hear it, but we are past that now.

MR. DUBUC: All right, sir.

THE COURT: Bring back the jury.

MR. MC MANUS: Your Honor, may I take that Court exhibit?

THE COURT: Please.

(Whereupon, the jury entered the courtroom.)

THE COURT: You can swear the witness.

Whereupon,

CHARLIE D. TURNER

called as a witness on behalf of the plaintiff, being first duly sworn, was examined and testified as follows:

THE COURT: Mr. McManus.

MR. MC MANUS: Thank you, sir.

Good afternoon, Your Honor. Good afternoon, ladies and gentlemen.

DIRECT EXAMINATION

BY MR. MC MANUS:

Q. Sir, could you please state your name.

A. Dr. Charlie D. Turner.

Q. And your address, sir?

A. [redacted] in Raleigh, North Carolina.

Q. Do you have a business address?

A. My business address is North Carolina State

University ---

THE COURT: You will have to hold your voice up, Doctor. The gentleman at the very end of the jury box and I both need to hear you.

THE WITNESS: Yes, sir.

My address is 6940 Three Bridges Circle, Raleigh, North Carolina.

BY MR. MC MANUS:

Q. And do you have a profession, sir?

A. I am an assistant professor in aerospace engineering.

Q. And I believe you indicated you were a doctor. Is that correct, sir?

A. That is correct.

Q. Are you a medical doctor, sir?

A. No, I have a doctor of philosophy in aerospace engineering.

Q. Could you give me a summation of your educational background, sir.

A. I obtained a bachelor of science in aerospace engineering at the University of Alabama in 1971. I obtained a master's in aerospace engineering from the Virginia Polytechnic Institute and State University in 1976, and I obtained my doctor of philosophy degree in aerospace engineering from Virginia Tech, Virginia Polytechnic Institute and State University, and that was in 1980.

Q. Doctor, what is aerospace engineering?

A. Aerospace engineering is designing both flight and space vehicles. It's looking at the different type of loadings. You study the dynamic type loadings, the inertia loadings you would see, and also the performance parameters and designing any type of flight vehicle.

Q. What type of courses did you take in that field as an undergraduate?

A. The courses could be broken down in three basic areas, and that would be fluid or aerodynamics, structures, and structural dynamics.

Q. And when you received your master's degree, did you have any particular emphasis or focus in aerospace engineering at that time?

A. My master's degree, as I say, was an aerospace engineering, and the focus was in structures, and structural dynamics.

Q. And when you received your doctoral degree, sir, what was your focus and emphasis at that time for that degree?

A. Again, it was in structures, and structural dynamics, and also in aerodynamics, doing flutter analysis.

Q. Did you take further university courses as part of your doctoral studies?

A. Yes. I took about 30 or 40 more hours beyond the

master's level to get the doctoral degree.

Q. And was there a thesis involved?

A. Yes. There was a dissertation involved in the doctor's degree.

Q. And do you recall the subject matter of your thesis?

A. It was the study of the effect of wing store flutter on wing store aerodynamics and storodynamics on wing store flutter.

So it was incorporating storodynamics in to aircraft flutter analysis.

Q. Could you give me a resume of your professional work experience, sir?

A. After I graduated from Alabama, I went to work as a civil servant for the U.S. Air Force. I worked at the Air Force Armament Laboratory from 1971 till 1978.

After I left the Air Force I went to work for Cessna Aircraft Corporation from 1978 to 1979. After I left there I went to Beech Aircraft, and I worked until 1981.

At that time I became associated with North Carolina State University.

Q. What were your responsibilities when you were employed by the Air Force?

A. At the Air Force my initial job was doing loads and dynamics studies of stores and how they affected the

aircraft. In developing flight limits for the aircraft, we had to take into account both the aerodynamics and inertia affects of the store on the airplane, and make sure the loads and maneuver loads wouldn't exceed those design limits for the airplanes.

And later I went to the flutter group and did flutter analysis on the effect of stores on the aircraft.

Q. Doctor, what were your responsibilities for Cessna?

A. At Cessna Aircraft I was responsible for the Cessna Citation Three, doing some of the flutter analysis on that.

I was also engaged in an aircraft accident investigation for reconstructing a sequence of events for a crash involving a Conquest, or a Cessna 441.

Q. Is Cessna a company that manufactures airplanes?

A. Cessna designs and manufactures aircraft.

Q. And what were your responsibilities with the Beech Company?

A. With the Beech Aircraft Company, I was in the structural dynamics group. I did the preliminary flutter analysis on the commuter 1900.

I also did the preliminary flutter analysis on the new model 250, and also model G-90.

I also was the representative for the dynamics

group in all aspects of dynamics with the 1900 design group.

I was also involved in developing new flight flutter testing and techniques.

Q. Is Beech also a company that manufactures airplanes?

A. Beech also designs and manufactures aircraft.

Q. And you have mentioned, sir, that you are a professor at the North Carolina State University.

Is that correct?

A. That is correct.

Q. And what are your teaching responsibilities?

A. At present my teaching responsibilities are in the area of structures. I teach the undergraduate sequence of structure courses. I am also to develop both senior, advanced senior level and graduate courses in structures and structural dynamics.

Q. Do you hold any other academic positions at this time?

A. No, I do not.

Q. Now, Doctor, you have mentioned some terms. Could you please explain to me what is flutter analysis?

A. Okay. Flutter is a self-sided oscillation where the structure derives energy from the airstream and it is the instability of that that can lead to catastrophic failure.

The analysis is to determine at what airspeeds these occur to ensure that the design is safe.

If we find a problem, we go back to the design group and determine that something needs to be changed in the original design to prevent this from occurring.

It's also looking at the matter, once the aircraft is designed, velocity testing to ensure that there is no instability in the aircraft.

Q. Doctor, you have mentioned the term dynamics.

What does that include?

A. Dynamics is when you look at both the loading aerodynamic-type loadings plus the inertia-type loading in conjunction with that, and it's also a flutter type solution to a problem.

Q. Doctor, have you published any articles in the field of aerospace engineering?

A. Yes, I have published a series of articles on the work I did on the wing store flutter.

I have published several articles on the effect of control surface aerodynamics on flutter analysis, and also an article on the new method I have been developing for doing flight flutter testing.

MR. MC MANUS: Your Honor, at this time I would like to show the witness Plaintiffs' Exhibit 89.

BY MR. MC MANUS:

Q. I ask if you can identify this.

A. This is my resume.

MR. MC MANUS: Thank you, sir.

Your Honor, at this time I would move Plaintiffs' Exhibit 89 into evidence.

MR. DUBUC: I have an objection based on scope, Your Honor. I will object at this time and clarify it later on.

THE COURT: Objection is overruled.

MR. MC MANUS: Your Honor, at this time I would tender Dr. Turner as an expert in aerospace engineering.

THE COURT: Do you wish to voir dire him?

MR. DUBUC: Yes, I would like to.

THE COURT: Excuse the jury.

(Whereupon, the jury left the courtroom.)

THE COURT: You may inquire.

VOIR DIRE EXAMINATION

BY MR. DUBUC:

Q. Doctor, through the discussion of flutter analysis that you apparently spent a lot of time with, is that correct?

A. I didn't hear the first part of your question.

Q. Mr. McManus had asked you a lot of questions about flutter analysis. Do you recall those questions?

A. That's correct.

Q. Your involvement in that was in connection with design of airplanes primarily?

A. Well, I was involved in flutter analysis, in

design, testing and also the aircraft accident.

We worked on attempting to develop the sequence of events that developed from a failure and it involved a flutter analysis also.

Q. There was a failure that affected the stability of the airplane?

A. It affected the flutter characteristics of the airplane, yes.

Q. Is flutter analysis something that you have used in connection with the preparation of your report in this case?

A. If you mean a flutter analysis in the sense it involves static dynamics and aerodynamics, then the static part of the flutter analysis in developing the strength requirements, that knowledge is involved in this one.

Q. But the remainder of the analysis is something you use in a different kind of situation, one example being the accident you worked on, and I think you were at Beech, were you not?

A. No, I was at Cessna Aircraft.

Q. I'm sorry.

A. The interdynamic static portion would not enter into this.

Q. You mentioned that one investigation. Did you work primarily in the accident investigation during the

time you were with the Air Force?

A. While I was with the Air Force I did not work on any aircraft accident investigation.

Q. Okay.

And other than that Beech -- I'm sorry -- that Cessna accident, have you worked in any other accident investigations as such, as a primary responsibility?

A. No, not as a primary responsibility.

Q. In connection with this case, is this the first time you have used the methodology of taking calculated failure modes for a component and working backwards up to finding G-components?

A. In the Cessna case we used the rotational frequency. We worked back and calculated a force on the mass balance of an elevator.

MR. DUBUC: Excuse me, Your Honor.

BY MR. DUBUC:

Q. Maybe my question wasn't clear.

As I understand what you have done in this case, is you have taken a design mode for the airplane and its weight and you have massed data on that component and weight, and you develop a moment about the combined centerfold of the aft component, in this case the tail.

Is that basically what you did?

A. Well, that's right for just part of the analysis.

Q. Then you noted failure bending moment, and you determined the minimum type acceleration in order to make it bend or break.

Is that correct?

A. That's correct.

Q. Okay.

And is that the opinion you are being asked to give in this case, your computations?

A. My computations involve partly of what you just said.

Q. Okay.

Anything else that you are going to testify to, as you have been told you will testify to other than that computation and numbers and so on.

MR. MC MANUS: I would object, Your Honor, to the characterization. He has been asked to do some tasks.

MR. DUBUC: All right.

I withdraw that for now, Your Honor.

THE COURT: What is your proffer about the rest of this examination?

MR. DUBUC: I have one more question.

BY MR. DUBUC:

Q. In asking you about that in your deposition in October, I asked you these questions the same way I have just asked them, about your method, and you said part of it

you were doing in design, but as I understood you, your answers were that there was something new about what you were doing in this case.

Now, I'm not sure I understood that, but I want to be sure I had that right.

A. I recall at the time this work I had done at Cessna had slipped my mind.

Q. I see. So you didn't tell us about that then. Okay.

Your Honor, the point of this -- can we approach the bench on it? No.

The point is,first of all, I have an objection as to the testimony of this witness other than what he has done himself in his own experience, and since I don't know, again, I noted in reviewing the record that there were some things he said he was going to do subsequent to the November deposition.

And if Your Honor wants me to make those objections when they come up, I will. I was only raising them beforehand so if they came up on a proffer we would know whether we had that problem.

THE COURT: Let's let this unroll.

Are you challenging his qualifications? Do you have any objection to his qualifications?

MR. DUBUC: Yes, I do.

THE COURT: All right.

Objection overruled.

MR. DUBUC: I am also raising the point about scope.

THE COURT: That is a different point.

But the objection element -- I am not going to strike it, but it's vulnerable to being stricken.

MR. DUBUC: All right.

THE COURT: Bring in the jury.

(Whereupon, the jury entered the courtroom.)

DIRECT EXAMINATION (Cont'd.)

BY MR. MC MANUS:

Q. Doctor, sir, have you been asked to do some tasks and studies involving ---

THE COURT: I don't know if I actually ruled, but the witness is qualified.

MR. MC MANUS: Thank you, Your Honor.

BY MR. MC MANUS:

Q. Dr. Turner, have you been asked to do some tasks and studies involving aeronautical engineering surrounding the air crash of the C-5A which occurred on April 4, 1975, near Saigon, Vietnam?

A. Yes. I have been asked to do essentially two tasks. One of those was to look at the sequence of events that occurred during the impacts on both the east and west

side of the river, and the other was determine the forces that the occupants of the aft troop compartment would experience during this sequence of events.

Q. And in conjunction with those tasks, sir, did you review and read any materials?

A. Yes. I reviewed and read several reports.

If you want me to look at these to make sure I hit them all -- but I looked at the report written by John Edwards, I looked at his deposition and trial testimony, I looked at the collateral report, I looked at a report and deposition by Dr. Turnbow, I looked at the trial testimony by a Mr.Timm, I looked at the deposition given by Harriet Mary Neill, and I also looked at a deposition given by Christine Lieberman, and I looked at a number of Lockheed reports; including loads reports and stress analysis.

I looked at an article in James on World Aircraft, about basically on the C-5. I looked at the photogrammetry measurement on soil vegetation interpretations relating to the C-5A incident by Dr. Stanley Morain, and also I read a report on the failure of the C-5A by air pressure closure by Joseph Tilson.

Q. Doctor, based on your review of those materials, do you have an understanding as to the history and sequence of the C-5A's trip on the day of April 4th, 1975?

A. Yes, I do.

Q. What is that, sir?

A. Okay. The aircraft, after taking off, climbed to approximately 20,000 to 23,000 feet. There was a failure of the aft pressure bulkhead enclosure.

Once the failure occurred, part of the ramp came off and impacted the structure, cutting several of the hydraulic lines, cut the cables that go to the tail surfaces, and also cut the electrical trim controls, leaving the airplane with just one active hydraulic system.

Even though the pilot would have had the capability to control the longitudinal axis of the airplane, he had lost the cables. So the airplane only had control in the lateral sense. The right airelon and spoilers were able to control the pitch altitude with the engines.

With this amount of control, he was able to return towards the air base, and some distance from the air base while he was making his turn, the nose dipped.

In an attempt to recover the airplane, he had to use the thrust, he was able to pull the nose up, slowed the descent down, and at that point he impacted the ground on the east side of the river.

