. It was in the San Francisco area. And that was a one-day program.

MS. MILLS: Could you tell us what your observations were of the quality of the program that you saw?

THE WITNESS: Well, you understand it was being developed and this was sort of a shake-down class at that point. So at that point, I was impressed with the fact that they had included the critical elements, team work, and communication, of really using all resources, of doing exercises in the class that would make the point rather than just tell the point, to make it very clear to the participants why it was important to rely on each other to communicate.

MS. MILLS: So is it fair to say that you believed that the albeit developmental CRM program that you saw of USAir did it here to contemporary thinking in cockpit resource management and crew resource management?

THE WITNESS: Yes.

MS. MILLS: Can you define decision making for us, please?

THE WITNESS: Well, traditionally decision making has been considered a choice from among a set of options in whatever kind of environment. That was based mainly on research and laboratory situations, and most recently, there has been a shift or an expansion of our research and understanding of decision making in complexed, dynamic environments like aviation.

The more recent views considered decision making to really include two major components. One being the situation assessment. Before you make a decision in a natural environment, you have to recognize that a problem, that a situation exist about what your decision is required. So it's up to the participants to notice the cues to define what the problem is and identify the options available to them and then make the decision.

MS. MILLS: And you said there was two elements. The situation assessment being one. What was the other element?

THE WITNESS: Choice of a course of action.

MS. MILLS: Now in your work at Ames, have you had a chance to observe cockpit decision making?

THE WITNESS: Yes. We have video tapes from a number of different studies run in full mission simulators. These provide a very rich opportunity to see a number of

crews from the same airline who are faced with exactly the same scenarios and how they can respond to those.

And that provides us with an opportunity to video tape their performance and then analyze that performance in considerable detail to identify differences and strategies and their relation to overall effectiveness with which the crew copes with the situation.

Effectiveness being judged not by us, but by test pilots who are from the airline.

MS. MILLS: You're getting ahead just a little bit. What are some of the unique features of cockpit decision making versus general decision making in a naturalistic environment, i.e., a non-laboratory environment?

THE WITNESS: Decision making in the cockpit is frequently fought with time pressure, especially decisions that need to be made close to take off or landing. There is high risk associated with many of those decisions. There are very real consequences. In the laboratory, there are usually very few consequences. You may get a bonus of a few dollars for making an optimal choice, but life does not hang in the balance.

In the cockpit, the crew is doing another task while they are making the decisions. They have to fly the

plane. They have to perform the standard procedures, the communication, the check list, and make decisions on top of these other activities. So it's a much higher work load kind of decision making than we usually find in the laboratory.

Another important difference is that decision making in the cockpit is very much supported by guidance. Crews aren't figuring out from scratch what they ought to do in most situations. There are either regulations or procedures or guidelines for what to do under a variety of circumstances. And that's very different from decision making in many other situations.

MS. MILLS: And what about the role of the decision maker? Is the decision maker role kind of the same in a non-cockpit environment versus a cockpit environment? Is there one person involved in making the decision all the time in the cockpit?

THE WITNESS: Well, even though the captain has the ultimate responsibility for the decision in the cockpit, it is usually a team effort. It should be a team effort. If it's a crew, whether it's one or two other people in the cockpit, but there are other resources available as well; company operations, ATC, cabin crew, depending on the nature of the situation.

So there are many resources that the crew can draw upon in making the decision.

MS. MILLS: And could they also be considered part of the team?

THE WITNESS: Certainly.

MS. MILLS: Would the controllers be considered part of this team?

THE WITNESS: Absolutely.

MS. MILLS: In the cockpit environment, could you categorize the types of decisions that pilots make or captains make or do all decisions fall into one category?

THE WITNESS: Well, no. There are clearly many different kinds of decisions that need to be made. And they differ in their difficulty. They differ in their complexity. Some decisions can be categorized as rule-based decisions. These are cases in which there is very little question about what should be done, but rather it's a matter of whether something should be done. So there's usually a rule that says if condition X occurs, then you carry out response Y.

A case of going around would be clearly a rule base type of decision. It's really a go/no go kind of decision in which you've got a bifurcation. If certain conditions exist that say all conditions are satisfactory,

you proceed with your general plan. If the conditions are not safe, then you take plan B, which is clearly specified in advance. Those are fairly tightly defined kinds of decisions. And what the crew has to do is to discern what the conditions are. Whether they should take plan A or plan B.

Other types of decisions differ really in the choice among a set of options. So the work is really considering a choice among different alternates to divert to us if a diversion is required. In some cases, neither is a good option. Neither because of terrain or because of fuel or because of weather, and the consequences of making either choice really have to be considered. So the kind of decision there is quite different.

MS. MILLS: Now, is there something that underlies all decisions? And you said that decisions consist of two elements. The first one being the situation assessment. Is there something that underlies how good a situation assessment is? In other words, is the situation assessment a function of something such as -- or what are some of the factors that affect the quality of the situation assessment? Let me ask if that way.

THE WITNESS: Qualities that affect -- the factors that affect the quality of the situation assessment?

MS. MILLS: Yes. In other words, are all situation assessments the same or are there some factors that affect that and make it better or worse?

THE WITNESS: Well, first of all, the situations themselves differ. Some situations are relatively easy to assess, because the cues are ambiguous. You may have some kind of indicator in the cockpit that says you've got a problem with your hydraulic system or a fuel leak. And it's an unambiguous indicator. You can verify it, and you know what the problem is. So the situation assessment is quite straightforward.

In other cases, the cues are ambiguous. And in these cases, it's much more difficult for the crew to assess the situation. Ambiguity can either arise from vague cues where there's no clear definition of what the problem is, and these can be thumps and bumps and vibrations, noises, but they can also be things like weather.

Where you know that weather exist, but it may be at a distance from you, so it's not clear what it means for your particular flight. Other kinds of ambiguity can be when you've got conflicting cues or if you've got readily interpretable cues, but they don't make any sense to you under the circumstances.

MS. MILLS: So is it fair to say that a situation

involving some kind of system failure where there's a clear instrument that indicates that would be a fairly unambiguous kind of situation, it's easy to assess, versus assessing a weather situation where the weather is very dynamic. Would you agree that that would be a more difficult situation to assess?

THE WITNESS: Usually that would be the case. I mean sometimes system indicators are themselves malfunctioning, so the crew would want to verify, as well as they could, that the indications they are getting are correct. But weather is generally unpredictable. It's dynamically changing.

Some system malfunctions may change dynamically. You may have a leak in the system and you have to observe it over time. But certainly dynamic situations are much more complexed than static ones.

MS. MILLS: Well, let's look at a weather situation that's fairly dynamic. What can the decision maker do to try to make a weather situation that contains somewhat ambiguous information less ambiguous?

THE WITNESS: It's a matter of monitoring the situation, looking for changes, using the resources available, calling whoever might have additional information, just really checking and rechecking. If it's a

dynamic situation, just continuing to monitor it and look for trends in the change.

MS. MILLS: Would you say a pilot soliciting information about the weather environment experienced by the pilot in front of him, would that be an example of what you would consider an effective way of creating an unambiguous situation?

THE WITNESS: Well, it would certainly be one step, absolutely. The trouble is with weather, the consequences aren't always immediately evident.

MS. MILLS: Now where does experience play a role in this, in terms of the experience of a decision maker? How does that affect the quality of the decision making?

THE WITNESS: Well, a relatively large body of literature has accumulated over the past several years on expert versus novist, problem solvers and decision makers. And the primary conclusions from that research is that experts don't differ from novists in the complexity of their reasoning, but really in the way they can see problems, their understanding of the situation, their ability to go beyond the surface cues to understand what the cues really mean.

They seem to differ in their understanding of what cues are more important than others, what sources of

information they can rely on, and generally they have a longer time horizon. They generally are able to look further ahead in the future and project what the consequences of the current situation might be.

MS. MILLS: So it's fair to say then the experienced decision maker, if he was a pilot, would be asking questions if it's a weather situation about this weather before he actually encountered it. Is that correct?

THE WITNESS: If he perceived it to be a threat.

MS. MILLS: Is it fair to say that this experienced decision maker would also solicit information to clarify any ambiguities in the situation. Is that correct?

THE WITNESS: You might expect that, yes.

MS. MILLS: Would you expect this decision maker also to share his concerns with the person next to him, someone participating in the decision, about the potential hazards in a situation?

THE WITNESS: Well, that's a different issue. That's more of CRM issue as opposed to a decision making issue, but yes.

MS. MILLS: Well, from a CRM view point, would you expect that as an example of good CRM?

THE WITNESS: Sure. And, of course, some information once obtained is sort of broadcast in the

cockpit. So you may assume that it is available.

MS. MILLS: In your research, have you looked at examples of what you consider effective and ineffective decision making?

THE WITNESS: Yes. We've been trying to discern. It's very difficult in a non-laboratory environment to define better and worse decision making, because the criteria are not as clear. In laboratory situations, you, the experimenter, can set up the problems and define the criteria, and you can use mathematical models to arrive at optimal solutions.

In the real world, the criterion is often difficult to establish. So we've been working to try to define working with experts in the field, what constitutes effective decision making, and then to look at the strategies that seem to be associated with those.

By using both our observations of crews in the full mission simulators, which give us comparisons across a crew facing the same problems and analyses of NTSB accident reports, where other experts have evaluated these individual cases, we've been trying to put together a collection of behavioral features.

Generally speaking, the features that seem to characterize good decision making are the situation

assessment, strategies that the crew uses, and their contingency planning, really trying to think about what happens and essentially do some pre-decision making, pre-planning to prepare for decisions they might need to make down the line.

And then two supporting activities are really managing the task and work load, as well as, of course, communicating about what the problem is and how they're going to deal with it.

MS. MILLS: So the elements of effective decision making include situation assessment, pre-planning, contingency planning and, I'm sorry?