Once he impacted on the east side of the river, the airplane remained in contact with the ground for a short duration; the nose would pitch up. The airplane would then become airborne again, and struck the ground several

more times lightly. It crossed the river.

At this time in crossing the river the nose probably dropped slightly, and the airplane began to descend again.

Q. Doctor, were you able to determine, or did you obtain information concerning the speed of the aircraft at any time during the sequence you have described?

A. Okay. We were able to obtain the airspeed of the aircraft through the MADAR data.

Q. What is MADAR, sir?

A. This is malfunctional analysis detection and recording system that the C-5A aircraft carried. It monitored more than 100 functions on the airplane to determine that there is a problem.

And so the data was recorded on this, and so we have an idea. Slightly before the airplane impacted on the east side, the MADAR data was recorded on tape, and so it's not the actual impact velocity, it is the velocity slightly before the impact.

The system did malfunction, but did record some data after the initial impact before the second impact on the west side of the river.

Q. Doctor, I don't know if I asked you this before, but did you review photos and a movie in conjunction with your investigation?

A. Yes, I viewed two movies and several hundred

photographs of the crash site.

Q. Doctor, turning to -- have you completed your explanation of the course of the airplane's travel from the time it took off?

A. No, I haven't.

Q. I'm sorry to have interrupted you. Would you continue?

A. Once the airplane crossed the river, it impacted in a slight nosedown attitude on the west side just beyond the dikes.

At this time, the airplane began to dig in. The impact was sufficient enough to start the failure of the structure and at this time there was a complex set of loadings and inertia loadings, frictional loadings, aerodynamic loadings to cause the aircraft to break up and separate into several major pieces; the wing, tail group, aft troop compartment, and forward flight deck.

Q. Doctor, turning to your first task, sir.

I believe you said that was looking at the sequence of the events as the airplane impacted on both the east and west sides of the Saigon River.

Do you have an opinion, sir, with a reasonable degree of scientific certainty as to the sequence of events as the airplane impacted and broke apart?

A. Yes, I do.

Q. What is that opinion?

MR. DUBUC: I will object.

THE COURT: I beg your pardon?

MR. DUBUC: I just note my objection.

THE COURT: It is overruled.

THE WITNESS: Okay. The sequence of events is the airplane touched down, again, on the east side of the river, as I described just a little bit earlier. It was just beginning -- the nose was just coming up as it touched down on the east side of the river, and slowed down somewhat.

The airplane became airborne again and it reached some peak. The nose began to drop again, and the airplane came down. The airplane was slightly offcenter and rolled to one side.

At this point the loading was sufficient to break the tail off the airplane, break the wing, and separate the airplane into four major parts and each of those traveled some distance, impacted the ground and slid different distances depending if you are looking at the aft troop compartment, or the forward flight deck.

Q. Doctor, have you seen a diagram or photograph that would assist you in showing where the various events of the sequence you have just described are in relation to the crash site?

A. I have some slides that I have picked out, one

of them including an outlet from the MADAR tape. If we can see those at this time.

THE COURT: Ladies and gentlemen, if you want to stretch while these gentlemen are getting their material together, please feel free.

Stay as wide awake as you can and as you will.

Mr. Dubuc, would you like to come down here?

MR. DUBUC: I can see from right here.

THE COURT: Go ahead.

MR. MC MANUS: Your Honor, this is Plaintiffs' Exhibit 4063.

BY MR. MC MANUS:

Q. Dr. Turner, can you identify this slide?

THE COURT: Just a moment.

Can all the jurors see the exhibit?

(Jurors nodded affirmatively.)

BY MR. MC MANUS:

Q. Can you describe this, sir?

A. Okay. This is an outlet from MADAR system. This is a loss of data that is indicated in the middle of the slide. This lost data occurred when the airplane impacted on the east side of the river; there was a few seconds of data loss.

This is readings from the lateral accelerometer, the vertical acceleration, and the pitch angle. The

accelerometer readouts that are indicated here show that the impact excited the structure.

This is what I was talking about earlier about structural dynamics. We have the structure being excited, the impact line from the vertical acceleration, you can see additional striates where you have the two beeps right together on the positive side, but you can also take this data and use logarithmic decrement and calculate an acceleration loading on the initial impact.

If you would do this, you would get something like four to five G's, vertical G's at this time.

So the thing to remember on this is even though I will be talking about a G-accelerating force, all of these have embedded on the top of them the structural dynamics that are indicated here. So it's not a static case that we are talking about.

Depending on where you're sitting you may see higher or lower accelerations.

We can go to the next slide.

Q. Doctor, can I stop you for just one minute, sir?

You have mentioned pitch. Can you describe what that is in relation to the motion of an airplane?

A. Okay. The pitch is the nose up or nose down type motion.

Q. Up and down?

A. Something like this.

(Indicating.)

Q. Thank you, sir.

A. This slide indicates the complexity of the loading that the aircraft saw. We note that the parts are spread out into a fairly wide pattern. This indicates a large inertia and aerodynamic forces that caused the aircraft to break up, and the forces kind of sprayed the airplane out.

It is not in a continuous line.

The next slide.

MR. DUBUC: Can we have the number of this?

MR. MC MANUS: I'm sorry. This is Plaintiffs' Exhibit 4098.

THE COURT: In evidence -- is it in evidence?

MR. MC MANUS: Yes, sir -- it hasn't been moved in. There has been no objection. It's on both parties' lists.

THE COURT: It's not in evidence.

Go ahead.

THE WITNESS: This is ---

MR. MC MANUS: Excuse me just one minute.

This is Plaintiffs' Exhibit 4003.

THE WITNESS: This is the T-tail structure, what remains of the T-tail, and some of the fuselage attached

to it. This is one of the pieces of the structure that we used in failure analysis to determine some of the G-loadings that we will discuss later.

BY MR. MC MANUS:

Q. This is Plaintiffs' Exhibit 4001.

A. This shows the relationship between the aft troop compartment and the forward flight deck. This relationship to the links of the track were used in part of the analysis to determine an upper bound on the G-levels that the aft troop compartment saw, and you can note on this slide the tracks, the depth of the tracks indicating the higher G-loading or the higher G-acceleration rate.

And this is -- you can note by the standing water and the tracks that are perpendicular in the cross hatching that this is in the field itself.

Q. Doctor, I would like to show you what has been introduced into evidence as Plaintiffs' Exhibit 248.

I would like to ask you if you have seen a copy of this, sir.

A. Yes, I have seen a copy of it.

Q. By using this diagram, sir, are you able to demonstrate where the plane broke up and where the various components separated and landed in their respective positions?

If it's easier for you to come down to the diagram, sir, you can do that.

A. Okay.

THE COURT: Could you use a pointer -- there is one right there. It's important that the jurors and I as well as Mr. Dubuc all can see.

THE WITNESS: Okay.

In this case the airplane crossed the river. The initial impact, once it crossed the river was at this point. The airplane began to disintegrate in this region from the high G-loading and it seems to have lifted off as the wing separated itself.

The lift would pull the plane up slightly, the wing would separate pulling the forward flight deck and the aft troop compartment from the fuselage. And the main part of the lower fuselage just impacted at this point and just disintegrated from the tail because it also has aerodynamic type loading and the forward velocity would move on up, the surface would stall, and probably flip at this time and at this point.

The wing would have the maximum amount of lift possible. It would rise to the point where it stalled, and then it would just rotate around the center of gravity, kind of flying to this point.

The aft troop compartment and forward flight deck were pulled up slightly since they are attached forward The front of the aft troop compartment is attached to the

aft part of the wing, and the aft part of the forward flight deck is attached to the wings. The wing came up, it gave a rotational motion, rolled over, and ended up on its back. This allowed the lifting of the wing, pulling the aft troop compartment forward. It sailed away probably slightly nose up, hitting at this point, kind of bouncing along, and it finally dug in on the last 70, 75 feet, and impacted this little slight rise.

And in conjunction with this little slight rise, the forward flight deck, as it approached,moved away from it, taking the path of least resistance, and coming almost parallel to it.

That describes the sequence of events.

BY MR. MC MANUS:

Q. Thank you, sir.

Your Honor, at this time I would move into evidence Plaintiffs' Exhibits 4063, 4098, 4003, and 4001.

MR. DUBUC: No objection.

THE COURT: They are received.

(Plaintiffs' Exhibits Nos. 4063, 4098, 4003 and 4001 were received into evidence.)

BY MR. MC MANUS:

Q. Doctor, in conjunction with our discussion of your second task, will you be needing the slides again, sir?

A. No, I will not.

Q. If we could turn to the second task.

Do you have an opinion with a reasonable degree of scientific certainty about the forces that the occupants of the troop compartment were subjected to during the series of events you have just described?

BY MR. MC MANUS:

Q. WHAT IS THAT OPINION, SIR?

A. WITH A REASONABLE DEGREE OF SCIENTIFIC CERTAINTY, WITH RESPECT TO THE OCCUPANTS OF THE AFT TROOP COMPARTMENT, WE HAVE SEEN G-LOADINGS IN A RANGE OF 40 TO ABOUT 100 G'S.

Q. AT WHAT POINT WAS THAT, SIR?

A. IN LOOKING AT IT IN THE SEQUENCE OF EVENTS I HAVE DESCRIBED, THIS LOADING OF THE FINAL STRUCTURAL FAILURE WOULD HAVE OCCURRED IN THE IMPACTING OR THE COMING TO FINAL REST OF THE AFT TROOP COMPARTMENT, ITSELF.

Q. AND WERE YOU ABLE TO MAKE CALCULATIONS ABOUT G-FORCES AT ANY OTHER TIME DURING THE SEQUENCE OF THE CRASH?

A. YES. I CALCULATED THE G-FORCES AT EACH INCREMENT, FOR EACH POINT IN THE SEQUENCE OF EVENTS I HAVE JUST DESCRIBED, SIR.

Q. AND CAN YOU STATE THOSE FOR ME, SIR?

A. OKAY.

IN THE INITIAL TOUCHDOWN ON THE WEST SIDE OF THE RIVER, I USED A STRUCTURAL FAILURE AT THIS POINT TO ALLOW ME TO CALCULATE THE G-LOADS.

THIS WAS THE FAILURE OF THE T-TAIL AND THE FUSELAGE SECTION.

AT THIS POINT THE ACTUAL G'S, OR THE FAILURE LOAD,

WOULD BE, LIKE, 13-G'S. THIS WOULD BE SOMETHING IN THE ORDER OF 11 TO 15 G'S, WHICH IS WHAT YOU WOULD EXPECT TO SEE IF THE AIRCRAFT WAS SLIGHTLY DAMAGED.

THE COURT: SLIGHTLY?

THE WITNESS: SLIGHTLY DAMAGED.

THE COURT: ALL RIGHT.

THE WITNESS: THIS WOULD BE WRINKLING OF SKIN, OR SOMETHING LIKE THAT.

ACTUALLY, THE AIRCRAFT HAD BEEN TORN APART AT THIS POINT; AND, THEREFORE, WE HAVE A FAILURE LOAD. IT IS IN A NON-LINEAR REGION.

SO WE WOULD EXPECT THIS TO OCCUR AROUND 20 G'S, SOMETHING IN THAT RANGE.

SO THE LOWER BOUND ON THE G-LOADING THAT THE PEOPLE, OR THE OCCUPANTS, WOULD HAVE SEEN AT THIS TIME WOULD HAVE BEEN SOMEWHERE AROUND 15 TO 20 G'S.

BY MR. DUBUC:

Q. AND IS THAT ON THE EAST SIDE OR THE WEST SIDE OF THE RIVER?

A. THIS IS ON THE WEST SIDE OF THE RIVER WHERE THE AIRCRAFT -- THE FIRST IMPACT ON THE WEST SIDE OF THE RIVER.

Q. AS THE SEQUENCE OF THE BREAKING-UP OF THE AIRCRAFT CONTINUED, WAS THERE A DIFFERENCE IN THE G-LOADS?

A. YES, THERE WAS A DIFFERENCE. THE PROBLEM

IS IN CALCULATING THE VELOCITY WE NEED FOR THE AFT TROOP COMPARTMENT ON ITS FINAL -- AS IT FINALLY CAME TO REST.

OKAY. I WAS ABLE TO CALCULATE THIS, USING THE STRUCTURAL FAILURE ON THE FIRST PART.

WE USED THE DISTANCE WITH THE G-LOADING ON THE FORWARD FLIGHT DECK.

WE MADE AN ASSUMPTION THAT BOTH THE FORWARD FLIGHT DECK AND THE AFT TROOP COMPARTMENT WOULD HAVE GONE ABOUT THE SAME DISTANCE, IF THE SMALL RISE HAD NOT BEEN THERE.

AND WE WERE ABLE TO CALCULATE G-LOADINGS, BASED ON THAT. AND THEN THIS WOULD HAVE GIVEN US AN UPPER BOUND ON THE G-LOADING THAT THE OCCUPANTS WOULD HAVE SEEN.

AND THIS WAS IN THE RANGE OF 200 TO 400 G-S.

Q. NOW, DOCTOR, DO YOU HAVE AN OPINION, WITH REASONABLE SCIENTIFIC CERTAINTY, AS TO THE TROOP COMPARTMENT BEING AIRBORNE FOR A DISTANCE PRIOR TO ITS FINAL RESTING PLACE?

THE COURT: JUST A MOMENT.

MR. DUBUC: YOUR HONOR, I OBJECT. IT IS LEADING AND --

MR. MC MANUS: I DID NOT HEAR THE FIRST PART OF THE OBJECTION.

MR. DUBUC: IT IS LEADING, AND YOUR HONOR, AND I HAVE BEEN SITTING HERE LISTENING TO THIS, BUT THIS IS GETTING PRETTY LEADING.

THE COURT: THE OBJECTION TO THE FORM OF THE

QUESTION IS SUSTAINED.

MR. MC MANUS: YES, SIR.

BY MR. MC MANUS:

Q. DOCTOR, WOULD YOU, AGAIN, GO THROUGH THE SEQUENCE OF EVENTS OCCURRING TO THE TROOP COMPARTMENT WHERE CARLY WAS LOCATED FROM THE POINT OF THE FIRST IMPACT ON THE WEST SIDE OF THE SAIGON RIVER?

A. OKAY.

MR. DUBUC: YOUR HONOR --

THE COURT: JUST A MOMENT.

MR. DUBUC: I OBJECT. HE HAS ASKED THIS, AND HE ANSWERED.

HE HAS SUGGESTED SOMETHING NOW, AND HE IS GOING TO HAVE HIM GO THROUGH IT AGAIN, AFTER ASKING A LEADING QUESTION, AND I OBJECT.

HE ANSWERED THIS QUESTION ONCE ON DIRECT TESTIMONY, YOUR HONOR.

THE COURT: THE OBJECTION IS OVERRULED.

BY MR. MC MANUS:

Q. IF YOU COULD ANSWER THE QUESTION, SIR?

A. OKAY.

AFTER THE IMPACT ON THE WEST SIDE OF THE RIVER, THE INITIAL IMPACT, THE AIRPLANE, NOSE DOWN, BEGAN TO ROTATE UPWARD.

THE WING LIFTED OFF OF THE AIRPLANE, ALLOWING THE

LOWER PART OF THE FUSELAGE --

THE COURT: THE QUESTION WAS -- IS THIS RESPONSIVE TO YOUR QUESTION?

BY MR. MC MANUS:

Q. IF YOU WOULD JUST, SIR, SPEAK TO THE TROOP COMPARTMENT --

A. OKAY.

Q. (CONTINUING) -- AND --

MR. DUBUC: MAY WE APPROACH THE BENCH?

THE COURT: YES. LADIES AND GENTLEMEN, IF YOU WANT TO STRETCH, YOU MAY.

(AT THE BENCH)

MR. DUBUC: YOUR HONOR --

THE COURT: MAYBE I DON'T UNDERSTAND WHAT THE PROBLEM IS.

MR. DUBUC: WELL, YOUR HONOR --

THE COURT: WAIT FOR MR. MC MANUS.

MR. DUBUC: FIRST, I OBJECT BECAUSE IT IS A LEADING QUESTION.

THE COURT: ALL RIGHT. I GOT THAT.

MR. DUBUC: HE HAS ALREADY ASKED THIS WITNESS THE QUESTION, AND HE GOT AN ANSWER. WE DID NOT OBJECT TO THAT.

THE WITNESS DESCRIBED HIS OPINION AS TO THE SEQUENCE.

NOW, APPARENTLY, IT LOOKS AS IF THERE IS SOMETHING HE WANTS IN.

I DONT KNOW WHAT HE IS GOING TO SAY, BUT THE POINT IS THAT HE ASKED HIM THAT ONCE.

THE COURT: ALL RIGHT. YOU HAVE MADE THE OBJECTION. I DON'T THINK -- WELL, GO AHEAD.

MR. DUBUC: NOW, HE IS BACK AGAIN, AND HE STARTED HIS DESCRIPTION AGAIN, AND IT IS ON THE WING NOW.

YOUR HONOR, IF HE IS LIMITED ONLY TO THE AREA OF THE THING GOING THROUGH THE AIR, IT PRESCINDS MY OBJECTION. BUT I THOUGHT THE QUESTION WAS TO DESCRIBE IT AGAIN.

BUT THE POINT I AM MAKING IS THAT HE HAS ASKED A LEADING QUESTION RELATING TO THE AREA --

THE COURT: WE ARE NOT PLAYING A GAME HERE, MR. DUBUC. I AM TRYING TO GET THE TESTIMONY OUT. I THOUGHT THE QUESTION WAS -- LET'S SEE IF I MISUNDERSTOOD.

I THOUGHT THE QUESTION WAS:

WHAT WERE THE G-FORCES IMPACTING ON THE TROOP COMPARTMENT AT THE VARIOUS POINTS OF IMPACT ON THE WEST SIDE?

MR. DUBUC: WELL, HE HAS ANSWERED THAT.

THE COURT: HE DID NOT ANSWER THAT.

MR. DUBUC: I THOUGHT HE DID.

THE COURT: IF THAT IS THE QUESTION, IF YOU WILL ASK THAT QUESTION, AND IF YOU HAVE AN OBJECTION, WHAT IS IT?

MR. DUBUC: I THOUGHT HE ANSWERED THAT.

THE COURT: WELL, MAYBE HE DID. IT DOESN'T BECOME YOU TO OBJECT TO A REPETITIOUS EXAMINATION.

MR. DUBUC: NO. NO, I REALIZE THAT. BUT UNDER THE CIRCUMSTANCES, IN COMING BETWEEN AN OBJECTION AND A LEADING QUESTION, WHERE HE ATTACKS IT AGAIN --

THE COURT: ALL RIGHT.

MR. DUBUC: (CONTINUING) -- THE OBJECTION DOES NOT HELP ANY.

THE COURT: MAYBE YOU HAVE A POINT TO TAKE UP ON APPEAL. I HAVE RULED. GO AHEAD.

MR. MC MANUS: THANK YOU, SIR.

(OPEN COURT)

BY MR. MC MANUS:

Q. DR. TURNER, I ASKED YOU IF YOU COULD DESCRIBE THE BEHAVIOR OF THE TROOP --

MR. DUBUC: YOUR HONOR --

THE COURT: THAT IS NOT THE QUESTION.

MR. MC MANUS: COULD I HAVE THE REPORTER READ THE QUESTION BACK, SIR?

THE COURT: WELL, READ THE QUESTION AS IT WAS STATED UP HERE BY ME.

(THE FOLLOWING QUESTION WAS READ BACK BY THE COURT REPORTER, AS FOLLOWS: "WHAT WERE THE G-FORCES IMPACTING ON THE TROOP COMPARTMENT AT THE VARIOUS POINTS OF IMPACT

ON THE WEST SIDE?")

BY MR. MC MANUS:

Q. CAN YOU ANSWER THAT QUESTION, SIR?

A. OKAY.

THE TROOP COMPARTMENT ON THE WEST SIDE SAW G-FORCES IN THE RANGE OF --

THE COURT: AT EACH POINT.

THE WITNESS: OKAY.

ON THE INITIAL IMPACT, IT SAW G-FORCES ALONG THE HORIZONTAL AND I GUESS I WOULD CALL IT THE LINE OF FLIGHT DIRECTION OF ABOUT, I WOULD SAY, 13 G'S. DEPENDING ON THE ACTUAL MATERIAL FAILURES, WE WOULD BE TALKING ABOUT 15 TO 20 G'S.

OKAY.

THE TROOP COMPARTMENT, ONCE IT SEPARATED FROM THE AIRCRAFT, THEN TRAVELED A DISTANCE. IT IMPACTED AGAIN. IT SAW AT THIS TIME BOTH VERTICAL G'S AND HORIZONTAL G'S.

THE VERTICAL G'S WOULD BE IN THE RANGE OF TEN TO 30 G'S. THIS WAS THE TIME IT WOULD TAKE THAT PORTION OF THE AIRPLANE TO COME DOWN.

IT ALSO HAD A, LET'S SEE, FORWARD-TYPE G-DEACCELERATION. THIS WOULD BE IN THE RANGE OF SEVEN TO 13 G'S.

AND THEN THERE WAS ALSO AN IMPACT-TYPE G-LOADING. IT WAS IN THE RANGE OF 200 TO 400 G'S, AND THIS WAS FOR A

SHORT DURATION AS IT IMPACTED THE HILL.

THIS DOES NOT INCLUDE THE G-LOADING THAT WAS CALCULATED DUE TO THE STRUCTURAL FAILURE THAT WAS ALSO USED.

BY MR. MC MANUS:

Q. DOCTOR, YOU HAVE MENTIONED DIFFERENT POINTS OF IMPACT.

COULD YOU DESCRIBE WHAT WAS HAPPENING TO THE TROOP COMPARTMENT AS IT WENT THROUGH THE SEQUENCE OF THESE IMPACTS?

A. OKAY.

ON THE FIRST IMPACT, IT WAS BASICALLY A PART OF THE AIRCRAFT, ITSELF.

ON THE SECOND IMPACT, ONCE A WING CAME UP, IT ESSENTIALLY PULLED --

THE COURT: ARE WE TALKING ABOUT THE WEST SIDE?

MR. MC MANUS: YES, SIR, ON THE WEST SIDE. I AM SORRY, YOUR HONOR.

THE COURT: ALL RIGHT.

THE WITNESS: THE TROOP COMPARTMENT ESSENTIALLY PULLED FROM THE AIRPLANE, OR THE FUSELAGE, ITSELF, WHEN THE WING ROSE.

IT BECAME AIRBORNE FOR A DISTANCE, AND THEN KIND OF SKIPPING ALONG FOR A SHORT DISTANCE, AND THEN IT KIND OF ROTATED AND HIT DOWN VERY HARD.

AND THIS IS WHERE THE HIGH-G-LOADING OCCURRED.

BY MR. MC MANUS:

Q. DOCTOR, WE HAVE MENTIONED "G-LOADING."

COULD YOU DESCRIBE IN SOME SORT OF PRACTICAL TERMS WHAT AMOUNT OF FORCE IS INVOLVED IN G'S? FOR EXAMPLE, I BELIEVE YOU GAVE A FIGURE OF 40 G'S AT ONE POINT.

A. OKAY.

FORTY G'S, IF AN INDIVIDUAL WEIGHED 200 POUNDS, THEN 40 G'S ON THAT INDIVIDUAL WOULD BE, LIKE, 8000 POUNDS, OR, LIKE, A FOUR-TIMES-WEIGHT FORCE ON THAT PERSON.

SO WHEN YOU ARE TALKING ABOUT 40 G'S, YOU ARE TALKING ABOUT QUITE A BIT OF FORCE THAT'S INVOLVED.

Q. THANK YOU, SIR.

MR. MC MANUS: I HAVE NO FURTHER QUESTIONS AT THIS TIME, YOUR HONOR.

MR. DUBUC: EXCUSE ME, YOUR HONOR. I WANT TO GET A NOTEPAD.

THE COURT: ALL RIGHT. TAKE YOUR TIME.

MR. DUBUC: THANK YOU, YOUR HONOR.

CROSS-EXAMINATION

BY MR. DUBUC:

Q. GOOD AFTERNOON, DOCTOR.

A. GOOD AFTERNOON.

Q. DOCTOR, YOU DESCRIBED SOMETHING ABOUT WING-FLUTTER TESTS IN SOME OF THE QUESTIONS MR. MC MANUS ASKED YOU?

A. YES, I DID.

Q. ALL RIGHT.

THAT PROCESS, WITH THE EXCEPTION OF SOME OF THE COMPUTATIONS YOU HAVE MADE, IS REALLY NOT APPLICABLE TO THIS ACCIDENT; IS THAT CORRECT?

A. FLIGHT-FLUTTER TESTING IS BASED ON DEVELOPING A STIFF, OR A STRUCTURAL MODEL, OR A STIFFNESS-TYPE MODEL, BASED ON MAKING UP A MODEL OF THE MASS CHARACTERISTICS, AND THEN DOING AN EIGEN SOLUTION OF THOSE.

SO THE WEIGHT-TYPE DATA, THE STRUCTURAL-TYPE DATA, IS INVOLVED IN DOING THE FLUTTER ANALYSIS, BUT NOT THE UNSTEADY AERODYNAMICS, WHICH IS AN ADDITIONAL PART.

Q. SIR, HOW MANY ACTUAL ACCIDENT INVESTIGATIONS HAVE YOU ACTUALLY PARTICIPATED IN, WHERE YOU WERE INVOLVED PRETTY MUCH FULL TIME IN THAT?

A. THE ONLY FULL-TIME ACCIDENT INVESTIGATION I HAVE BEEN INVOLVED IN WAS THE ONE AT CESSNA AIRCRAFT CORPORATION.

Q. HOW LONG AGO WAS THAT, SIR?

A. THAT WAS IN 1978/1979.

Q. OKAY.

AND YOUR FULL-TIME JOB IS AS A PROFESSOR?

A. THAT IS CORRECT.

Q. ALL RIGHT.

NOW, SIR, WITH RESPECT TO WHAT YOU DID IN THIS CASE,

YOU TOLD MR. MC MANUS SOME OF THE THINGS YOU LOOKED AT, AND I WANT TO BE SURE WE UNDERSTAND THAT.

YOU LOOKED AT THE COLLATERAL REPORT?

A. THAT IS CORRECT.

Q. AND YOU LOOKED AT MR. EDWARDS' REPORT? DID YOU LOOK AT THE REPORT?

A. YES, I SAW MR. EDWARDS' REPORT.

Q. ALL RIGHT.

I THOUGHT I WROTE DOWN -- I MAY HAVE MISSED IT. I THOUGHT I WROTE DOWN YOU READ HIS DEPOSITION AND HIS TRIAL TESTIMONY, BUT NOT HIS REPORT.