THE WITNESS: Task and work load management. Then communication to make sure that all of the above are understood by the entire crew.

MS. MILLS: In the course of your research, have you read transcripts of cockpit voice recorders?

THE WITNESS: Yes.

MS. MILLS: Have you read the transcript of the cockpit voice recorder of USAir 1016?

THE WITNESS: Yes.

MS. MILLS: Do you see any of these indications: situation assessment, pre-planning, task work load, management and communication in the CVR transcript of USAir

1016?

THE WITNESS: Yes. There certainly was a lot of talk about the weather. Actually, the crew spent a lot of time before they actually got to Charlotte in trying to get a good ride for their passenger. So they were doing a lot of little deviation around weather on route.

Weather clearly was on their mind. Once they got to Charlotte and they saw this cell lying just south of the runway, they clearly were paying attention to it. There are numerous references to it in the transcript. So they were monitoring the situation. They were clearly looking to see if there was any change in the situation.

They did ask for ride reports to see how other people were experiencing the weather situation at the airport. And the captain, without any prompting from ATC, recognized that there was a possibility of windshear. So his expertise in looking at the situation, let him know that there was a possibility, which he did mention.

MS. MILLS: So you see all the elements of what you consider effective decision making in this transcript. Is that correct?

THE WITNESS: Yes. I mean, they did make a contingency plan. If they had to go around. They weren't going to fly into this cell. They were going to make the

right turn. The task management was clearly very good. The first officer was flying. The captain let the first officer fly. Didn't jump in and try to take over the activities there, but clearly monitored and supported the first officer.

The captain did what the pilot not flying should be doing, which was working the radios and trying to get information, monitoring the problem, monitoring the weather situation.

MS. MILLS: As a basis of comparison, you've read CVRs where you saw what you consider ineffective decision making. Is that correct?

THE WITNESS: Yes.

MS. MILLS: And you've seen where these four elements weren't not present. Is that correct?

THE WITNESS: That's correct.

MS. MILLS: Were you in attendance today at the hearing?

THE WITNESS: Yes.

MS. MILLS: Did you observe the testimony of the captain and first officer?

THE WITNESS: Yes.

MS. MILLS: Did you get a sense of the kind of situation with regard to the weather they were trying to

assess on Flight 1016?

THE WITNESS: I'm sorry. I'm not sure what the question is.

MS. MILLS: Do you feel after listening to the testimony of the captain and first officer that you have a sense of what their situation assessment was like in trying to assess the weather as they were entering Charlotte?

THE WITNESS: Well, it appears to me that they were aware of the threat of this cell they saw. There was convective activity all around. So they knew there was a possibility of some problem when they got to Charlotte, and they were watching to see if the situation deteriorated.

They were basically monitoring the situation and looking for any changes and asking for the ride reports.

MS. MILLS: Were the cues that they were getting about the weather, were they ambiguous or unambiguous?

THE WITNESS: Well, they could see this cell, which indicated some severe weather. But the question is how that would affect their flight. And I think the ambiguity resided in how that would affect their flight.

MS. MILLS: Were the cues conflicting that they were getting?

THE WITNESS: To a degree they were. I mean, they knew there was a cell here. The question is how widespread

the effect of that cell might be. So they heard that the flights preceding them had smooth rides and yet they knew this cell was sitting there. Then very shortly before they attempted their on final approach, they did get a low level windshear alert for the northeastern corner of the airport.

So they did have this alert, they did see this cell, but they were hearing that the ride reports were okay. So, I would say, yes, that was conflicting information.

MS. MILLS: How difficult is it to assess a situation in a dynamic environment when there are conflicting cues like they faced?

THE WITNESS: Well, it clearly is a very difficult situation. I mean, the weather cues are, in a sense, inherently ambiguous just because they don't know the extent. I don't know how one translates from a radar picture and correlates that with a visual experience and one's own subjective experience of flying. They had to put all of this information together.

I would say that was a very difficult situation. They are getting different cues that are telling them perhaps different things.

MS. MILLS: I would like to ask you some questions now about some of your research findings. Would you refer to Exhibit 14-E, page 6.

THE WITNESS: Fourteen-E?

MS. MILLS: Yes, 14-E, echo.

THE WITNESS: Yes.

MS. MILLS: In the middle of the page, it's an analysis of NTSB reports. It's found that in most cases, crews exhibited poor situation assessments rather than faulty decision making based on adequate situation assessment. Then if you continue, at the bottom of this page, going to the next page. "Using our decision taxonomy, and it's a frame to examine the tactical decision errors, we found that a large proportion of them -- 31 out of 47 -- were go/no go types of decisions, which should have been the simplest types of decisions. These included rejected take off, to simple decision height go arounds and diversions. In all but one case, the crew decided to continue or go in the face of cues that suggested discontinuation or no go of the current plan."

Do you feel that the circumstances of this accident, as you know them, would fit this particular finding of your research?

THE WITNESS: Well, certainly features, the type of decision is the same. It is a go/no go kind of decision. They faced ambiguous cues. I suspect that we're seeing a bias here in the sense that accidents have occurred when

there was a decision to go rather than to abort the landing or take off or whatever it should have been.

We don't see the inverse case. We don't see what may be inappropriate decisions that would substand that on its head. So, this is a select sample, if you will. But clearly the crews are in a position to try to continue with the flight there. They want to get their passengers where they want to go.

There seems to be -- even in laboratory situations, it seems to take a considerable amount of evidence to get people to change their interpretation of a situation. The evidence that will lead one to make a change seems to be greater than to convince them to continue with their course of action.

MS. MILLS: Can I refer you to Exhibit 2-F. Two-foxtrot, page 5.

THE WITNESS: Two-F. Page 5?

MS. MILLS: Mm-hmm. It's going to be the first paragraph. If you go about to the second sentence, it begins, "When a windshear causes a large and sudden in decrease indicated air speed, immediate increase in power and airplane pitch altitude is critical at a successful transition of the shear. The same immediate recognition and response is necessary for a large magnitude down drafts."

Doctor, my question is this, given your testimony about the difficulty of making decisions in the face of conflicting cues and the difficulty that leads in accurately assessing a dynamic situation, how realistic is it to expect pilots to make an immediate recognition of a situation that we know is ambiguous and contains conflicting cues?

THE WITNESS: Well, it sounds like you're asking about conflicting -- the quote here sounds like they are not really conflicting cues. I mean, at this point, crew is in the situation. And presumably once they are in it, they should be better able to recognize it by the changes in their indicated air speed and changes in pitch attitude. But the question of whether one can recognize the situations before one gets into them, I think is extremely difficult, because of the unpredictability, the changes of direction.

You don't see a windshear, as far as I can tell, before you are in it. So I don't know how a crew could be expected to recognize it. Other than to know that there are perhaps warnings or as in the case of crew for 1016, they had a low level windshear warning for the northeast quadrant. Well, to know whether that's going to affect their runway or not, how can they know. I don't know. You'd have to ask somebody who's an expert on windshear. I don't know.

MS. MILLS: Is it also fair to say that sometimes the absence of information is information. For example, both crew members testified that their airborne windshear alerting system did not alert either orally or visually. Can that be interpreted as information that there is no windshear?

THE WITNESS: Absolutely. I mean, if they've been trained to use this instrument. Crews expect the instruments that are provided to them in the cockpit to be valid indicators of conditions around them. Certainly.

DR. STRAUCH: Thank you, Dr. Orasanu, I have no further questions.

CHAIRMAN HAMMERSCHMIDT: Thank you, Dr. Strauch. Is there any other questions from the tech panel?

(No response.)

CHAIRMAN HAMMERSCHMIDT: Federal Aviation Administration.

MR. DONNER: We have no questions. Thank you.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Donner. National Air Traffic Controllers Association.

MR. PARHAM: Mr. Chairman, we have no questions.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Parham. Honeywell.

MR. THOMAS: No questions. Thank you.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Thomas. Airline Pilots Association.

MR. TULLY: No questions.

CHAIRMAN HAMMERSCHMIDT: USAir.

MR. SHARP: No questions, Mr. Chairman.

CHAIRMAN HAMMERSCHMIDT: Douglas Aircraft Company.

MR. LUND: No questions. Thank you, Mr. Chairman.

CHAIRMAN HAMMERSCHMIDT: Pratt & Whitney.

MR. YOUNG: No questions. Thank you.

CHAIRMAN HAMMERSCHMIDT: Association of Flight Attendants.

MS. GILMER: No questions. Thank you.

CHAIRMAN HAMMERSCHMIDT: International Association of Machinists.

MR. GOGLIA: No questions, Mr. Chairman.

CHAIRMAN HAMMERSCHMIDT: Thank you. Dispatchers Union.

MR. SCHUETZ: No questions, Mr. Chairman.

CHAIRMAN HAMMERSCHMIDT: Thank you. National Weather Service.

MR. KUESSNER: No questions.

CHAIRMAN HAMMERSCHMIDT: Mr. Laynor. Mr. Clark.

BY MR. CLARK:

MS. MILLS: In your research, I understand that

you work with simulators or follow that.

THE WITNESS: Yes.

MS. MILLS: Does any of that involved directly windshear type of avoidance and training?

THE WITNESS: No, it has not.

MS. MILLS: In the simulator work -- well, can you describe some of the programs you've worked on on the simulators? I think you've described the RTOs, rejected takeoffs.

THE WITNESS: You mean about the scenarios?

MS. MILLS: Yes.

THE WITNESS: The kinds of problems that the crews have actually faced?

THE WITNESS: Right.

MS. MILLS: A frequent element is a requirement to go around due to weather, but there has not been windshear in any of these, but there has been weather. System malfunctions of various types, major hydraulic system failure, CSD overheat, jammed stabilizer trim, engine oil leaks. All of which required of coping with the system malfunction and making a decision about possible deviation and then where to deviate.

MS. MILLS: In your simulator work, specifically in the go around mode related to weather, do you have the

ability to simulate rain or simulate the visual cues? How representative is that?

THE WITNESS: The video tapes that we're working with now were collected many years ago. These were night flights. So they were in full mission simulators. The turbulence could be simulated, but the visual cues were not present.

MS. MILLS: Have you done in the weather side any work in turbulence or tried to duplicate turbulence as an initiating factor for go around?

THE WITNESS: Not specifically. Presence of turbulence was used as a cue in one of the early studies. And it was one of the cues that highlighted for us the importance of situational awareness. The crews that seemed to be more effective overall in coping with the problems were those who recognized the turbulence and thought about the weather and recognized the possibility that they might need to go around and really were prepared for it and were able to make earlier decisions than those who didn't prepare for it.

MS. MILLS: In the simulator training, do you have an assessment of how the effect of the absence of vertical G's may affect the decision making process?

THE WITNESS: I don't. I don't know.

MS. MILLS: And also in your research, what is your perception? If you can characterize the time it takes to respond or to make a decision to a various event, are we talking on the order of within a half a second of onset, six seconds, something like that? You've been there and have seen the typical types of delays.

THE WITNESS: Right. Actually, that's a very interesting question. I think certain classes of decisions when we started looking at things, like how long it takes to make decisions, we realized that the more effective crews -- again, more effective as judged by the check pilots who observed the crews in the simulators -- seem to be the ones who show the greatest amount of variation in their response to the problems they encountered.

When a fast decision was required, they were the fastest. However, when time allowed, they were the ones that took the time and often really managed the situation to acquire more time so that they could gather information. So when it was not a time pressure situation, more effective crews really exploited the opportunity to gather information to make a good decision, rather than jumping quickly to a decision.

So time is a tricky question. Making a fast decision is necessary under certain circumstances and not

under others.

MS. MILLS: The urgency would have a great effect on how fast somebody may try to respond?

THE WITNESS: Well, I think one aspect of situation assessment includes assessing whether a fast decision is required, assessing how much risk is involved, how much risk is involved in delaying the decision. That's all part of what we're now defining as the situation assessment phase of decision making. And if they assess that they have to make a quick decision, well, then they better get on with it quickly.

MS. MILLS: Dr. Strauch referred earlier to the definition of windshear -- or part of the windshear training that may result in large and sudden decreases in indicated air space. If the training environment duplicated that in which we had large and sudden decreases in air speed, and out in the real world, we may not have such a large decrease or such a sudden decrease, that may be a compounding factor that would increase the decision time to react to an event?

THE WITNESS: Well, it's possible. Certainly.

MR. CLARK: I have no other questions.

CHAIRMAN HAMMERSCHMIDT: Thank you. Mr. Schleede.

MR. SCHLEEDE:

MS. MILLS: Yes. Dr. Orasanu, I notice in your

paper that's contained in Exhibit 14-C, you have a chapter entitled, "Can We Teach Crews to Make Better Decisions?" I had written a question down that can we teach decision making to pilots. That's a question to you.

THE WITNESS: That's a good question. Before we teach it, I think we need to understand what is involved. That's why we're doing our research. We're trying to understand what the features of effective decision making are, and then to try to figure out how we can support decision making. Some of the support may come from better information available to the crews that are indicators, that signal danger, that help in assessing the risks associated with different conditions. Then training the crews to use their resources and to assess the situation and really to try to put together the pieces.

So I think in principle, it is possible, and I would certainly say that it's probably something that needs to be done under the kinds of stresses that crews actually find themselves in and using the simulators, not just reading about it in the classroom. That's one stage, but I think one needs to practice these kinds of skills.

MS. MILLS: How would you characterize the stage that the research in these areas is? Is it embryonic or is it halfway through or coming to closure? Can you put a time

frame on it for us, where we stand, coming to a point where we might be able to apply some of this research?

THE WITNESS: Well, I think the early findings are being applied already in principle. We have some recommendations that have fallen out of our research and other people are doing research along these lines. I think these are first steps.

We're still trying to understand what we can do to help crews. We've identified the problems. We've identified some of the processes. We've identified some of the kinds of decisions crews have to make, how we can best prepare them to deal with these very difficult kinds of decisions.

It's something we don't really know yet, other than to exhort them to be alert, to gather information. But one of the problems that we see is that in the cases of accidents, it often appears that there is an inadequate assessment of risks. That the crew doesn't really perceive the risk to be as great as it is. It's not clear how one can train that kind of improved perception. I don't know how to do it yet.

MS. MILLS: I recall nearly 20 years ago, people stating that you could not regulate or teach judgment. There was considerable research done in aviation in Canada

and the United States and Europe. And I believe now there is a program where we actually teach, and it is required by regulation, judgment training.

Would you characterize this risk assessment or situational assessment and decision making as a similar effort in what I've described as in the previous judgment training.

THE WITNESS: Mm-hmm. I think once the research is done that we will be in a position to train this. I don't think this is intractable, but I think that we just need to identify the situations and know what their features are and know what it is that we need to train. We just haven't gotten to that point yet.

MS. MILLS: You mentioned other people are doing research. Is there a central focus, sort of a leadership role? Does NASA plan a leadership role of the various organizations that are conducting this research?

THE WITNESS: NASA is doing a considerable portion of this. The military has been supporting research in aviation decision making, what was the Naval Training System Center. The names have been changed, but I can't remember the new acronym. The FAA has supported a lot of this work and many of its grantees are doing work related to the decision making.

MS. MILLS: How about the airlines and other aeronautical organizations, are they being supportive?

THE WITNESS: Oh, yes. We work with the airlines, and I know that everyone else who is doing work that requires judgment. One of the issues is we don't want to just do research in the laboratory with college sophomores and that was the problem with some of the earlier research.

If you're going to merely try to understand this element of situation assessment that seems to rely very heavily on the expertise in perceiving important cues in the situation. Then college sophomores are probably not your best student population, unless they happen to all be pilots. That's why we work corroboratively with airlines in doing this research.

MS. MILLS: On a side line, is any of your research being applied to an air traffic control situation or is this strictly the cockpit environment?

THE WITNESS: Ours has not been applied. Other people are doing work on air traffic control. I can't comment direct on that. I don't know exactly what they're doing, but I know that it is ongoing. We're trying to expand our work to look at the team much broadly, more broadly defined. So we're looking at the flight deck as it interacts with the dispatchers and ATC in flight replanning

situations.

MS. MILLS: I'm not quite sure how to ask this next question. I'll try it here. In your position with your knowledge and your research and your expertise, could you help tell us at this NTSB, what elements we need to document and examine in order to properly evaluate the decision making and situational assessment of the flight crew of USAir 1016?

We're going to be analyzing the record in a few weeks, and we would like your expertise and your suggestions.

THE WITNESS: Right. Well, at this point in our knowledge about crew decision making, the four features that I mentioned before would be the ones I think that I would emphasize. The situation assessment, which includes risk assessment and temporal parameter. What's the situation now, what might it be done the line. The monitoring and updating of information.

Clearly, the task management strategies. Contingency planning. Communication within the cockpit, and between cockpit and ground about the problem.

MS. MILLS: Including the controllers?

THE WITNESS: Certainly. Their sources of information.

MS. MILLS: Training program?

THE WITNESS: Mm-hmm.

MR. SCHLEEDE: Thank you very much, Dr. Orasanu.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Schleede. I have just one question. Dr. Orasanu, do you see any similarities in the fact of this accident involving Flight 1016 with the facts and circumstances of any other aviation accident that you have considered in your research?

THE WITNESS: Certainly. In the set of accident reports we've reviewed, there have been a number of accidents that involved windshear. Cases in which there was some weather activity in the vicinity of the airport.

CHAIRMAN HAMMERSCHMIDT: I was meaning more in terms of crew decision making.

THE WITNESS: I'm not sure what the question is.

CHAIRMAN HAMMERSCHMIDT: I was wondering if after having studied the cockpit voice recorder transcript, if you just see any factual similarities with other accident report material that you have done research on, such as NTSB reports? Any striking similarities with some other accident come to mind?

THE WITNESS: Well, I guess the most salient aspect is that in other accidents that have involved windshear, there has been an acknowledgement by the crews

that there is some level of weather activity in the vicinity of the airport. And in some cases, there's even been lightening.

The crews have been aware of that weather and have proceeded. And the question is what cues do they really need to make decisions to divert earlier on. I mean, I think this is really the central problem of the ambiguity of the cues.

Other accidents have occurred, whether the crews have seen weather. They know this weather, but they don't know how it's going to affect their flight, and that seems to be a major problem.

CHAIRMAN HAMMERSCHMIDT: Very good. Let's see. Mr. Feith, do you have a question.

MR. FEITH: Yes.

BY MR. FEITH:

MS. MILLS: You were talking about simulators. So in talking about the simulators, I just have a question. Do you believe that the simulators provide an effective atmosphere or stress environment for a pilot to effectively train and monitor how a crew is going to make a decision based on a variety of different cues, considering the fact that when a pilot goes into a simulator he basically knows what's going to be required of him in the performance of

either an initial or a recurrent ride?

THE WITNESS: That's always a concern, the realism of a simulator for training purposes. At this point, I think it's the safest and the only way we can do it. One can induce a variety of stressors in the simulator through work load, through information load, changes in runways, that require a lot of activity to be performed at the same time that decisions are being made.

Clearly, the crew is not facing the real risks that they face in other environments. But certainly one doesn't want to train in the real environments where there is risks. So I think it's the only thing we can do at this point.

MR. FEITH: Thank you very much.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Feith. Dr. Orasanu, do you have any other suggestions that may help the safety board in its work or is there anything you would like to add for the record whatsoever?

THE WITNESS: No, thank you.

CHAIRMAN HAMMERSCHMIDT: Well, we certainly appreciate your attendance here and your participation in this public hearing. You have shed some light on a very important area. So you may step down now.