A. AT THE TIME I HAD NOT READ HIS REPORT. THAT IS WHAT I RECALL.

Q. I SEE.

A. I AM NOT SURE. I WOULD HAVE TO --

Q. WHEN DID YOU READ HIS REPORT?

A. I AM NOT SURE WHEN I READ HIS REPORT.

Q. AND I THINK YOU SAID YOU READ DR. TURNBOW'S DEPOSITION; IS THAT CORRECT?

A. THAT'S CORRECT.

Q. DID YOU READ HIS REPORT?

A. YES, I READ HIS REPORT.

Q. OKAY.

AND YOU MENTIONED MISS NEILL. DID YOU READ MISS NEILL'S TESTIMONY, DEPOSITION TESTIMONY, OR DID YOU READ

HER REPORT, OR BOTH?

A. I READ --

Q. IT WAS A STATEMENT; NOT A REPORT.

A. YES. IT WAS A DEPOSITION GIVEN ON THE --

Q. ALL RIGHT.

A. (CONTINUING) -- ON THE 25TH OF NOVEMBER.

Q. OKAY.

AND YOU MENTIONED YOU READ MISS LIEVERMANN'S DEPOSITION?

A. THAT IS CORRECT.

Q. DID YOU READ HER STATEMENT?

A. I DON'T RECALL READING HER STATEMENT.

Q. OKAY.

DO YOU RECALL WHERE MISS NEILL AND MISS LIEVERMANN WERE LOCATED ON THE AIRPLANE?

A. I BELIEVE MRS. NEILL WAS LOCATED ABOUT HALF-WAY UP THE -- OR HALF-WAY BACK IN THE AFT TROOP COMPARTMENT, AND MISS LIEVERMANN WAS LOCATED IN THE AFT SECTION OF THE AFT TROOP COMPARTMENT.

Q. OKAY.

AND DID YOU READ OR LOOK AT ANY DEPOSITION TESTIMONY OF ANYBODY ELSE, OTHER THAN THOSE TWO PEOPLE -- ANYBODY ELSE WHO WAS IN THE TROOP COMPARTMENT?

A. NO, I DID NOT SEE ANYONE ELSE'S WHO WAS IN THE TROOP COMPARTMENT.

Q. OKAY. DO YOU REMEMBER IF MISS LIEVERMANN

WAS INJURED?

A. I DON'T RECALL READING THAT.

Q. YOU DO NOT RECALL ONE WAY OR THE OTHER, OR YOU DO NOT RECALL THAT SHE WAS INJURED?

A. I DON'T RECALL READING THAT SHE WAS INJURED. I DO NOT KNOW.

Q. ALL RIGHT.

DO YOU KNOW IF MISS NEILL WAS INJURED?

A. I DON'T RECALL HER INJURIES, IF SHE WAS. I KNOW SHE WAS -- SHE SAID SHE WAS THROWN TO THE FORWARD PART OF THE CABIN, BUT THAT IS ALL I RECALL OF THAT.

Q. OKAY.

YOU MENTIONED YOU HAD READ SOME -- YOU READ JANE'S ALL THE WORLD'S AIRCRAFT. WHAT DID YOU USE THAT INFORMATION FOR?

A. I JUST LOOKED AT THE SECTION ON THE C-5A, AND AT THAT TIME I JUST USED IT TO OBTAIN WING AREA, TAIL-SURFACE AREAS OF THE AIRCRAFT, AND GROSS WEIGHT.

Q. IS THAT THE ONLY REASON YOU READ THAT?

A. IT GAVE ME ALSO THE AIR ~~FOILS~~ FOILS THAT THEY USED ON THE WING AND TAIL SURFACES.

Q. AND YOU INDICATED YOU HAVE READ THE PHOTOGRAMMETRY REPORT BY DR. MORAIN?

A. THAT IS CORRECT.

Q. IN FACT, YOU ATTACHED A COPY OF DR. MORAIN'S

DIAGRAM TO YOUR REPORT; DID YOU NOT, SIR?

A. THAT IS CORRECT.

Q. AND DID YOU CONFER WITH DR. MORAIN AT ALL BETWEEN THE TIME YOU WERE MAKING YOUR COMPUTATIONS AND THE TIME HE WAS MAKING HIS OBSERVATIONS AND MEASUREMENTS?

A. YES.

I WAS GIVEN SOME OF HIS MEASUREMENTS WHILE I WAS MAKING MY CALCULATIONS.

Q. DID YOU, YOURSELF, MAKE ANY MEASUREMENTS OF ANY DISTANCES FROM THE ANALYSIS OF THE PHOTOGRAPHS?

A. NO, I DID NOT.

Q. DID YOU RELY, IN MAKING YOUR COMPUTATIONS IN YOUR REPORT, ON THE MEASUREMENTS DR. MORAIN MADE?

A. OKAY. THOSE MEASUREMENTS THAT INVOLVED DISTANCES, I RELIED ON THOSE.

IF IT INVOLVED STRUCTURAL FAILURES, I RELIED ON MYSELF TO DO THAT.

Q. WELL, AS TO THE ONES AS TO DISTANCES --

A. THAT IS CORRECT.

Q. (CONTINUING) -- YOU RELIED ON DR. MORAIN; DID YOU NOT?

A. THAT IS CORRECT.

Q. ALL RIGHT.

NOW, WITH RESPECT TO THE HILL YOU HAVE DESCRIBED, OR THE ELEVATION, DID YOU MAKE ANY INDEPENDENT ANALYSIS

OF THE PHOTOGRAPHS AS TO THE EXISTENCE OF AN ELEVATION OR HILL, OR DID YOU RELY UPON DR. MORAIN FOR THAT?

A. I INITIALLY JUST LOOKED AT THE PHOTOGRAPHS AND FILMS. I ASSUMED THAT THERE WAS A HILL THERE, AND THEN LATER YOU COULD SAY I USED HIS REPORT TO VERIFY THAT, SINCE I WASN'T REALLY QUALIFIED TO DETERMINE THE ELEVATION, OR ANYTHING, ON THAT.

Q. WHEN YOU SAY THAT YOU LOOKED AT THE PICTURES, YOU WERE NOT LOOKING AT THEM AND FORMING AN EXPERT OPINION; YOU WERE JUST LOOKING AT THEM.

YOU WERE, IN FACT, RELYING ON DR. MORAIN, WERE YOU NOT, SIR, AS TO --

MR. MC MANUS: OBJECTION, YOUR HONOR. WHICH PICTURE --

BY MR. DUBUC:

Q. (CONTINUING) -- AS TO THE EXISTENCE OF THE HILL?

THE COURT: DO YOU UNDERSTAND THE QUESTION? WHY DO YOU NOT STATE IT AGAIN? THERE WAS AN INTERRUPTION, MR. DUBUC.

BY MR. DUBUC:

Q. THE QUESTION IS:

DO YOU HAVE ANY INDEPENDENT OPINION AS TO WHETHER THERE IS A HILL, OR A RISE IN TERRAIN, OR ARE YOU RELYING UPON DR. MORAIN, AS FAR AS AN EXPERT OPINION IS CONCERNED,

AS TO THAT FACT?

A. OKAY.

JUST PERSONAL OBSERVATION OF THE TRACKS OF BOTH THE AFT TROOP COMPARTMENT AND THE FORWARD FLIGHT DECK, THE PATH THAT THE FORWARD FLIGHT DECK TOOK, AVOIDING THE RISE, AND IN MY INITIAL ANALYSIS I ASSUMED THERE WAS A RISE THERE.

Q. SIR, DO YOU REMEMBER YOUR DEPOSITION BEING TAKEN ON NOVEMBER 24, 1981?

A. IF YOU WOULD LIKE TO SHOW ME A STATEMENT?

Q. YES. REFERRING YOU TO PAGE 119, I WILL LEAVE THAT WITH YOU, SIR.

DO YOU REMEMBER BEING ASKED THIS QUESTION AND GIVING THIS ANSWER, AT PAGE 119, LINE 2:

"DO YOU HAVE AN EXPERT OPINION, NOT RELYING UPON DR. MORAIN, OR ANYONE ELSE, AS TO WHETHER THE TERRAIN IS FLAT, AND WHETHER OR NOT IT RISES?

"ANSWER: I WOULD NOT MAKE AN EXPERT OPINION ON THAT. I WOULD HAVE TO BASE IT ON SOMEONE WHO READS PICTURES, AND I AM NOT AN EXPERT IN READING TO WRITE."

"READING TO WRITE" IS THE WAY THIS READS.

"WHENEVER -- WHEN I READ THIS, I THOUGHT I WOULD HAVE AN EXPERT READ IT AND GIVE ME AN ANALYSIS."

DO YOU REMEMBER GIVING THAT ANSWER TO THAT QUESTION, SIR?

A. THAT IS CORRECT.

Q. THANK YOU, SIR.

NOW, SIR, WITH RESPECT TO YOUR REPORT, YOU DID WRITE A REPORT; DID YOU NOT, SIR?

A. YES.

Q. YOU MENTIONED SOMETHING ABOUT MADAR IN AN EXHIBIT THAT MR. MC MANUS SHOWED TO YOU. DO YOU REMEMBER? THAT IS EXHIBIT 4063.

A. THAT IS CORRECT.

Q. HAD YOU LOOKED AT THAT MADAR BEFORE YOU PREPARED AND WROTE YOUR REPORT?

A. NO, I HADN'T SEEN THE MADAR UNTIL I GUESS IT WAS THE MORNING THAT I GAVE MY DEPOSITION. IT WAS CONCERNING THE REPORT.

Q. DID YOU READ MR. EDWARDS' REPORTS AND NOTE IN HIS OLD DEPOSITION TESTIMONY REFERENCES TO THE MADAR DATA?

A. I READ MR. EDWARDS' REPORT. IF HE REFERENCED IT, I WOULD HAVE SEEN IT.

Q. DO YOU REMEMBER READING ABOUT IT IN THE DEPOSITION, OR THE TRANSCRIPT OF IT THAT YOU READ, OF MR. EDWARDS' TESTIMONY?

A. I DON'T REALLY RECALL AT THIS TIME.

Q. I SEE.

DO I UNDERSTAND YOUR TESTIMONY TO BE THAT, IN FACT,

THERE IS SOME EVIDENCE IN THE PORTION OF THE MADAR TAPE THAT HAS EITHER BEEN ERASED OR NOT RECORDED BECAUSE OF ELECTRICAL INTERRUPTIONS THAT PERTAINS TO VERTICAL G-FORCES?

A. THERE MAY BE A PORTION THAT WAS ERASED THAT WOULD PERTAIN.

IN THE SLIDE THAT WAS SHOWN, IT INDICATED THAT THERE WAS SOME STRUCTURAL DAMPING GOING ON. THE ACCELEROMETER WAS DAMPING OUT.

WHAT OCCURRED JUST PRIOR TO IT HAD BEEN ERASED. SO WHAT THOSE THOSE ACTUAL VALUES ARE, YOU COULD NOT DETERMINE UNLESS YOU USED A LOGARITHMIC DECREMENT, AND YOU LOOKED AT THE OTHER DAMPING VALUES.

Q. AND, EVEN USING THE LOGARITHMIC DECREMENT, AS YOU MENTION IT, AND ANALYSIS, THAT IS ONLY AN ESTIMATION. THERE ISN'T ANY ACTUAL, USABLE DATA ON THAT MADAR THAT STATES:

THIS IS, IN FACT, THE VERTICAL ACCELERATION FORCE AT IMPACT; ISN'T THAT TRUE, SIR?

A. THAT IS CORRECT. IT ONLY SHOWED THE -- A DAMPED VALUE.

Q. SO YOUR -- I THOUGHT I HEARD YOU MENTION FIVE G'S IN CONNECTION WITH THAT.

A. THAT IS CORRECT.

Q. DID YOU COMPUTE THAT IN SOME WAY?

A. THAT'S CORRECT.

Q. DID YOU NOTICE, IN REVIEWING ANY OF THE TESTIMONY -- DID YOU REVIEW ANY OF THE FLIGHT-CREW DEPOSITIONS?

A. NO, I DID NOT.

Q. I WANT YOU TO ASSUME, FOR THE PURPOSES OF THIS QUESTION, THAT THE CO-PILOT SITTING IN THE COCKPIT OF THIS AIRPLANE JUST PRIOR TO THE FIRST IMPACT IN THE AREA WHERE YOU ARE TALKING ABOUT THE MADAR, AND YOU ARE TALKING ABOUT YOUR ESTIMATE OF FIVE G'S, OBSERVED THE INSTRUMENT THAT MEASURES THE RATE OF DESCENT TO BE 500 TO 600 FEET A MINUTE.

NOW, ASSUME THAT.

MY QUESTION IS:

WOULD THAT BE CONSISTENT WITH YOUR CALCULATION FROM DATA THAT IS NOT CLEAR DATA, BUT HAS TO BE EXTRAPOLATED?

A. WELL, AGAIN, THE DATA ON THIS POINT WAS MEASURED -- IT WAS RECORDED ESSENTIALLY BY THE STRUCTURE. THE STRUCTURE HAS BEEN EXCITED BY SOMETHING.

IT INDICATES -- THE ACTUAL DATA THERE SHOWS ABOUT ONE-AND-A-HALF G'S.