THE WITNESS: Thank you.

(Witness excused.)

CHAIRMAN HAMMERSCHMIDT: Let's see. Our next witness is Captain Tom Johnson. Captain Johnson is the director of training for USAir.

MR. SHARP: Mr. Chairman?

CHAIRMAN HAMMERSCHMIDT: Mr. Sharp?

MR. SHARP: USAir would like to request that an exhibit, which has not previously been submitted, but I think it has been distributed to all parties. It's numbered as Exhibit 2-S. It would assist Captain Johnson in his testimony, and I think make it a little easier for the board to understand some things that will be discussed during his testimony.

MR. SCHLEEDE: Yes, it has been distributed to all the parties. It has been entered in the record as 2-S, in sierra.

MR. SHARP: Thank you.

(Witness testimony continues on the next page.)

CAPTAIN TOM JOHNSON, DIRECTOR OF TRAINING, USAir, INC.,
PITTSBURGH, PENNSYLVANIA

Whereupon,

TOM JOHNSON,

was called as a witness by and on behalf of NTSB, and, after having been duly sworn, was examined and testified on his oath as follows:

MR. SCHLEEDE: Captain Johnson, would you please state your full name and business address for our record?

THE WITNESS: Yes. My name is Thomas E. Johnson,

Pittsburgh, Pennsylvania.

MR. SCHLEEDE: By whom are you employed?

THE WITNESS: USAir.

MR. SCHLEEDE: In what position?

THE WITNESS: I'm director of training standards.

MR. SCHLEEDE: How long have you had that position?

THE WITNESS: I've had it for eight weeks.

MR. SCHLEEDE: Eight weeks. Could you briefly describe your experience, training and education that qualifies you for your present position?

THE WITNESS: Yes. I attended Amerillo, Oklahoma State. The flight schools were Oklahoma State, Flight Safety, Braniff Educational System. And work background, I was a flight instructor at Oklahoma State. Flew as first officer for Executive Airlines, Air New England, and then qualified as a captain for the corporation of Taylor Wine, Great Western Champagne. Was hired by Allegheny Airlines in 1978, January.

MR. SCHLEEDE: What aeronautical ratings do you hold, FAA ratings, certificates?

THE WITNESS: I hold a flight instructor, instrument instructor, airplane power plant mechanic, flight engineer turbo jet, airline transport pilot, multi-engine

land. Type ratings or citations, M2-98, VAC-111, Faulker 100, 757, 767. Commercial privilege is multi-engine C, single engine, multi-engine land and sea.

MR. SCHLEEDE: Approximately how much total flying time do you have?

THE WITNESS: Ten thousand hours estimate.

MR. SCHLEEDE: Have you flown the DC-9?

THE WITNESS: I have as a first officer, yes.

MR. SCHLEEDE: Approximately how many hours?

THE WITNESS: Probably 1200 to 1500.

MR. SCHLEEDE: And that's line operation?

THE WITNESS: Yes, it is.

MR. SCHLEEDE: How about as an instructor?

THE WITNESS: None as an instructor on the DC-9.

MR. SCHLEEDE: What position did you hold prior to assuming your most recent position?

THE WITNESS: Yes. The most recent position was a check airman on the Boeing 767.

MR. SCHLEEDE: Thank you. Ms. Mills will continue.

MS. MILLS: Good afternoon, Captain Johnson. You've shared some of your aviation background with us. Would you tell us a little bit more about your previous training experience or training department experience with

USAir? You said you were check airman. Have you ever worked with the DC-9 program at all?

THE WITNESS: No, I have not worked with the DC-9 program. My background, I was hired as a captain on the M2-98. From there, I was a first officer on the 727, DC-9, BAC-111. Checked out in 1984 on the BAC-111. Became a check airman in 1986 on the BAC-111. In 1989, I became the flight manager of the Faulker 100. In 1991, I became the manager of CRMAQ programs. Then in 1992, went on to be a check airman on the 767, until the new position.

MS. MILLS: Are you still a check airman?

THE WITNESS: Yes, I am.

MS. MILLS: Now you are currently the director of training and you've held that position for eight weeks. Did the previous director of training conduct an out briefing?

THE WITNESS: I'm sorry, repeat.

MS. MILLS: Did the previous director of training conduct an out brief?

THE WITNESS: No, he did not, but he did leave an outline.

MS. MILLS: Excuse me?

THE WITNESS: I was left an outline.

MS. MILLS: Okay. How many check airmen do you employ at USAir?

THE WITNESS: Roughly a 187 check airmen.

MS. MILLS: How many aircrew program designees?

THE WITNESS: Okay. Would it be all right, I do have an exhibit 1 that I could put up as I describe the --

MS. MILLS: Well, basically, I'm just looking for a number.

THE WITNESS: Designees, I do not know.

MS. MILLS: Can you explain the designee program to us, please?

THE WITNESS: Yes. The FAA, through their aircraft program manager, conducts check rides, evaluation rides. And because of the work load, they will designate from a 121 carrier or check airman to carry out their work. Meaning, to give type ratings.

MS. MILLS: What kind of guidance is provided to these designees?

THE WITNESS: They go through quite an extensive program. Once again, I do have an exhibit that I could put up, but I could say also that the selection process is usually a recommendation to be a check airman. And then once they are a check airman, the FAA selects the candidate they want independently to be a designee.

MS. MILLS: Do they have a manual, a designee manual?

THE WITNESS: Yes, they do. A very good one.

MS. MILLS: Is it separate from the check airman's manual?

THE WITNESS: Yes, it is.

MS. MILLS: You referred earlier to an outline that the previous director of training gave you. What did that entail?

THE WITNESS: Open items, such as the advanced qualification program and where we were in some of the areas.

MS. MILLS: Did he indicate any areas that needed special emphasis?

THE WITNESS: No.

MS. MILLS: Are all of your check airman qualified to perform all checks or are some of them simulator only and others line check only?

THE WITNESS: All but one exception on the 767 that does international line checks. All instructors at USAir are check airmen, all checks. Meaning, they are capable of training both in the simulator, in the airplane, conducting checks from either the left seat or the right seat.

MS. MILLS: At USAir, who is responsible for the direct oversight of the check airman?

THE WITNESS: The check airman reports to the flight manager or the equipment manager.

MS. MILLS: How does the equipment manager monitor the check rides?

THE WITNESS: The flight manager has a senior instructor. And that senior instructor is charged with a selection, the training, and the monitoring of all check airmen.

The senior check airmen also uses the program designees as part of a standardization board. And that is how they go about monitoring the check airman. But there is a little bit more to it besides this monitoring for when the check airmen comes in each six months for a pilot check or recurrent LOFT.

At USAir, when a check airman recommends an applicant, a pilot, for his type ride, the check airman sits in the right seat during the rating ride, so either the FAA or the designee also watches the performance of the check airman during the rating ride, because we are into seat task dependency. Meaning, at USAir, we train and operate in crews versus individuals.

MS. MILLS: So in other words, you have not only a captain, but a check airman in the right seat, rather than a line first officer during the check ride?

THE WITNESS: Yes. For a check ride, yes.

MS. MILLS: And you mentioned standardization earlier. Would you please tell us the purpose of standardization?

THE WITNESS: Standardization is for uniform. In USAir, I've heard lately this word "standardization" a lot to meet a level. In my own training department, I see this standardization in many levels. One of them is the tech writers that we have working for us in the department.

A second to USAir, there's also a check audit program that's independent from the training program. That's a director of flight safety and quality assurance that reports directly to the vice president, who does an on-going audit or daily audit of the check airman program for standardization.

Also, there's a manager's meeting. A manager's meeting twice a month for the sake of standardization. On top of that, the manager has a standardization meeting with his designees and senior instructor monthly.

Quarterly, the check airman has a standardization meeting to go out there to meet the requirements of the advanced simulation program and standardization. And then once again, when the check airman take rides, they're reviewed and looked for their standard of performance.

So standard is to work all the same, in unison, at the same level.

MS. MILLS: Are pilots required to follow the procedures in USAir's pilot operating manuals and flight operations manuals?

THE WITNESS: Yes, they are.

MS. MILLS: Why does USAir require that pilots brief visual and instrument approaches?

THE WITNESS: That's part of your human factors, getting into your situational awareness; the planning, preparation, visualance. So that they are prepared during a low-time, low-workload period. So that they are prepared when they come into the critical phase of flight, that they can concentrate more on the airplane.

MS. MILLS: How long has this been a procedure?

THE WITNESS: As long as I can remember on briefing.

MS. MILLS: How do you insure that pilots are following these procedures?

THE WITNESS: Because at USAir we do give simulator rides every six months to both captain and first officer, and there are random line checks conducted with the crews.

MS. MILLS: So do the check airmen have a method

of providing you with feedback with regards to this pilot performance?

THE WITNESS: Absolutely. The check airman reports right back to his flight manager. The check airman, for instance, on a line check, if he see a substandard performance by that individual, he will replace that individual. And then the information will go back to the flight manager.

MS. MILLS: And you have access to this information?

THE WITNESS: Yes, I do.

MS. MILLS: Do you feel that the check airman are sufficiently candid in these evaluations?

THE WITNESS: Yes, I do.

MS. MILLS: From the feedback information that's provided to you, what percentage of USAir pilots perform incomplete briefings or no briefings at all?

THE WITNESS: I'm sorry, you'll have to repeat it. It's a little hard with the speaker.

MS. MILLS: From the feedback information that is provided to you, what percentage of USAir pilots perform incomplete briefings or no briefings at all?

THE WITNESS: I really don't have that information. I would imagine all USAir pilots do all their

briefings. Otherwise, it would be a substandard performance.

MS. MILLS: What percentage of USAir pilots fail line checks?