Q. IT SHOWS ONE-AND-A-HALF G'S ON THE MADAR TAPE?

A. ACTUAL MADAR DATA.

Q. BUT YOU HAVE SOME COMPUTATION AND GOT IT UP TO --

A. THAT'S RIGHT.

Q. (CONTINUING) -- FIVE?

A. YES.

Q. ALL RIGHT. LET ME ASK YOU THIS QUESTION:

ASSUMING THE SAME ASSUMPTION, THAT THE CO-PILOT OBSERVED A DESCENT RATE ON THE INSTRUMENT MEASURING THE RATE AT WHICH THE AIRPLANE COMES DOWN TO BE 500 TO 600 FEET PER MINUTE JUST PRIOR TO THE FIRST IMPACT, WOULD THAT DESCENT RATE, BASED ON WHATEVER KNOWLEDGE YOU HAVE ON THIS AIRPLANE, BE MORE CONSISTENT WITH ONE-AND-A-HALF G'S OR FIVE G'S?

A. OKAY.

TO GO BACK TO ANSWER THE QUESTION, HIS DESCENT RATE IS BASED ON AERODYNAMICS.

THERE IS ALSO A LAG IN HIS INSTRUMENTATION.

THEN, WHEN YOU START LOOKING AT THE STRUCTURE BEING EXCITED, IF THE AIRPLANE HAS A NOSE-UP OR NOSE-DOWN ATTITUDE, A HORIZONTAL COMPONENT OF VELOCITY WILL BE MEASURED AS A VERTICAL ACCELERATION.

AND SO, EVEN THOUGH THE ACCELEROMETERS ARE LOCATED AT THE C. G. OF THE AIRCRAFT, IF THE AIRPLANE HAS SOME ANGLE OF ATTACK, IT WILL PICK UP A COMPONENT.

AND, THEREFORE, IT WOULD RECORD -- IF THE AIRPLANE WAS EXACTLY 90 DEGREES, THEN THE VERTICAL ACCELEROMETER WOULD BE THE HORIZONTAL ACCELEROMETER, AND VICE-VERSA.

SO THERE MIGHT BE A COMPONENT OF THE HORIZONAL VELOCITY BEING RECORDED BY THE VERTICAL ACCELEROMETER.

Q. SIR, COULD YOU ANSWER JUST THE QUESTION I ASKED YOU? MY QUESTION IS LIMITED TO WHETHER AN OBSERVATION -- ASSUMING THE OBSERVATION TO BE ACCURATE AS TO WHAT HE SAW, AND ASSUMING THAT WHAT HE SAW WAS 500 TO 600 FEET PER MINUTE, AND KNOWING WHAT YOU KNOW ABOUT THIS AIRPLANE, AND WHAT YOU READ, IS THAT DESCENT RATE MORE CONSISTENT WITH A ONE-AND-A-HALF-G IMPACT THAN WITH A FIVE-G IMPACT?

A. AGAIN, I WOULD HAVE TO SAY YOU WOULD HAVE TO KNOW THE ANGLE OF ATTACK OF THE AIRPLANE AND WHAT COMPONENT OF THE HORIZONTAL VELOCITY IS IN THE VERTICAL DIRECTION.

IF THE INSTRUMENTATION IS ROTATED TO AGREE WITH THE LINES CORRECTLY, YOU COULD SAY THAT.

BUT BECAUSE THE AIRPLANE HAS SOME INCIDENCE TO THE GROUND, THEN YOU COULDN'T SAY ONE WOULD ACTUALLY NEGATE THE OTHER ONE, OR ONE WOULD MAKE THE OTHER ONE INVALID, SIR.

Q. OKAY.

WITH RESPECT TO THE HORIZONTAL POSITION OF THE AIRCRAFT, DID YOU NOTICE THAT THE AIRCRAFT ON THE EAST SIDE HAD HIT A DIKE; PART OF THE AIRCRAFT HAD HIT A DIKE, AND PART OF THAT AIRCRAFT HAD HIT ANOTHER DIKE JUST BEYOND IT?

A. OKAY. YOU ARE REFERRING ON THE EAST SIDE OF THE RIVER AGAIN?

Q. THAT IS CORRECT, SIR.

A. YES.

Q. ALL RIGHT.

A. THAT WAS IN THE REPORT I READ.

Q. OKAY.

THE COURT: WE WILL TAKE OUR AFTERNOON RECESS AT THIS TIME.

(THE JURY WAS TAKEN OUT OF THE COURTROOM, AND THE FOLLOWING PROCEEDINGS WERE HAD WITHOUT THE PRESENCE AND HEARING OF THE JURY:)

THE COURT: YOU MAY STEP DOWN, SIR.

ARE THERE ANY THINGS THAT WE ARE GOING TO NEED TO REVISIT?

MR. DUBUC: I DON'T THINK SO, YOUR HONOR.

THE COURT: ALL RIGHT.

(WHEREUPON, A SHORT RECESS WAS TAKEN, AFTER WHICH THE FOLLOWING PROCEEDINGS WERE HAD:)

THE COURT: BRING BACK THE JURY.

(THE JURY WAS BROUGHT INTO THE COURTROOM, AND THE FOLLOWING PROCEEDINGS WERE HAD WITHIN THE PRESENCE AND HEARING OF THE JURY:)

THE COURT: MR. DUBUC?

MR. DUBUC: THANK YOU, YOUR HONOR.

BY MR. DUBUC:

Q. DOCTOR, JUST BEFORE THE BREAK, WE WERE TALKING ABOUT THE COMPARISON OF YOUR FIGURE OF FIVE G'S AND THE ONE-AND-A-HALF G'S AND THE DESCENT RATE. DO YOU REMEMBER

THAT LINE OF QUESTIONS?

A. THAT IS CORRECT.

Q. DID YOU TELL ME THAT YOU WERE NOT ACCEPTING THE 500 TO 600 FEET PER MINUTE? I AM NOT SURE I UNDERSTOOD WHAT THAT EXPLANATION MEANT.

A. I WAS ACCEPTING THE 500 OR 600 FEET PER MINUTE, SIR.

Q. YOU WERE ACCEPTING IT?

A. YES.

Q. NOW, FOR THIS AIRPLANE, AT A DESCENT RATE OF 500 TO 600 FEET PER MINUTE, WHAT WOULD YOU EXPECT THE LANDING G-FORCE TO BE?

A. WELL, IF YOU ARE TALKING ABOUT THE VERTICAL G, IT WOULD BE VERY SMALL.

BUT IN THAT CASE THE VERTICAL ACCELEROMETER MIGHT NOT BE IN LINE WITH THE DIRECTION OF DESCENT. IT MIGHT BE SLIGHTLY CANTED DUE TO THE ANGLE OF ATTACK OF THE AIRCRAFT AND, THEREFORE, IT IS REALLY A COMPONENT FROM THE FORWARD DEACCELERATION.

Q. ALL RIGHT, SIR.

IF WE ASSUME THAT THE AIRCRAFT WAS IN A SLIGHTLY LEVEL -- APPROXIMATELY LEVEL POSITION --

A. YES.

Q. (CONTINUING) -- WHAT EFFECT WOULD THAT HAVE ON WHAT YOU JUST TOLD US ABOUT 500 TO 600 FEET?

A. WELL, AS THE AIRPLANE --

Q. FIVE HUNDRED TO 600 FEET PER MINUTE?

A. (CONTINUING) -- APPROACHES THE LEVEL CONDITION, THE COMPONENT BECOMES MUCH SMALLER.

Q. OKAY.

AND YOU MENTIONED A COUPLE OF DIKES IN YOUR REPORT; DID YOU NOT?

A. I BELIEVE IT IS MENTIONED IN THE REPORT, YES.

Q. ON THE EAST SIDE OF THE RIVER?

A. THAT IS CORRECT.

Q. I WOULD LIKE TO SHOW YOU A SLIDE TO SEE IF THIS HELPS US WITH THE POSITION OF THE AIRPLANE.

MR. CONNORS: DEFENDANTS' D-1406.

MR. DUBUC: I BELIEVE THIS IS IN EVIDENCE, YOUR HONOR.

BY MR. DUBUC:

Q. DO YOU REMEMBER LOOKING AT THAT PICTURE, AMONG THE PICTURES YOU LOOKED AT? THIS PURPORTS TO BE A GOUGE ON THE EAST SIDE OF THE RIVER?

A. THAT IS CORRECT.

Q. AND THAT GOUGE APPEARS TO GO THROUGH SOMETHING -- A LINE THAT RUNS UP FROM THE LOWER LEFT TO THE UPPER RIGHT, IN THE UPPER LEFT-HAND CORNER.

DO YOU SEE THAT?

A. THAT'S RIGHT.

Q. IS THAT ONE OF THE DIKES THAT YOU MENTIONED?

A. YES.

Q. OKAY.

MR. DUBUC: WHAT IS THE NEXT SLIDE?

MR. CONNORS: THE DIKE.

BY MR. DUBUC:

Q. IS THIS ALSO ONE OF THE DIKES THAT YOU MENTIONED DOWN HERE?

A. YES, IT IS ONE OF THE DIKES.

Q. ALL RIGHT.

MR. CONNORS: D-1405.

BY MR. DUBUC:

Q. NOW, THIS IS A PICTURE, ANOTHER PICTURE, ON THE EAST SIDE OF THE RIVER. DO YOU SEE UP IN THE UPPER PORTION THERE THE GOUGE MARKS WE WERE LOOKING AT?

A. YES.

Q. DO YOU REMEMBER LOOKING AT THIS PICTURE, ALSO?

A. YES, I HAVE SEEN THIS PHOTOGRAPH.

Q. DO YOU SEE THE DIKE --

A. OR ONE QUITE SIMILAR.

Q. DO YOU SEE THE DIKE IN THE LOWER PORTION HERE?

A. YES.

Q. AND IT HAS A DISTURBANCE ON IT; DOES IT NOT?

A. YES.

Q. IS THAT ONE OF THE DIKES THAT YOU INDICATED

SOME PORTION OF THE AIRPLANE MAY HAVE HIT?

A. YES. THIS WAS SIMILAR TO THE PHOTOGRAPHS I LOOKED AT.

Q. OKAY.

DID YOU EVER MAKE ANY DETERMINATION AS TO HOW HIGH THOSE DIKES WERE?

A. I BELIEVE SOME DETERMINATION WAS MADE ON THE HEIGHTS OF THOSE. I DID NOT MAKE IT.

Q. DR. MORAIN DID THAT?

A. YES.

Q. DO YOU REMEMBER WHAT HE INDICATED THEY WERE?

A. NOT AT THIS TIME.

Q. OKAY.

WE CAN ASSUME THAT THEY ARE APPROXIMATELY A FOOT TO TWO FEET HIGH, FOR THE PURPOSES OF THIS QUESTION. AND WE CAN ASSUME THAT THERE IS A DISTURBANCE ON THIS DIKE AND A GOUGE OVER HERE AND A DISTURBANCE ON THE NEXT ONE THAT WE SAW IN THE LAST PICTURE.

WOULD THAT INDICATE TO YOU THAT THE AIRCRAFT OVER THAT PARTICULAR AREA WOULD BE IN A VERY LOW RATE-OF-DESCENT PROFILE?

A. YES.

Q. ASSUMING THOSE DIKES ARE ONLY A FOOT TO TWO FEET HIGH?

A. YES.

Q. YOU WOULD AGREE WITH THAT; WOULDN'T YOU?

A. AS THE AIRPLANE IS FAIRLY LEVEL -- IT PROBABLY HAS SOME PITCHING COMPONENT. EACH TIME IT IS NOSE SLIGHTLY UP, NOSE SLIGHTLY DOWN.

Q. OKAY.

AND, THEREFORE, WOULD YOU AGREE THAT IF THOSE ASSUMPTIONS ARE CORRECT, THAT THE ACCELEROMETER AND THE RATE OF DESCENT -- AND THE RATE-OF-ASCENT INSTRUMENT WOULD HAVE -- WOULD NOT HAVE GREAT ERRORS IN THEM IF THE AIRPLANE IS THAT LEVEL?

A. WELL, THE AIRPLANE, I JUST SAID, IS PITCHING SLIGHTLY. AND EACH TIME THE NOSE SLIGHTLY COMES UP, OR IMPACTS A DIKE, THE WINGS ARE MOVING UP AND DOWN. THE AIRPLANE CAN GENERATE HUGE AMOUNTS OF LIFT AT THIS TIME.

Q. OKAY.

NEVERTHELESS, IT DOES APPEAR THAT IT IS IN A FAIRLY HORIZONTAL POSITION, AT LEAST AT THE TIMES IT IMPACTED ON THE POINTS SHOWN IN THE PICTURE?

A. EACH TIME IT IS IMPACTING, THE AIRCRAFT WOULD BE SLIGHTLY PITCHING UP. IF IT DOESN'T LEAVE A MARK, THE NOSE IS SLIGHTLY PITCHING DOWN.

SO YOU ARE GETTING A ROTATION, ALSO, ABOUT THE CENTER OF GRAVITY, WHICH IS SHOWN ON THOSE PITCH ACCELEROMETERS.

Q. ALL RIGHT, SIR.

A. AND THIS WOULD BE EXCITING THE STRUCTURE, AND

IT IS WHAT IS GIVING YOU THE INDICATION OF THE VERTICAL ACCELERATION.

Q. OKAY.

AND THAT IS WHAT IS SEEN ON AN ACCELERATION -- ON THE RATE-OF-DESCENT METER; IS THAT CORRECT?