THE WITNESS: Line checks, I'm not really sure. I know the failure rate for the total training program is around two percent. I find that two percent is a healthy failure rate. Anything less than two percent would be that we're not challenging enough. Anything more than a two percent means that we have a faulty program in place. But I differentiate right now or not as I sit before you to tell you what the fail rate is on a line check.

MS. MILLS: When the principal operation's inspector was interviewed -- just a second. I'm getting ahead of myself. Describe for us the relationship that USAir has with the FAA, the Management Office in Pittsburgh, please?

THE WITNESS: Well, are you talking about the FSDO, Flight Standard District Office with USAir?

MS. MILLS: Yes.

THE WITNESS: I think it's a very technical, a very professional relationship. It insures the compliance of all the FARs, and it's the pursuit of a safe operation.

I know that our FSDO office is responsible to

insure the oversight, the approval, the surveillance, the inspection of USAir. But I found this group also to be very helpful and very pro-active. They've helped in many programs at USAir. Some of them the altitude awareness that was conducted with the Airline Pilots Association, our FSDO office and USAir.

We have a self-disclosure program that I think is excellent. Where we notice the FSDO office if we're in non-compliance on a small item and rectify it. To me, personally, the FSDO office has been a great help. I mean, talk about taking advantage of your resources. They are a resource, very bright and dedicated group. I think that they've been very fair in the handling of USAir and very consistent in their manner.

MS. MILLS: As director of training, do you provide to the principal operation's inspector projected and/or revised training schedules?

THE WITNESS: Once again, you'll have to repeat that.

MS. MILLS: Do you provide to the principal operation's inspector projected and/or revised training schedules?

THE WITNESS: Yes, that's true. You know, in a training department, it should be noted that everything goes

through the FAA. We're either approved or accepted. So they get a listing of failure rates. They get schedules in advance. They are part of USAir as a surveillance.

MS. MILLS: Do you notify the FAA when you withdraw somebody from training?

THE WITNESS: Yes, we do.

MS. MILLS: How about actions taken on students who fail training -- you just said that. Excuse me. A report of additional training provided to airmen in excess of the approved training hours?

THE WITNESS: Different areas -- are we talking about a proficiency check in additional training or are we talking about initial training?

MS. MILLS: Either.

THE WITNESS: Initial training, no, there's no record. USAir, we train to proficiency. During a proficiency check, yes. In the remark section, we put down that one maneuver can be repeated or trained and then re-evaluated. That is placed in the remark's section, and that is kept on record.

For the record keeping in the computer program, there is a remark's box.

MS. MILLS: Would you be surprised if I told you the aircrew program manager on the DC-9 said that that

wasn't being accomplished?

THE WITNESS: Well, you would have to talk to him.

MS. MILLS: When the principal operation's inspector was interviewed a week after the accident in Charlotte, he said that there were different cultures within USAir, and that there was variance in DC-9 crew standardization that were not acceptable. But he said that he recognized that it takes years to change.

And then he went on to say that that wasn't acceptable to him, but by selecting you, Tom Johnson, as director of training, there was indication that USAir wanted to change this.

So I have to ask you, are you aware of these variance in crew standardization and these different cultures?

THE WITNESS: Well, you know it's kind of hard to ask a question like that when you give a compliment. I think I mentioned in our interview that the problem I had with standardization some times was the generation of aircraft. Meaning, first generation aircraft DC-9 versus third generation Faulker-100, the use of glass in computers versus electro-mechanical gages.

I think we are going to step up our programs, but right now, I think we have very good programs at USAir. I

think we're dedicated. And as far as culture goes, that's a wide avenue. I would need to have that framed to come up with an answer.

MS. MILLS: So does that mean that you're not aware of any USAir flight crews not adhering to USAir procedures?

THE WITNESS: No, I'm not aware of that.

MS. MILLS: Are you familiar with an incident that occurred in September of '89 where a USAir 737 Flight 105 on approach to Kansas City struck and severed four electronic transmission cables located about 75 feet above the ground, 7,000 feet east of the runway threshold? There was substantial damage to the aircraft.

NTSB investigated this incident. And the board found that the flight crew members did not adequately prepare for and execute the approach. Do you recall if there were any changes after that?

THE WITNESS: Yes, there were a lot of changes. In fact, I would like to back it up just a little bit. The changes started to occur in 1984. And that was Detroit, I believe Flight 183, where the NTSB had a recommendation that we get involved with CRM and windshear.

At that point, we implemented programs, not that the programs are the level that we are at today. In 1989,

we did have a CRM program, but we weren't hitting the button. So we redeveloped the program in 1990 taking the advisory circular and following the points. That's the program that we have today, meaning an indoctrination of practice feedback in an on-going recurrence or re-enforcement stage.

So we have from that accident, developed a new CRM program.

MS. MILLS: And you're saying that it was CRM that caused them not to adequately prepare for and execute the approach?

THE WITNESS: Well, that would go back to situational awareness with visualance planning.

MS. MILLS: I think it went back to briefing, but I'm not real sure here.

THE WITNESS: And then briefing would be part of the communications, all is part of the CRM issue.

MS. MILLS: Is windshear training -- I'm going to shift gears here. Is windshear training required by regulation?

THE WITNESS: I'm sorry, by regulation?

MS. MILLS: Yes.

THE WITNESS: Yes, it is.

MS. MILLS: How is this accomplished at USAir?

THE WITNESS: I'm glad you asked. I really am. I'll ask you this, are you familiar with the windshear training aid?

THE WITNESS: Yes, sir, I am.

MS. MILLS: At USAir, we're involved with the windshear training aid. Sorry to say not at the beginning. In 1985 when the FAA did the commission of, I think, Boeing, Douglas, United Airlines, AWA and Helenwell. In 1987, this document came out. By 1989 through the ATA, there was an advisory circular on windshear.

It came out in the month of October. The month of November, USAir had all its simulators qualified and approved. We followed this document. Over these hearings, I've listened to a lot of questions with regard to windshear. These documents have the answers to a lot of the questions. Everything to the type of program that we have set in the simulators.

The advisory circular recommended three scenarios. One before VR, one after VR, and approach. At USAir, we have six scenarios. We've taken advantage of all four of the wind model programs. Some of them do have turbulence and introduction to the maneuver, but not all. All of them do have turbulence within the maneuver as recommended by the software from the JAWS program, where they did collect the

data for these programs.

As far as the visual reference, these models it goes everything from VFR down to a mile and a half. But through these documents, everything from the management awareness, to the windshear pilot's guide, to the examples of windshear pilot training, and to the windshear simulator implementation program, USAir has used this document.

This is a living document in the fact that it does have a revision service to it.

MS. MILLS: Are all of the windshear scenarios presented survivable?

THE WITNESS: Yes, they are. And there's a reason behind it, as outlined in the windshear training guide. We're not looking to capture all of the windshear training just in the simulator. There are different modules or sets that we do with the training. It starts in the academic classroom environment where we're actually doing the avoidance and a certain amount of the recognition.

At the simulator program on the briefing, once again, we go through the recognition and then into the simulator, the recovery maneuver. It's outlined and it's step by step. As I said, we're not looking to capture every learning objective solely in the simulator. So that by having it and it's binary in nature, meaning that simulator

defaults to survivable, we want to -- and I should go back and forth with this. The students are fully aware that windshear is not always survivable, and that is in the academic section on one of the quiz test.

However, when they are in the simulator, we are trying to re-enforce the procedure itself. Now, if we do have an applicant that say is not challenged by the maneuver or possibly doesn't see the critical nature of the maneuver, then the instructor will set non-survivable, so that we can have a change in that individual's performance.

MS. MILLS: Now you mentioned that the objective of the ground training is the avoidance portion of it. How is that evaluated in the pilots, their knowledge?

THE WITNESS: Two ways. They do go through the testing, and I think you've been through the ground schools with the slide presentation. And then in discussion on the briefing and the debriefing, and then the actual maneuver itself in the simulator. So it's three steps or three modules of training.

MS. MILLS: Is there some kind of quizzing that goes on in the oral briefing?

THE WITNESS: Discussion in the oral briefing. I should bring up, though, there is a publication that we've talked about earlier, Flight Crew View. That did have in

the last edition or the edition we spoke about, May, a quiz on windshear.

MS. MILLS: Do you collect that quiz and grade it?

THE WITNESS: No, not that edition. That's like playing solitary. I mean, why would you cheat yourself?

MS. MILLS: Is there any scenario set in the simulator to determine whether or not pilots would delay or divert? The pilot is given cues, windshear cues to see that he diverts rather than fly into a shear.

THE WITNESS: In the simulator, the only cues that you can get because simulators are a certain limitation to it, the cues are internal. Meaning, inside the cockpit, the instrumentation, looking for the plus or minus 15 knots, the plus or minus 500 feet, plus or minus five degree pitch, unusual throttle or the one degree -- excuse me -- one dot on the glidescope. So those are the cues that are used in the simulator portion.

MS. MILLS: There is no windshear advisories broadcast. There's no PIREPS. There's no other peripheral information provided by the check airmen?

THE WITNESS: No. Once again, the nature of the training is not to hide the training. In fact, it's very up front and a discussion on it trying to really get secured on the maneuver itself. We're talking about going to the

recognition and recovery. Then talking about the avoidance. And maybe that's not enough verbiage connected to it.

Avoidance maybe should be identify and avoid. And in that discussion, that's when we're talking about the visual clues of looking out the window, the use of airborne weather radar, and the use of PIREPS, the use of forecast weather.

MS. MILLS: Did you say earlier that USAir had an internal evaluation program?

THE WITNESS: Yes, I did.

MS. MILLS: And what kind of program is that?

THE WITNESS: That's run separate from the training department. That is a director of flight safety and quality assurance reporting directly to the vice president of flight operations.

MS. MILLS: What is the scope of that program?

THE WITNESS: I believe not only do they check the simulator program, but line checks, and even do an audit of maintenance and really the whole flight operations.

MS. MILLS: When a corrective action is applied, what's in place to insure there's follow up to see if a deficiency remains?

THE WITNESS: When they do have a discrepancy, it's demonstrated in two ways. Some times it's just a

memorandum or other times they report. That information is then taken by the director of training and the changes are implemented through the channels.

MS. MILLS: Who does this process report to?

THE WITNESS: The report would go initially to the vice president of flight operations.

MS. MILLS: Is there any top management representative who's responsible to see the programs properly maintained and established?

THE WITNESS: Well, the vice president of flight operations is a pretty high position.

MS. MILLS: Have there been any concerns or trends identified by this program?

THE WITNESS: No, not trends. Problems that maybe have been adjusted. I have not seen any in the last eight weeks.

MS. MILLS: I have no further questions.

CHAIRMAN HAMMERSCHMIDT: Thank you, Ms. Mills. Dr. Strauch, do you have some questions?

DR. STRAUCH: I have a few questions.

Captain Johnson, you said that in USAir's examination of its CRM program, I think the words you used was, that the program wasn't hitting the button. Could you elaborate on that a little bit?

THE WITNESS: Yes. We put resources towards what we perceived to be the right direction for CRM, and that was a psychologist. And we're addressing more into the clinical psychology and not into the management. Dr. Laynor, of the NTSB, I think summed up the definition of CRM the best. And that was the effective use of all resources; the hardware, software, human ware, to aid in effective and safe flight operations.

Well, we weren't going that direction. We were doing more of the hot-tub mentality. I'm okay, you're okay transcretional analysis. Well, in today's environment, we really were looking for a management style. And so the present CRM program that was outlined in the advisory circular -- I believe 120-51 -- I think really gave us the avenue.

We developed a program somewhat in house with the help of the NASA UT group, and we did have some people at USAir that had extensive background from the Air Force in human factors.

DR. STRAUCH: I think you mean transactional analysis?

THE WITNESS: Yes, you're right.

DR. STRAUCH: Apparently, you also asked people at NASA Ames to observe your program also?

THE WITNESS: Yes, that's correct.

DR. STRAUCH: Were you required to do that?

THE WITNESS: No, we were not. But we were looking for input on the program. One of those deals it's not who's right, it's what's right. So we were looking to develop a good program for all the resources that were out there, and nothing is as good as the NASA Ames group.

DR. STRAUCH: Was it their reputation that made you go to them at NASA Ames?

THE WITNESS: Yes.

DR. STRAUCH: Their reputation for expertise in human factors?

THE WITNESS: Yes.

DR. STRAUCH: Was their input valuable?

THE WITNESS: I'm sorry?

DR. STRAUCH: How valuable was their input?

THE WITNESS: Very good. I didn't do that type of development, but looking at modules -- for instance, the inquiry of sertion model, maybe the decision making model came directly from these types of people.

DR. STRAUCH: Did another change in the CRM program also include the participation of first officers in the program too?

THE WITNESS: Yes. We didn't go after one phase.

Meaning, the indoctrination awareness. That would have been empty. We went for all three phases at once. And the second phase was the incorporation of a recurrent LOFT. Going towards another advisory circular, 120-35, on-line orientation flight training, we recoup 120-51 CRM and 120-35 for the advanced simulation.

We wanted to train crews as a crew and not as an individual. So the recurrent LOFT allowed us to address the seat task dependency issue and work on the human factors. We bring a first officer in an additional period a year. That's not mandated. That's just extra training offered by USAir.

During this recurrent LOFT training, we have it as a line trip with different points covering the mandated maneuvers for proficiency training period. At the end of the period, we do extra maneuvers. And at that time, on some of the equipment, we capture the windshear training.

Some of the airplanes that USAir actually have in their LOFT a windshear. The kind of windshear that would catch the pilot off guard. And then at the end of the period legitimate recommended windshear training.

DR. STRAUCH: Now, you said you include first officers in yearly LOFT sessions and this is not mandated. Is that correct?

THE WITNESS: That's correct.

DR. STRAUCH: Does this cost USAir money to bring them in?

THE WITNESS: It cost USAir a lot of money.

DR. STRAUCH: And why is USAir willing to spend this money?

THE WITNESS: Because reading over the accident reports, and especially the one years ago out of Detroit. Doing the research, they found that the crew members actually trained independently -- meaning, not a simulator partner -- over a few periods back. And so that they might have been good pilots. They might have had good skills -- not just this group, but others -- and weren't able to function as a team.

DR. STRAUCH: Does USAir intend to continue including first officers in the CRM program?

THE WITNESS: Yes. We're on our second year, and already we've developed a LOFT program for next year.

DR. STRAUCH: What kind of feedback have you gotten from the pilots about the CRM program?

THE WITNESS: They think it's over due. I was really surprised how proactive the pilot group was for that type of training. It was really a very pleasant surprise.

DR. STRAUCH: Now in your CRM programs, do you

emphasized different topics every year in recurrent training?

THE WITNESS: Yes, we do.

DR. STRAUCH: What was the topic that was emphasized this past year?

THE WITNESS: Okay. I do have a copy of the syllabus, and before I get it, some of the markers run in together. But this year, was the communications, the decision making, team building and team maintenance. Next year's program, which is being designed right now, will be situational awareness.

DR. STRAUCH: In the session where communications was dealt with, did that also cover briefing?

THE WITNESS: Yes, it does.

DR. STRAUCH: Could you take us down a little bit and tell us how this particular session dealt with briefings and what it asked the pilots to do?

THE WITNESS: There's a couple of briefings. The one briefing I think that we're discussing now is the crew briefing. Meaning, a discussion before the flight on the expectations, breaking down the barriers, setting up the guideline, the barriers -- or excuse me -- setting up the guidelines to the trip. Small items, like the operation of the cockpit door. How that is going to be handled. Whether

it's going to be a knock, a phone call, or just using the key. So that everybody knows in advance what the expectations of the trip are.

DR. STRAUCH: Now in the development of the CRM programs, including the LOFT sessions and so on, did USAir management work alone or did they work with other segments of the company?

THE WITNESS: The CRM program really took off. A lot of other departments were very interested. When we were going through the indoctrination awareness of the first portion of it, we actually got called and admitted people from other corporations.

We had a lot of people come in from Amtrak, from the Atomic Energy Plant, which I was surprised to find that how similar it is to run an atomic energy plant versus driving an airplane. We brought in the military. And, in fact, we talked, of course, on military installations.

We brought our flight attendants in the supervisory level. All the dispatchers at USAir have gone through the program. And the representatives of our FSDO office.

Right now in the re-enforcement stage, that is, in the recurrence event, we have a flight attendant and a pilot teaching that segment. Not only is that segment or module

talk to the pilots, but the same module is taught to the flight attendants.

DR. STRAUCH: Did the Airline Pilots Association also participate in the CRM program development?

THE WITNESS: Yes, they were very, very supportive. In fact the first cadre of facilitator were from the Airline Pilots Association or their recommendations.

DR. STRAUCH: So it's fair to say that their recommendations played a part in the development of the CRM program?

THE WITNESS: Absolutely.

DR. STRAUCH: Captain, did you listen to the testimony of Dr. Orasanu?

THE WITNESS: Yes.

DR. STRAUCH: If I could read the same quote to you that I did to Dr. Orasanu. Again, from Exhibit 2-F, page 5. "When a windshear causes a large and sudden decrease in indicated air speed, immediate increase in power and airplane pitch altitude is critical to a successful transition of the shear. The same immediate recognition and response is necessary for a large magnitude down drafts."

Having heard Dr. Orasanu's testimony about conflicting cues and difficulties that that creates for

situation assessment, do you feel that this is applicable? This is reasonable to expect crews in dynamic weather conditions to be able to immediately recognize and respond to large magnitude down drafts?

THE WITNESS: I don't think so. In looking once again at the training aid, they say that sometimes the response goes anywhere from five seconds to 15 seconds. So it's really difficult to quantitate what the reaction time of a pilot group would be to such an activity.

DR. STRAUCH: So in other words, you feel in this particular aspect, this part of the air program that was taken, I assume, verbatim from the windshear training aid, may not be reasonable?

THE WITNESS: I don't really understand that question.

DR. STRAUCH: My question, I guess, is do you think there needs to be changes in the windshear training aid, as a result of what we know about this accident?

THE WITNESS: I really don't know much about this accident yet. I'll wait until the NTSB report comes out, the final draft, and then have a better idea of where we're going.

DR. STRAUCH: As a result of what you now know about decision making, do you feel there needs to be changes

in the windshear training aid?

THE WITNESS: No, I don't. I think the windshear training aid is an excellent document. There's just more to it. It's not a simplification of answer by saying, well, we'll change the training. There's more to this issue than just the training.

DR. STRAUCH: What are some of the cues that you ask pilots to look for when there's a possibility of a windshear encounter?

THE WITNESS: I think we went over this a little bit. The visual cue of looking out the window, the radar, the use of the airborne weather radar, the calling of PIREPS and the forecast weather.

DR. STRAUCH: In your examination of the cockpit voice recorder transcripts of Flight 1016 and the testimony of the captain and the first officer, do you feel that they have followed USAir's guidance in attempting to obtain information about the possibility of a windshear encounter?

THE WITNESS: Yes, I do. Just in watching the use of the airborne weather radar, the cognizant nature of looking out the window and the situational awareness being up on that cell and the request of PIREPS, I thought they went a great deal in the research of whether there was a windshear.

Now we both know that windshear at this time is no way to quantitate for a pilot to distract the presence or the intensity of a windshear. He can only go at a probability level.

DR. STRAUCH: Do you have any explanation as to why the cell that this flight apparently traversed was not visible on their radar?

THE WITNESS: No, I really don't.

DR. STRAUCH: I would just like to follow up on some questions of Ms. Mills. You stated that the failure rate, wash out rate was approximately two percent to USAir pilots?