A. NO. THE AIRPLANE IS ESSENTIALLY FLYING AT A LEVEL POSITION, OSCILLATING ABOUT THE CENTER OF GRAVITY. AND, THEREFORE, THE RATE-OF-DESCENT METER IS OPERATING STRICTLY ON THE PRESSURE CHANGES, WHERE THE ACCELEROMETER IS OPERATING ON FORCE EXCITATION.

THE AIRPLANE, IN HITTING THESE DIKES, THE NOSE IS PROBABLY COMING UP, COMING DOWN. AND EVEN THOUGH IT IS ESSENTIALLY MAINTAINING THE SAME ALTITUDE, THE AIRPLANE IS PITCHING SLIGHTLY ABOUT THIS POINT.

Q. OKAY.

A. AND THIS PITCHING, THESE IMPACTS, ARE EXCITING THE STRUCTURE.

THE CO-PILOT, IF HE IS LOOKING AT THE RATE-OF-DESCENT METER, WOULD SEE NO CHANGES.

THE PEOPLE INVOLVED IN IT WOULD FEEL THE STRUCTURE VIBRATING AT THE FREQUENCY THAT IS INDICATED BY THE ACCELEROMETER.

Q. ALL RIGHT.

A. AND AT THOSE LEVELS.

Q. DID YOU READ ANYTHING THAT STATED THAT IN THOSE

TERMS, IN CONNECTION WITH THIS ACCIDENT?

A. I DON'T BELIEVE I HAVE READ ANYTHING THAT TALKS ABOUT THE ACCELEROMETER READINGS.

Q. SO WHAT WE ARE HEARING IS YOUR OPINION ON THIS; IS THAT IT?

A. MY EXPERT READING OF AN ACCELEROMETER PRINTOUT, SIR.

Q. DID YOU READ THE ENTIRE MADAR TAPE, OR JUST THAT SLIDE THAT WAS SHOWN?

A. I REQUESTED THE ENTIRE MADAR OUTPUT DATA.

Q. DID YOU READ IT ALL?

A. I WAS NEVER GIVEN THAT DATA.

Q. TO WHOM DID YOU MAKE THE REQUEST?

A. IT WAS MADE THROUGH THE AGENCY, THROUGH MIKE COHEN, AND A LETTER WAS SUPPOSEDLY -- A REQUEST WAS MADE FOR IT.

Q. DO YOU RECALL MR. EDWARDS' TESTIMONY ABOUT THE MADAR TAPE AND DATA?

A. NOT AT THIS TIME.

Q. DID YOU REVIEW WHAT MR. EDWARDS REFERRED TO?

A. I AM AFRAID I DON'T REMEMBER IT. I COULDN'T REFER TO IT.

Q. YOU MENTION IN YOUR REPORT SOMETHING ABOUT THE LANDING GEAR SHEARING ON THE WEST SIDE, ON PAGE TWO, WHEELS AND PIECES. DO YOU SEE THAT? IT IS ON PAGE

TWO OF YOUR REPORT, SIR: LANDING GEAR DUG IN; IMPACTS ON THE EAST SIDE OF THE RIVER.

A. WELL, YOU JUST SAID ON THE WEST SIDE.

Q. I AM SORRY. LOOK AT PAGE 2 OF YOUR REPORT, THE EAST SIDE OF THE RIVER. WE ARE STILL ON THE EAST SIDE OF THE RIVER.

A. OKAY.

Q. YOU MENTIONED THE LANDING GEAR DUG INTO THE SOIL, AND LATER ON THAT PAGE YOU MENTION:

"IT IS PROBABLE THAT TWO COMPLETE SETS OF LANDING GEAR WERE LOST DURING, OR SHORTLY AFTER, THIS IMPACT."

DO YOU SEE THAT?

A. I WAS LOOKING AT THE LAST LINE: "THE IMPACTS WERE OF SUFFICIENT MAGNITUDE (SNAPPED OFF SEVERAL PIECES OF LANDING GEAR)" --

Q. I AM COMING TO THAT.

A. OKAY.

Q. BUT I AM TALKING ABOUT THE SENTENCE --

A. OKAY.

Q. (CONTINUING) -- REGARDING TWO SETS OF LANDING GEAR. DO YOU SEE THAT?

A. OKAY. TWO SETS OF LANDING GEAR WERE LOST AFTER THAT IMPACT.

Q. HOW MANY LANDING GEAR ARE THERE IN A SET?

A. I DON'T RECALL AT THIS TIME.

Q. YOU DON'T RECALL?

A. NO.

Q. YOU WROTE THIS, DIDN'T YOU, SIR?

A. YES. IT LOST SEVERAL SETS, AND WHAT I REFER TO WAS JUST LOOKING AT THE PHOTOGRAPHS. THERE WERE SETS OF LANDING GEAR SEEN IN THE PHOTOGRAPHS.

Q. BUT YOU DO NOT RECALL HOW MANY THERE ARE IN A SET?

A. NO, NOT AT THIS TIME.

Q. ALL RIGHT.

THEN YOU MENTIONED:

"THE IMPACTS WERE OF SUFFICIENT MAGNITUDE (SNAPPED OFF SEVERAL PIECES OF LANDING GEAR) TO HAVE WEAKENED PART OF ALL OF THE C-5A STRUCTURE."

YOU ARE TALKING ABOUT THE EAST SIDE WHEN YOU SAY THAT; IS THAT CORRECT, SIR?

A. THAT IS CORRECT.

Q. AND IS THIS STRUCTURAL DAMAGE, IN YOUR OPINION, LIMITED ONLY TO THE LANDING GEAR?

A. WELL, AT THIS POINT I WAS TALKING MAINLY ABOUT THE UNDERCARRIAGE STRUCTURE OF THE LANDING-GEAR STRUCTURE.

Q. DO YOU RECALL THE DISCUSSION OF THIS IN YOUR DEPOSITION? YOU TOLD US YOU THOUGHT THERE MIGHT HAVE BEEN SOME STRUCTURAL DAMAGE IN OTHER COMPONENTS AROUND THE TAIL OF THE AIRPLANE?

A. OKAY.

DURING THE DISCUSSION IN THE DEPOSITION, WE HAD MENTIONED THE WING, ALSO, BECAUSE THERE WERE INDICATIONS THAT IT MIGHT HAVE HIT A TREE, AND THERE MIGHT HAVE BEEN SOME LOCAL DAMAGE THERE.

WE DISCUSSED THE TAIL. I DON'T RECALL THAT AT THIS TIME.

I MIGHT HAVE SAID I DIDN'T THINK IT DAMAGED THE TAIL, BECAUSE IT DOESN'T SEEM OF A SUFFICIENT G-LEVEL AT THIS TIME TO DAMAGE THE TAIL.

IT WAS ONLY IMPACT-TYPE LOADINGS OR FRICTIONAL FORCES ON THE GEAR, ITSELF.

Q. OKAY.

NOW, YOU MENTIONED THAT YOU RELIED ON DR. MORAIN WITH RESPECT TO MEASUREMENT OF TRACKS FOR THE COMPUTATION YOU MADE.

BUT YOU MADE ANOTHER COMPUTATION.

IS THE COMPUTATION YOU ARE REFERRING TO IN THAT ANSWER THE ONE YOU MADE AS TO THE T-TAIL SEPARATING?

A. OKAY. WHEN WE TALK ABOUT RELYING --

Q. IS THAT THE KIND OF COMPUTATION, OR IS IT SOMETHING ELSE?

A. OKAY. I REFERRED TO TWO TYPES OF COMPUTATIONS, SIR.

ONE TYPE OF COMPUTATION USES THE DISTANCES DR. MORAIN

MEASURED, THE TRACKS.

THE OTHER SET OF COMPUTATIONS INVOLVES THE STRUCTURAL FAILURES IN THE TROOP COMPARTMENT AND ON THE TAIL, ITSELF.

Q. ALL RIGHT.

NOW, THE FIRST ONE, AS FAR AS MEASUREMENT OF TRACKS, YOU HAD A COMPUTATION ON PAGE 4 OF YOUR REPORT, WHICH IS LABELED "T-TAIL."

DO YOU SEE THAT, SIR?

A. THAT IS CORRECT.

Q. AND THAT COMPUTATION, SO FAR AS I CAN SEE, READING THIS, DOES NOT REFER TO TRACKS; IS THAT CORRECT?

A. THAT IS CORRECT. THIS IS BASED ON LOCKHEED DATA --

Q. RIGHT.

A. (CONTINUING) -- AND THE STRUCTURAL FAILURE OF THE TAIL.

Q. NOW, THAT IS AS TO THE T-TAIL?

A. THAT'S CORRECT.

Q. OKAY.

I SEE SOME COMPUTATIONS AS TO THE FLIGHT DECK THAT REFER TO AVERAGE G'S, AND SOME --

A. YES.

Q. AM I CORRECT THAT THOSE COMPUTATIONS USE THE TRACK LENGTHS COMPUTED BY DR. MORAIN?

A. YES, THEY DID.

Q. I SEE, AS TO THE TROOP COMPARTMENT, SOME REFERENCES TO 175 YARDS, SOME AVERAGE ESTIMATED G-FORCES. DO THOSE COMPUTATIONS RELY UPON LENGTHS OF TRACKS MEASURED BY DR. MORAIN?

A. THAT IS CORRECT. THESE COMPUTATIONS USED BOTH THE FORWARD FLIGHT DECK AND THE AFT TROOP COMPARTMENT TRACK LENGTHS AND FORMED BOTH AN UPPER AND A LOWER BOUND ON OUR G-FORCES.

Q. ALL RIGHT.

AND, SIR, I NOTICE ON THAT SAME PAGE 5 YOU HAVE SOME COMPUTATIONS WHICH I THINK YOU MENTIONED IN RESPONSE TO MR. MC MANUS' QUESTIONS.

YOU HAVE SOME THAT RELATE TO THE TRACKS AND A SUDDEN ENDING, I THINK YOU SAID, AT THE HILL.

THOSE DEPEND UPON THE LENGTH OF THE TRACKS MEASURED BY DR. MORAIN AND THE EXISTENCE OF THE HILL; IS THAT CORRECT, SIR?

A. THAT IS CORRECT. THE VELOCITY AT THIS POINT -- I USED SOME TRACK LENGTHS TO OBTAIN THE VELOCITY AT THE IMPACT ON THE HILL.

Q. ALL RIGHT.

NOW, AS TO THOSE TRACKS, IF DR. MORAIN'S MEASUREMENTS ARE INCORRECT, WOULD THAT AFFECT YOUR COMPUTATION OF G-FORCES?

A. OKAY. THE --

Q. AS TO THE ONES WE HAVE JUST TALKED ABOUT, WITH

TROOP-COMPARTMENT TRACKS, THE ONES I JUST MENTIONED AND WE TALKED ABOUT, THE 175 YARDS, THE LAST TRACK OF THE TROOP COMPARTMENT ON THE HILL, AND THE FLIGHT-DECK COMPUTATIONS?

A. OKAY.

THE LENGTHS OF HIS TRACKS THAT I USED FORM THE LOWER BOUND, AND ANY VARIATIONS IN LENGTHS WOULD FORM SOME SHIFTING OF BOTH MY LOWER BOUND AND MY UPPER BOUND FOR G-LEVELS.

BUT IT WOULD NOT CHANGE THE ACTUAL VALUES THAT ARE BASED ON STRUCTURAL ANALYSIS.

Q. ALL RIGHT.

DO YOU RECALL GIVING THIS ANSWER TO THIS QUESTION FROM YOUR DEPOSITION OF NOVEMBER 24TH. YOU STILL HAVE IT THERE, DON'T YOU, SIR, PAGE 85, LINE 9?

A. YES.

Q. "YOU ARE TAKING THE 165 FEET FROM DR. MORAIN'S MEASUREMENTS; IS THAT CORRECT?

"THAT IS CORRECT.

"IF THOSE MEASUREMENTS ARE NOT CORRECT, WOULD THAT AFFECT YOUR COMPUTATIONS?

"ANSWER: THAT IS CORRECT."

MR. MC MANUS: YOUR HONOR, THAT IS WHAT HE JUST TESTIFIED.

MR. DUBUC: WELL, I AM NOT SURE. I THINK HE QUALIFIED IT, WHEN HE JUST TESTIFIED, YOUR HONOR.

THE COURT: THE OBJECTION IS OVERRULED. GO

AHEAD.

BY MR. DUBUC:

Q. THAT IS TRUE; IS IT NOT, SIR?

A. AS I INDICATED BEFORE, IF THERE IS A DIFFERENCE IN THE TWO -- THE NUMBERS THAT -- LET'S SEE.

I USED HIS DISTANCES. IF THEY ARE SLIGHTLY OFF, THEN THAT WOULD CHANGE A LOWER BOUND AND AN UPPER BOUND FOR THE ANALYSIS BASED ON THE INTEGRATION TECHNIQUE, BUT IT WOULD NOT CHANGE THE G-FORCES WHERE STRUCTURAL FAILURES WERE USED.

Q. THEY WOULDN'T CHANGE THE G-FORCES YOU COMPUTED FOR THE T-TAIL. YOU MADE THAT COMPUTATION; IS THAT CORRECT?

A. THE T-TAIL OR THE SEAT FAILURES.

Q. ALL RIGHT.

HAVE YOU GOT -- WITH RESPECT TO THE T-TAIL, THAT WAS ON THE SEPARATION OF THE T-TAIL FROM THE REST OF THE FUSELAGE; IS THAT CORRECT?

A. THAT IS CORRECT.

Q. AND, IN MAKING THAT CALCULATION, AS I UNDERSTAND IT, YOU MADE YOUR CALCULATIONS ASSUMING ONLY LONGITUDINAL OR COMPRESSION LOADS; IS THAT CORRECT?

A. NO. THE FAILURE IS A BENDING-TYPE FAILURE.

Q. ALL RIGHT.

A. IT HAS SOME AXIAL LOAD INVOLVED IN IT.

(SIC)

Q. SO THAT ACTUAL LOADS AND BENDING LOADS ARE WHAT THE

ASSUMPTIONS WERE?

A. THAT WAS WHAT WAS ACTUALLY USED IN PREPARING THIS REPORT.

Q. THAT IS WHAT YOU DID?

A. YES.

Q. SIR, DID YOU, IN MAKING YOUR COMPUTATIONS, HAVE ANY FACTOR INCLUDED FOR THE POSSIBLE STRUCTURAL DAMAGE TO THE T-TAIL AS A RESULT OF THE INITIAL LANDING ON THE EAST SIDE OF THE RIVER?

A. NO, THERE WAS NO FACTOR INVOLVED FOR ANY DAMAGE ON THE EAST SIDE.

Q. OKAY.

WAS THERE ANY FACTOR INVOLVED IN THAT CALCULATION FOR ANY AIR LOADS ON THE TAIL THAT MIGHT HAVE AFFECTED THE LOADING ON THE FUSELAGE STRUCTURE BENEATH?

A. YES.

I LOOKED AT THE AERODYNAMIC LOADING; AND, IN THIS CASE, I LOOKED AT TWO POSSIBLE FAILURES:

ONE WOULD BE THE DEACCELERATION OF THE AIRPLANE IN THE AXIAL DIRECTION, THE T-TAIL PITCHING FORWARD.

IN THIS PARTICULAR CASE, AS THE T-TAIL PITCHES FORWARD, THE ANGLE OF ATTACK OF THE TAIL IS DECREASED; AND IT WOULD EITHER GO TO ZERO, OR THE AERODYNAMICS WOULD ACTUALLY REDUCE THE LOADING ON THE TAIL, ITSELF.

AND, ALSO --

Q. ALL RIGHT.

A. (CONTINUING) -- IF YOU HAVE A FLAT IMPACT, THE REVERSE WILL HAPPEN, AND THE AERODYNAMICS WILL ALSO RELIEVE THE LOADS.

Q. ALL RIGHT.

DID YOU USE ANY FACTOR FOR A VERTICAL INERTIAL LOAD?

A. I USED THE INERTIA DATA OF THE TAIL, AND BECAUSE IT IS ON A PLANE --

Q. BUT THAT IS STATIC DATA. I AM TALKING ABOUT THE LOADS THAT MIGHT HAVE BEEN CREATED BY THE AIRCRAFT IN THE CONFIGURATION IT WAS IN, THE TRIM IT WAS IN, THE ABSENCE OF CERTAIN CONTROL SURFACES, AND WHAT YOU HAVE READ AND DESCRIBED AS TO THE SEQUENCE IN WHICH THE AIRCRAFT MADE ITS LANDING.

DID YOU CONSIDER ANY VERTICAL INERTIA LOADS BECAUSE OF THE CONFIGURATION?

A. AGAIN, I WILL SAY I USED THE MASS DATA, WHICH IS INERTIA DATA. AND THE INERTIA DATA, BEING EITHER VERTICAL OR HORIZONTAL, WILL GIVE YOU THE BENDING MOMENT ABOUT THE FUSELAGE.

Q. ALL RIGHT.

DID YOU USE ANY FACTOR IN YOUR COMPUTATION FOR VERTICAL AND LATERAL SHEAR LOADS, AGAIN, BECAUSE OF THE CONFIGURATION OF THE AIRPLANE?

A. OKAY. WHEN YOU START TALKING ABOUT VERTICAL

AND LATERAL SHEAR LOADS, YOU ARE GOING BACK TO THE BEAM ANALYSIS OR THE FUSELAGE-TYPE ANALYSIS ON THE FUSELAGE, SIR.

THIS IS INCLUDED IN THE LOCKHEED STRESS ANALYSIS, AND THE NUMBERS -- OR THE FAILURE-TYPE INFORMATION COMES OUT OF THEIR STRESS ANALYSIS, ITSELF.

AND SO EVERYTHING WAS TAKEN INTO ACCOUNT BY THE LOCKHEED ANALYSIS, EXCEPT THE AXIAL LOADING.

AND THEY FELT THE DRAGS ON THE SURFACES WERE SMALL ENOUGH NOT TO.

Q. ALL RIGHT.

BUT THOSE FIGURES THAT YOU ARE USING, THE LOCKHEED FIGURES THAT WE PROVIDED TO YOU, WERE FOR AN AIRPLANE IN A NORMAL CONFIGURATION.

A. THAT IS CORRECT.

Q. THOSE ARE BUILT-IN, COMPUTED LOADS; ARE THEY NOT?

A. WELL, THEY ARE THE WORST-CASE LOADS. THE NORMAL AIRCRAFT WOULD NOT EXPERIENCE THIS, BECAUSE THEY ARE GUST LOADINGS.

Q. RIGHT.

BUT THEY WERE NOT SPECIFICALLY DIRECTED TO THIS PARTICULAR SITUATION. THOSE WERE DESIGNED-COMPUTATION, WORST-CASE LOADINGS; IS THAT CORRECT?

A. THAT IS CORRECT.

Q. AND YOU HAVE DESCRIBED HERE A SITUATION WHERE YOU SAY THERE WAS A LANDING ON ONE SIDE OF A RIVER, WITH SOME SUBSTANTIAL FORCE.

AND YOU HAVE DESCRIBED THE POSSIBILITY OF STRUCTURAL DAMAGE BEYOND JUST THE GEAR.

AND IN THAT --

A. WELL --

Q. (CONTINUING) -- DESCRIPTION I THINK I HEARD YOU SAY THERE WAS SOMETHING ABOUT CONTROLS NOT BEING USABLE AND --

A. THAT IS CORRECT.

Q. (CONTINUING) -- CERTAIN CONTROLS WERE NOT AVAILABLE. AND THOSE WOULD CREATE DIFFERENT LOADS ON AN AIRPLANE, WOULD THEY NOT, PARTICULARLY THE TAIL SECTION, IF THOSE WERE THE CONTROLS THAT WERE NOT AVAILABLE?

A. THAT IS CORRECT.

Q. AND MY QUESTIONS ARE DIRECTED TO WHETHER THAT WAS CONSIDERED, THOSE SPECIFIC THINGS WERE CONSIDERED AS SPECIFIC FACTORS IN YOUR COMPUTATION?

A. OKAY.

IN LOOKING AT THE RANGE OF G-LOADING I GAVE, I LOOKED AT THE AERODYNAMICS OR THE AIR LOADS THAT CAN BE GENERATED PER ANGLE OF ATTACK.

AND, THEREFORE, TO ACCOUNT FOR THE AERODYNAMIC LOADING BECAUSE OF THIS, I GAVE A RANGE OF G-LOADINGS. I DID

NOT GIVE A PARTICULAR VALUE TO ACCOUNT FOR THIS.

BECAUSE THE AERODYNAMIC LOADING PER DEGREE IS ABOUT, OH, 1700 POUNDS -- OR 17,000 POUNDS.

Q. OKAY.

NOW, I WOULD LIKE TO GO, IF I COULD, TO THE COMPUTATION BASED ON THE TRACKS, FOR WHICH YOU SAY YOU RELY ON DR. MORAIN'S COMPUTATIONS; IS THAT CORRECT?

A. OKAY.

FOR THE UPPER AND LOWER BOUNDS OF THE DATA.

Q. OKAY.

IF DR. MORAIN'S CALCULATIONS ARE NOT CORRECT, ASSUMING FOR THIS QUESTION THAT THEY ARE NOT CORRECT, THEN THAT WOULD CHANGE THE LOWER BOUNDS, AS WELL AS THE UPPPER BOUNDS, OF YOUR ESTIMATES, WOULD IT NOT, ASSUMING THAT THE TRACKS, LET'S SAY FOR THE PURPOSE OF THIS QUESTION, ARE LONGER THAN HE MEASURED THEM TO BE?

A. OKAY.

IF YOU LOOK AT THE EQUATION THAT WAS USED, THEN THE TRACK LENGTH IS INVERSELY PROPORTIONAL TO THE "G," AND THE "G" IS PROPORTIONAL TO THE VELOCITY SQUARED.

AND SO IF YOU CHANGE LENGTHS IN ANY MANNER, YOU WILL CHANGE THE "G'S" IN SOME FASHION.

Q. NOW, IF I COULD TRY TO UNDERSTAND WHAT YOU HAVE JUST TOLD US, WOULD IT BE A FAIR STATEMENT THAT WHAT YOU ARE TELLING US IS THIS:

AS TO HORIZONTAL G-FORCES, FOR EXAMPLE, WITH THE AIRPLANE GOING ON THE GROUND, IF THE TRACK MEASUREMENTS, ASSUMING FOR THE QUESTION, BY DR. MORAIN ARE NOT ACCURATE, AND, IN FACT, IF THE TRACKS ARE LONGER THAN HE MEASURED THEM, THE INVERSE PROPORTION MEANS THAT THE AVERAGE G-FORCES, AS YOU HAVE COMPUTED THEM OVER THAT TRACK, WOULD BE SMALLER.

IS THAT A FAIR STATEMENT?

A. OKAY. THE LOW BOUND WOULD BE SLIGHTLY LESS, YES.

Q. OKAY.

MR. DUBUC: MAY WE SEE THE NEXT SLIDE?

MR. CONNORS: D-1401.

BY MR. DUBUC:

Q. I JUST WANT TO SEE IF I UNDERSTAND WHAT YOU HAVE TOLD US TODAY.

YOU MENTION IN YOUR REPORT THAT YOU HAVE AN IMPACT ON THE WEST SIDE OF THE RIVER. I BELIEVE THAT IS ON PAGE 3 OF YOUR REPORT.

NOW, CAN YOU TELL US ON THIS PICTURE, IN YOUR OPINION, WHERE THE IMPACT WAS, THE FIRST IMPACT?

A. WOULD YOU LIKE ME TO COME UP THERE AND POINT IT OUT?

Q. OH, EITHER WAY; WHATEVER IS CONVENIENT FOR YOU, SIR.

A. OKAY.

IT SEEMS LIKE THERE IS A LIGHT STRIKE WHERE THE GRASS

STARTS CHANGING COLORS, AND THEN IT GETS DEEPER, AND WHERE THERE IS THE MAXIMUM AMOUNT OF WATER YOU HAVE THE HEAVIEST DEACCELERATION.

Q. THROUGH HERE?

A. BACK A LITTLE. THE STRIKE STARTS -- NO. YOU HAVE ONE WHERE IT LOOKS SLIGHTLY NOSE LOW.

THE COURT: WHY DO YOU NOT TAKE A POINTER AND GO DOWN OVER THERE?

THE WITNESS: YES, SIR.

WHEN THE AIRCRAFT CROSSED THE RIVER, IT STARTED IN SLIGHTLY LOW, SIR. DO YOU SEE THE SCUFFING?

THE COURT: THE QUESTION IS WHERE THE FIRST TOUCHDOWN IS.

BY MR. DUBUC:

Q. THE QUESTION IS THE FIRST TOUCHDOWN.

A. THE FIRST TOUCHDOWN WOULD START IN HERE, AND THEN IT STARTED REALLY BEARING DOWN.

THE COURT: JUST WHERE THE FIRST ONE WAS -- THAT IS THE QUESTION.

BY MR. DUBUC:

Q. THE FIRST ONE -- WHERE IS THE FIRST ONE?

A. RIGHT IN THIS AREA HERE.

Q. OKAY.

AND DID YOU ESTIMATE WHAT THE G-FORCES WERE AT THAT POINT?

A. NO. THE G-FORCES WERE ACTUALLY BASED OVER A DISTANCE.

Q. AN AVERAGE?

A. NO. I DID NOT USE THE AVERAGE-TYPE G-FORCES. I SPECIFIED IN THE REPORT THAT THE AVERAGE G-LOADING CANNOT BE USED, BECAUSE YOU STILL HAVE THE AIRCRAFT DEVELOPING LIFT. THE LIFT -- THE FRICTIONAL FORCES THAT ARE DEACCELERATING THE AIRPLANE ARE A FUNCTION OF THE WEIGHT, MINUS THE LIFT, AND ALSO A FUNCTION OF THE DRAG.

BOTH THE DRAG AND THE LIFT ARE FUNCTIONS OF VELOCITY SQUARED.

AND, THEREFORE, IF YOU TRY TO DEVELOP THE AVERAGE G-TYPE FORMULATION, YOU WON'T BE ABLE TO DO THE INTEGRATION.

THEREFORE, YOU HAVE TO USE A COMPLEX FORMULATION IN THIS REGION.

AND WHAT I USED WAS A FITTING OF THAT FUNCTION, AND THAT WAS A CUBIC FUNCTION, C TIMES T CUBED.

AND THAT WOULD ALLOW ME TO GIVE A BETTER REPRESENTATION OF THE DEACCELERATION ALONG THIS REGION.