THE WITNESS: Yes, the failure repeat rate would be about two percent.

DR. STRAUCH: Is that across the board or does it vary by equipment?

THE WITNESS: It varies a little by equipment, but it does change. The 767 program had a higher failure rate. That rate has now come into compliance with the other fleet types.

DR. STRAUCH: Would the DC-9 failure rate be higher than average, average, or below average?

THE WITNESS: Very average. It's the first generation aircraft. It's been on property for a long time.

It's an entrance level aircraft. Younger crews are attracted to that airplane. Study habits are better.

DR. STRAUCH: You stated that the flight safety department conducts audits of the check airmen program?

THE WITNESS: Not the check -- yes, they do. Yes. The whole program, the whole training program.

DR. STRAUCH: Can you elaborate a little on how those audits are conducted and what they are like?

THE WITNESS: Yes. The director of flight safety and quality control has his own team. Those are check airmen, and they call them audit check airmen. And they are free to go in and out and monitor the performance or the ride being given in the simulator.

DR. STRAUCH: Are you ever told in advance when this is going to happen?

THE WITNESS: No, I'm not. They run independent, sort of internal/external program

DR. STRAUCH: You also said there's an audit of maintenance program?

THE WITNESS: Yes. I understand that they actually do look at the gate area, the operation's side. I mean, they look at a lot, that program, the title audit.

DR. STRAUCH: I know that's outside you area, but would you feel qualified to describe that audit?

THE WITNESS: It's outside my area, and I don't feel qualified to do so.

DR. STRAUCH: I didn't think so. Finally, the most recent issue of Flight Crew View discussed windshear. When was the Flight Crew View distributed to USAir's pilots?

THE WITNESS: Six times a year.

DR. STRAUCH: Do you know when this most recent one was issued? I believe it's Exhibit 2-F.

THE WITNESS: The May edition. It covers three months, but yes.

DR. STRAUCH: Do you know around when USAir distributed it or were you involved with that?

THE WITNESS: That was just a little before me, but I would say two weeks -- about ten weeks ago. Eight to ten weeks ago.

DR. STRAUCH: And what do you expect pilots to do when they receive Flight Crew View?

THE WITNESS: I would expect them to read it.

DR. STRAUCH: Are they required to read it?

THE WITNESS: Yes, they are. We do have as part of our recurrent ground school program, the winter edition. There is a test that is taken. And those results are counted, and that's conducted through the chief pilot's office for the counting of that exam.

DR. STRAUCH: Now in this particular issue, there was no test. How would the company determine that the pilots are, in fact, reading this issue of Flight Crew View?

THE WITNESS: You know, we're really dealing with professional airline pilots, and I would hope that they would read such materials. It's a benefit to that group. It's not benefitting me by giving them exams to monitor their performance of taking those exams. Really, I'm hoping that they are reading it. As they say, as playing solitary, you're not going cheat yourself.

DR. STRAUCH: Thank you, Captain Johnson. I have no further questions.

THE WITNESS: Thank you.

CHAIRMAN HAMMERSCHMIDT: Thank you, Dr. Strauch. Let's see, going to the parties. Federal Aviation Administration.

MR. DONNER: No questions. Thank you.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Donner. National Air Traffic Controllers Association.

MR. PARHAM: Captain Johnson, I just have two questions, I think. Do you think including an LLWAS alert in the windshear scenario at USAir be beneficial to the pilot training?

THE WITNESS: I'm not really sure. As you asked

the question, I would need to think about it. At USAir, it's not, even as the director, I don't make those calls. There's a lot of research that goes into it. And quite frankly, it is publications from the NTSB, advisory circulars from the FAA, and then with the manufacturers, software, hardware, and before we make any kind of decision on changes to training.

MR. PARHAM: Let me ask that another way then. Maybe you can think about this one. Because an ATC LLWAS is not included in the scenario, do you think that's de-emphasizing the importance of that as one of the cues in the obvious decision?

THE WITNESS: No. I think it's captured in the ground school portion of training. And that's for the avoidance area, and that's where it would be addressed. So, no, I don't think it's short changed.

MR. PARHAM: I have no further questions, Mr. Chairman.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Parham. Honeywell.

MR. THOMAS: No questions. Thank you.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Thomas. Airline Pilots Association.

MR. TULLY: Thanks.

Captain Johnson, I just wanted to clarify one issue. You were asked about the role of check pilot during check rides. And I think you said check pilots rode in the right seat on check rides. Just to clarify that issue, check rides that are PCs, PTs and LOFTS always have mixed crews. In other words, a captain and a first officer, right?

THE WITNESS: Yes. Maybe I should have qualified that answer. This is during a rating ride or a type ride that the check airmen would be in the right seat. During the other training event, we're looking to crew it with a crew complement, meaning captain and first officer in their seats.

MR. TULLY: Thanks.

CHAIRMAN HAMMERSCHMIDT: Is that all, Mr. Tully?

MR. TULLY: Yes.

CHAIRMAN HAMMERSCHMIDT: Douglas Aircraft Company.

MR. LUND: No questions. Thank you.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Lund. Pratt & Whitney.

MR. YOUNG: No questions. Thank you.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Young. Association of Flight Attendants.

MS. GILMER: No questions, Mr. Chairman.

CHAIRMAN HAMMERSCHMIDT: Thank you, Ms. Gilmer. International Association of Machinists.

MR. GOGLIA: No questions, Mr. Chairman.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Goglia. Dispatchers Union.

MR. SCHUETZ: Mr. Chairman, no questions.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Schuetz. National Weather Service.

MR. KUESSNER: No questions.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Kuessner. USAir.

MR. SHARP: We just have a few questions.

Captain Johnson, there has been some references made to the cultures in the airlines. In fact, during the mergers that we've had in the past, we accomplished a task that was called mirror image. Who was the overseer of that mirror image and who approved that?

THE WITNESS: It was our FSDO office and USAir was the airline that we imaged the other airlines to.

MR. SHARP: And was it found that all those people who were coming under the USAir rules and regulations and policies complied with that at the completion of the mirror image?

THE WITNESS: Yes, sir. And part of it was

additional training to meet that standard.

MR. SHARP: Could you define AQP for us, please?

THE WITNESS: Thank you. It's the advance qualification program that we're presently working at. And that's a program where a front-end analysis will be done from the front-end analysis course ware, and then from the course ware will be an on-going data collection to support the unfirmed analysis. Right now, we work under FAR 121, Appendix E and F.

As the airlines become more sophisticated with computers, it's hard to identify the training events, the type of instruction that's needed and the level of training device. Through the systematic approach of course ware development, the advance qualification program will be able to address these training programs.

MR. SHARP: Could you define the term for us, "training to proficiency?"

THE WITNESS: Training to proficiency means that we train to a 100 percent, that we don't have a grading criteria and the fact of an 80 or a 90 or a 95. That training to proficiency means that you are proficient in that maneuver a 100 percent.

MR. SHARP: So that means if you have a substandard performance, you would continue training until

that individual was deemed to meet the standards of proficiency?

THE WITNESS: That's correct.

MR. SHARP: USAir requires its co-pilots to come back in and first officers to come back in two times a year for training. Do you know of any other airline that requires that type of training?

THE WITNESS: Not off hand.

MR. SHARP: Why would we do that?

THE WITNESS: Because we really participate in the crew tasks, that we are participants in CRM, that we are participants in line orientation flight training, that we are participants in advanced qualification programs.

MR. SHARP: I'll just reference it. We don't need to go to it. But in the Exhibit 10-D, there is --

CHAIRMAN HAMMERSCHMIDT: It's 2-O.

MR. SHARP: Oh, I'm sorry. It's 2-O, Exhibit 2-O. There's a suggestion of a short coming or some confusion regarding USAir's LOFT programs. That there might not be enough scenarios in that LOFT program. Could you comment on that, please?

THE WITNESS: Yes. There was in the report that the numbering system for the LOFTs didn't indicate the number of LOFTs. And, in fact, that was an error. That the

control number was not a counting number, but actually an identification number.

So where it said, "DC-9-1," that wasn't DC-9 and the 1 meaning the number of LOFTS, that was identification number meaning that was for a certification LOFT. An identification number would be like I-95 or channel 13. Thirteen doesn't indicate 13 channels.

So DC-9-1 was the control number or the identification number for a certification LOFT. DC-9-1-R was for the recurrent LOFT. And this was understood by both our POI and myself, as director of training, who shared the flight operations training manual. There's only two official copies. The POI holds one. I hold the other.

MR. SHARP: Captain Johnson, there has been a couple of comments made during the course of these proceedings, that reference the use of the flat director for an ILS approach. Do you know if USAir requires the use of a flat director on an ILS approach in the DC-9?

THE WITNESS: That flight director is predicated on a category one approach, meaning 4,000 RVRs. If it's above that, it's not required.

MR. SHARP: Could you describe for us please, if you're aware, the windshear simulating the windshear system in the DC-9 simulator?

THE WITNESS: It would be standard across the board. It does have six scenarios. I'm really not sure about the question.

MR. SHARP: Do you know if that has the Honeywell equipment installed?

THE WITNESS: It has the Honeywell equipment. It's been approved as of December 1993, and it does work.

MR. SHARP: W have no further questions. Thank you, Mr. Chairman.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Sharp. Let's see. Mr. Feith, do you have a question?

MR. FEITH: Yes, sir, I have several questions, and hopefully I'll be able to make them brief so that we can end the day.

MR. FEITH: Regarding windshear training, like we've been talking about, is there different windshear training in the DC-9 versus other aircraft in the fleet?

THE WITNESS: No. They are exactly the same. And that was part of the criteria for the approved windshear training program. That each aircraft was aerodynamically driven to be the same. So the degree of difficulty for the task was the same. Meaning the degree of difficulty in a windshear for an F-28 would be the same as a Boeing 757.

MR. FEITH: But given the fact that some of the

new airplanes that have automated systems and the integrated windshear system that gives you flight commands versus the DC-9 that does not give you a flight command, is there any segregated difference in the training that a pilot would receive?

THE WITNESS: No, other than the training for the technology.

MR. FEITH: You discussed briefings. Can you just give me what is expected in a briefing for an ILS? For example, is there standard phraseology that is required by USAir that the crew must maintain when they are briefing an ILS procedure?

THE WITNESS: Yes. That was on chapter 3 of the pilot's handbook. The first officer today went over it, I would say, perfectly, and that is the briefing.

MR. FEITH: That is expected every time you have an ILS?

THE WITNESS: That is the recommended briefing.

MR. FEITH: Is it mandatory?

THE WITNESS: Yes, the briefing is mandatory.

MR. FEITH: Is that phraseology or criteria that's set out in the manual required?

THE WITNESS: It is required. The reason it's in the order was for it to be user friendly, so that there was

actually a means to make sure that every item was accomplished.

MR. FEITH: Have you had any interaction with your POI?

THE WITNESS: Yes, I have.

MR. FEITH: Has he discussed any of the findings of previous NASIPs or any of the information that he gets during the course of the year from PTRS information, any feedback from any in routes?

THE WITNESS: Yes. He's very active in that area. And I see the POI, I would say, twice a week to go over all these issues. He's very active and he's not shy.

MR. FEITH: Has he, in your recollection and within the last -- you said you've been in this position eight weeks. In that eight-week period, has he discussed any problems that were identified, any deficiencies that were identified, where in route inspections identified improper or incomplete briefings by crews?

THE WITNESS: Yes.

MR. FEITH: And what changes have you made?

THE WITNESS: On an individual basis.

MR. FEITH: Can you recall how many incidents he has identified?

THE WITNESS: No, I cannot.

MR. FEITH: Who's responsible for making the changes to the Pilot OPs Manual and the Flight OPs manual?

THE WITNESS: I am charged with the standardization of all literature that comes out of the training department. Meaning, the pilot handbook syllabuses. But it is delegated down to the flight manager or the equipment manager. And that would be the individual that takes care of that source document.

MR. FEITH: What is the expectation of those manuals? Again, does it just provide guidance or is that a means of providing a directive to flight crews?

THE WITNESS: The pilot's handbook is FAA approved through the chapters anyway. Operating, meaning emergency, abnormal, normal for us, limitations in performance. And we do have training in there. The rest are FAA accepted. They are a document that has systems knowledge, and actually does have procedures and profiles.

MR. FEITH: Have you made any changes in procedures basically in general, as far as training goes, since you've arrived in this position?

THE WITNESS: No changes yet.

MR. FEITH: What do you anticipate?

THE WITNESS: Well, I would like to some day. I would like to see a lot of changes through the advanced

qualification program.

MR. FEITH: And just touching back on windshear. In the windshear training, what is your expectation of the crew, i.e., an individual pilot, during the windshear training? What is your focus, on his recovery technique or identifying and decision making with regard to windshear?

THE WITNESS: Fair question. Two items, the recognition, meaning the instrumentation recognition that we spoke about, and the recovery, the escape maneuver of the addressing of the thrust pitch and configuration. So really there are two objectives or two areas that we are looking at in a simulator.

MR. FEITH: So in evaluating a pilot's decision making and recognition skills with windshear, if he decides to -- if he's got enough cues where he's got an instantaneous or an increase in air speed or decrease in air speed and he chooses to abandon the entire approach and not execute a windshear profile or he had enough recognition based on information that he received from an ATC command in the simulator and he chose to fly away from that area, is that evaluated?

THE WITNESS: It's really a training maneuver, and that's why that maneuver is during proficiency training and not proficiency checks. But I don't really have an exact

answer for you on how far we go with it. But, of course, as far as the profile, that if it's an increase in performance, the pilot can, at that point, do a normal go around versus a windshear escape.

MR. FEITH: Then in the windshear training, when a first officer is flying a windshear profile, is he the flying pilot throughout the entire event?

THE WITNESS: Right now with the recurrent LOFT program that is almost the captain's ride. So as of this year, it was the captain that was the sole manipulator of the controls. The first officer was doing that seat task function. Meaning, in this case, calling out the sink rate and altitude. During the first officer's proficiency training period, he is the manipulator of the windshear maneuver.

MR. FEITH: How far does that go?

THE WITNESS: I'm sorry, I don't understand.

MR. FEITH: Does he continue to fly the aircraft throughout the entire event or does the captain assume command at some point?

THE WITNESS: The flying pilot stays with the airplane.

MR. FEITH: So if the first officer is flying the event or flying the aircraft when the event is initiated, he

then continues throughout the entire event till recovery or unsuccessful recovery depending on what scenario you give him?

THE WITNESS: Yes, because the two areas are the recognition and the coordination, meaning recognize in a timely manner. And then the crew coordination of actually flying through the presence of a microburst windshear.

MR. FEITH: Is there any USAir procedure or directive that says that the first officer will give up command or the captain will take command of the aircraft?

THE WITNESS: No, there's not.

MR. FEITH: Is the training that the first officer receives in the simulator, where he flies the entire event from start to finish with regard to windshear, is that a fair expectation for that first officer when he's flying a line operation?

THE WITNESS: That's a fair expectation, but the pilot, the captain is the pilot in command. It is always the pilot in command's airplane.

MR. FEITH: And one last question, do you provide your pilots during the course of either initial recurrent proficiency training any training regarding TDWR, Terminal Doppler Weather Radar training?

THE WITNESS: No, we do not.

MR. FEITH: Do you intend to?

THE WITNESS: In our new video, Ten Knots for Mama and the Kids, we do address the Doppler Weather Radar as an introduction to it, but that's all right now.

MR. FEITH: Why is that?

THE WITNESS: I'm not really sure.

MR. FEITH: Thank you, sir. I appreciate it.

THE WITNESS: Thank you.

CHAIRMAN HAMMERSCHMIDT: Thank you, Mr. Feith. Mr. Laynor.

MR. LAYNOR: Just one or two, captain. In the exhibit that was submitted, it shows six windshear scenarios. I understand that during a given recurrent training session, the crew may only be given one of those scenarios. Is that correct?

THE WITNESS: That's correct. We change that scenario on an annual basis, so that the individual doesn't see the same windshear twice for the recurrent training event.

MR. LAYNOR: So over a period of time, he's exposed to departure and approach scenarios?

THE WITNESS: Yes. In fact, last years was the approach. And this year coming will be the -- excuse me. Last year was the departure. It will be approach this year.

MR. LAYNOR: And all the crews know that when they go into the simulator. It's not a surprise to them?

THE WITNESS: It's not really a surprise, but we don't give it all away.

MR. LAYNOR: You commented that the simulator was equipped with the Honeywell windshear detection equipment. Is there any attempt to determine whether they recognize the cues of the windshear absent warning from that equipment?

THE WITNESS: I'm not really sure. I'm not aircraft specific on the DC-9 program or familiar with it.

MR. LAYNOR: And to follow up on one of Mr. Feith's questions. What do you look for for standards of proficiency in a windshear exposure?

THE WITNESS: The execution of the maneuver in a simulator event. Meaning, the addressing, the thrust, the pitch, and the configuration, and the recognition before that of the 15 knots, the plus or minus 500, or the five degrees or the one dot off on the glidescope.

MR. LAYNOR: And in the base of maneuver, is there any criteria for loss of altitude or air speed?

THE WITNESS: No. I think the goal of the windshear escape is to try to stay flying or stay in flight as long as possible to get out of the shear.

MR. LAYNOR: I see. Can you give any judgment on

how often the scenario has to be repeated, because crews may not perform satisfactorily?

THE WITNESS: No, I really don't know the answer to that.

MR. LAYNOR: Two more questions. One, do you have any special training on the use of the airborne weather radar?

THE WITNESS: We addressed it in the initial transition or upgrade training. And then it is during the IOE, initial operating experience or line check.

MR. LAYNOR: Does it include interpretation and use of the tilt control?

THE WITNESS: Yes, it does.

MR. LAYNOR: How about GPWS scenarios in your simulators?

THE WITNESS: Well, a lot of times on an non-precision approach, we'll get a demonstration of the GPWS.

MR. LAYNOR: Do we look for pilot response to a GPWS?

THE WITNESS: Yes, we do.

MR. CLARK: Thank you, Captain. That's all I have. I have no further questions.

CHAIRMAN HAMMERSCHMIDT: Mr. Schleede.

MR. SCHLEEDE: One area that would kind of back

the question up. What was the reason that you took over your position eight weeks ago? What happened to the previous director of training?

THE WITNESS: Why did I take it?

MR. SCHLEEDE: Why did you take that position? Was he promoted, retire? What happened to the previous director of training?

THE WITNESS: I think the previous director of training was going to retire, and then elected to spend his last couple of years flying to Paris and Frankfurt and London, and kind of relax.

MR. SCHLEEDE: Thank you very much.

CHAIRMAN HAMMERSCHMIDT: Captain Johnson, Thank you for your participation in the hearing. You may stand down.

THE WITNESS: Thank you.

(Witness excused.)

CHAIRMAN HAMMERSCHMIDT: Let me say in terms of our scheduling. We need to vacate this room, we are told by the hotel, by 6:00 this evening, especially in terms of the back of the room. They need to set up for another function immediately. So, hopefully, everyone can cooperate with that.

We will commence tomorrow at 8:30. The first

witness will be Mr. David Bowden with the FAA. Tomorrow night and Thursday evening, we have no time limitations. Although, I do believe that the pace of the witnesses should pick up considerably.

So, we'll see you in the morning.

(Whereupon, at 6:00 p.m., the hearing was adjourned, to reconvene at 8:30 a.m. on Wednesday, September 21, 1994.)

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