Q. WELL, SIR, ISN'T IT A FACT YOU STATE --

THE COURT: DO YOU WANT HIM BACK ON THE WITNESS STAND?

MR. DUBUC: NO, I HAVE SOME MORE QUESTIONS HERE. I JUST WANT TO GET OVER THIS, YOUR HONOR.

THE COURT: JUST SO HE IS TALKING TO THE JURY,

INSTEAD OF YOU.

MR. DUBUC: ALL RIGHT, YOUR HONOR.

BY MR. DUBUC:

Q. YOU HAVE STATED IN YOUR REPORT "AN AVERAGE G-FORCE RANGE," AS TO THE FLIGHT DECK. I AM READING RIGHT HERE FROM YOUR REPORT.

ISN'T THAT TRUE, SIR? DIDN'T YOU STATE AN AVERAGE G-FORCE RANGE FOR THE FLIGHT DECK?

A. OKAY.

WHEN YOU START TALKING ABOUT THE --

Q. THE QUESTION IS, SIR:

DID YOU STATE THAT IN YOUR REPORT?

A. OKAY.

ON THE FLIGHT DECK, I STATED AN AVERAGE "G." IF YOU GO BACK AND READ IT CAREFULLY, I DID NOT USE AVERAGE "G'S" AS LONG AS THE AIRPLANE WAS INTACT.

ONCE THE AIRPLANE BROKE APART, THEN I USED AN AVERAGE G-FORCE ON THE AFT TROOP COMPARTMENT AND ON THE FLIGHT DECK, WHEN THEY ARE NOT ABLE TO DEVELOP LIFT.

THERE IS NO WING LIFT AVAILABLE. THEREFORE --

Q. ALL RIGHT.

A. (CONTINUING) -- I ESTIMATED. I ALSO INDICATED THAT THIS WAS NOT EXACTLY RIGHT. IT WOULD GIVE A BOUND --

THE COURT: TALK TO THE JURY.

THE WITNESS: IT WOULD GIVE A BOUND ON THE

INFORMATION, BUT IT WOULD NOT BE THE RIGHT ANSWER.

WHAT WE ARE DOING IS USING AN ENGINEERING ANALYSIS. WE HAVE A NON-LINEAR EVENT. IT IS VERY COMPLEX, AND WHAT WE ARE DOING IS USING AN AVERAGE IN A SENSE INCORRECTLY, BUT WE KNOW WE ARE DOING IT THAT WAY.

AND THAT IS WHY IT IS GIVING US A BOUND ON THE G-FORCES IT DOESN'T GIVE US THE RIGHT ANSWER.

Q. WELL, I SEE AN ANSWER THAT COMES AFTER THE WORD "AVERAGE."

WAS THAT YOUR ESTIMATED RANGE? THAT IS NOT THE RIGHT ANSWER. IS THAT WHAT YOU ARE TELLING US?

A. THE G-FORCES THAT I GAVE IN THIS REPORT ARE ESTIMATED LOWER BOUNDS, ESTIMATED UPPER BOUNDS, AND THEN THE STRUCTURAL FAILURES THAT I USED IN THE TROOP COMPARTMENT, ITSELF, GIVES ME A MUCH BETTER ESTIMATION OF THE G-FORCES THAT WERE INVOLVED.

Q. ALL RIGHT.

NOW, TAKING A LOOK AT THIS TRACK AGAIN, YOU INDICATED THIS WAS THE FIRST POINT OF IMPACT, AND THIS IS ALL AIRPLANE IMPACT HERE?

A. OKAY.

WE HAVE, LIKE I SAID -- THE AIRPLANE IS PROBABLY COMING IN A SLIGHTLY NOSE-DOWN ATTITUDE.

IN LOOKING AT ONE OF THE PHOTOGRAPHS, IT LOOKS LIKE IT IMPACTED. ON ONE SIDE YOU CAN SEE THE CRIMPLING,

IF YOU LOOK AT THAT PARTICULAR PHOTOGRAPH.

AND THEN YOU WILL SEE SOME BUCKLING IN OTHER SECTIONS, DUE TO THIS FIRST IMPACT.

AND, AS IT CONTINUES TO LOSE LIFT AND SLOWS DOWN, THE IMPACT WOULD BECOME GREATER.

BUT THE STRUCTURAL EFFECT -- IT IS ACTING AS A SPRING. IT BEINGS TO REBOUND SLIGHTLY, AND THEN THE NOSE COMES UP, AND AT THIS POINT THE WING STARTS LIFTING.

AND WITH THE DEACCELERATION FORCE, THE LIFT FORCES OF THE WING, THEY EXCEED THE STRUCTURAL DESIGN LOADS, AND THE AIRCRAFT BEGINS TO DISINTEGRATE AT THIS POINT.

Q. WHAT POINT IS THAT?

A. IT BEGINS TO DISINTEGRATE PROBABLY IN THIS REGION. AS IT LIFTS UP, IT DISINTEGRATES.

THE LOWER SECTION OF THE FUSELAGE ESSENTIALLY IMPACTS IN THIS AREA. IT JUST COMES APART.

AS I SAID EARLIER, THE WING, AS IT COMES OFF, LIFTS THE AFT TROOP COMPARTMENT SLIGHTLY UP. IT ALSO GIVES A ROTATIONAL MOTION TO THE FORWARD FLIGHT DECK, AND IT MAKES IT SLIDE ESSENTIALLY ON ITS BACK.

Q. ON ITS BACK?

A. THAT IS CORRECT.

Q. UPSIDE DOWN?

A. THAT IS RIGHT.

Q. IN THE ENTIRE SLIDE OF THE FLIGHT DECK?

A. MOST OF THE -- WHEN THE FLIGHT DECK IS IN THIS REGION --

Q. THE FLIGHT DECK IS WHERE THE CREW WAS LOCATED; IS THAT CORRECT?

A. THAT IS RIGHT. IT HAS ROLLED, AND MY OBSERVATIONS ON THAT ARE THAT THERE IS A LIGHT STRUCTURE STICKING UP, IF YOU LOOK AT A PHOTOGRAPH OF THE FLIGHT DECK, ITSELF.

THIS WOULD HAVE BEEN BROKEN OFF, IF IT HAD SLID ANY ON ITS -- IN THE NORMAL POSITION.

BUT, AS THE WING ROLLED IT, IT SEEMS TO -- THE TRACK -- IT IS ON ITS BACK, AND THEN IT MOVES AWAY FROM THIS SLIGHT RISE.

Q. I THINK YOU HAVE ALREADY TOLD US YOU HAVE NOT READ THE TESTIMONY OR THE DEPOSITIONS OF THE CREW. BUT, ASSUMING FOR THIS QUESTION --

THE COURT: DO YOU STILL NEED HIM DOWN THERE, MR. DUBUC?

MR. DUBUC: I HAVE ONE MORE QUESTION FOR HERE, YOUR HONOR.

THE COURT: ALL RIGHT.

BY MR. DUBUC:

Q. ASSUMING FOR THIS QUESTION THAT THE OCCUPANTS OF THE FLIGHT DECK DESCRIBE THE DECELERATION OF THE FLIGHT DECK AS A SLIDE WITH THE ROLLOVER COMING AT THE END, JUST BEFORE IT STOPPED, THAT WOULD BE INCONSISTENT WITH WHAT

YOU HAVE JUST DESCRIBED; WOULD IT NOT?

A. WELL, THE -- THIS WAS A --

Q. WOULD THAT BE INCONSISTENT WITH WHAT YOU HAVE JUST TOLD US ABOUT SLIDING THE WHOLE DISTANCE ON ITS BACK, SIR?

A. IT DEPENDS ON WHAT THEY MEANT BY "COMING TO THE END."

Q. OKAY. WELL, WE WILL LEAVE THAT FOR LATER.

DID YOU MAKE ANY ESTIMATE OF THE G-FORCES OPERATIVE IN THIS AREA, SIR, WHERE WE SEE ALL THE DEEP GOUGES?

A. YES.

THIS IS THE G-FORCE FOR THE EQUATION C X T CUBED, WHERE THE DEACCELERATION IS EQUAL TO THAT FUNCTION, WHERE THE MAXIMUM DEACCELERATION WAS THE 13 G'S.

SO IF YOU TAKE THAT EQUATION AND CALCULATE THE TIME AND THE DISTANCES, THEN YOU CAN CALCULATE THE G-FORCES AT ANY POINT ALONG THERE.

Q. AND WHAT WOULD IT BE WHERE WE SEE THESE BIG GOUGES?

A. AGAIN, WHAT I STATED IS WE ARE NOT USING THE MATHEMATICS CORRECTLY IN THIS SENSE, IN THAT WE ARE NOT AVERAGING, BUT WE ARE USING THE FUNCTION C X T CUBED.

THIS IS A HIGHLY NON-LINEAR EFFECT, AND WE ARE NOT ATTEMPTING TO MODEL ALL THE NON-LINEARITIES OF EACH GOUGE.

THE GOUGES ARE DONE BY THE LANDING-GEAR POST. THEY

ARE A FUNCTION OF THE HEIGHT OF THE AIRPLANE ABOVE THE -- I GUESS YOU WOULD CALL IT -- GROUND OR THE DIRT, AND THE DEPTH OF THE POST WOULD DEFINITELY AFFECT IT.

WE CANNOT MODEL THOSE.

WE CANNOT MODEL THE COEFFICIENT OF LIFT, WHICH IS A FUNCTION OF THE POSITION OF THE AIRPLANE.

AND SO THOSE EFFECTS, IF YOU LOOK IN THE REPORT, WERE DISCUSSED. THOSE WERE THE ONES WE COULDN'T HANDLE MATHEMATICALLY, AND, THEREFORE, WE JUST LOOKED AT THE THINGS THAT COULD BE HANDLED MATHEMATICALLY.

AND THAT IS WHY WE GOT A BOUND ON OUR G-FORCE AND NOT THE NUMBER.

Q. THE ANSWER IS:

YOU DON'T HAVE A NUMBER FOR THIS; IS THAT CORRECT?

A. I HAVE THAT INCLUDED IN MY OVERALL BOUND OF G-FORCES. THAT IS ALL I CAN SAY.

Q. IN YOUR REPORT?

A. I HAVE A LOWER BOUND, AND I HAVE AN UPPER BOUND, WHICH --

Q. WHAT IS THE LOWER BOUND, AGAIN?

A. THE LOWER BOUND, WITHOUT THE ACTUAL FAILURE, IS ABOUT 13 G'S, PLUS OR MINUS TWO.

WITH THE FAILURE, WE ARE TALKING SOMEWHERE AROUND 20 G'S.

Q. SO 13 TO 20?

A. YES. THOSE ARE LOWER BOUNDS.

Q. WHERE WE HAVE THESE BIG GOUGE MARKS; IS THAT RIGHT?

A. NO. THE LOWER BOUND FOR THE ENTIRE TRACK.

Q. THE ENTIRE TRACK?

A. YES.

Q. OKAY.

WOULD IT BE FAIR THAT -- WITHDRAWN. ARE YOU FAMILIAR THAT THIS IS WET, WATERY GROUND?

A. I HAVE READ DR. MORAIN'S REPORT.

Q. THAT IS WHAT HE SAYS; ISN'T IT?

A. THERE IS GROUND SEEPAGE. THERE WAS SOME LOW-AREA GROUND SEEPAGE LATER THAT ACCOUNTED FOR SOME OF THE WATER.

Q. ALL RIGHT.

AND HAVE YOU FORMED ANY OPINION, BASED UPON WHAT YOU READ FROM DR. MORAIN, AS TO WHETHER OR NOT, IF WE SEE DEEP RUTS LIKE THIS, WE HAVE MORE FORCE, OR MORE "G'S," WHATEVER WE WANT TO CALL IT, THAN WE MIGHT HAVE WHEN WE HAVE SOME OVER HERE THAT ARE NOT SO DEEP?

A. THAT IS CORRECT.

Q. OKAY.

MR. DUBUC: LET'S HAVE THE NEXT ONE.

MR. CONNORS: DEFENDANTS' D-1362, PLAINTIFFS' 1000-60.

BY MR. DUBUC:

Q. NOW, THAT SHOWS THE ENTIRE AREA FROM THE DIKE TO THE T-TAIL, TO THE TROOP COMPARTMENT AND THE COCKPIT; IS THAT CORRECT, SIR?

A. THAT IS CORRECT.

Q. ALL RIGHT.

MR. DUBUC: THE NEXT ONE.

MR. CONNORS: THE NEXT SLIDE IS D-1364, PLAINTIFFS' 1000-88.

BY MR. DUBUC:

Q. AND THIS SHOWS -- OF COURSE, YOU HAVE SEEN THIS BEFORE; HAVE YOU NOT, SIR?

A. YES, I HAVE SEEN SIMILAR PHOTOGRAPHS, SLIDES.

Q. THAT IS THE T-TAIL?

A. THAT IS CORRECT.

Q. AND THAT IS WHERE YOU MADE YOUR COMPUTATION YOU HAVE TOLD US ABOUT, USING THE LOCKHEED DOCUMENTS, AND SO FORTH?

A. I USED THE FAILURE OF THE T-TAIL, YES.

Q. ALL RIGHT.

AND THIS IS THE TROOP COMPARTMENT AND THE COCKPIT; IS THAT CORRECT?

A. THAT IS CORRECT.

Q. AND YOU USED DR. MORAIN'S MEASUREMENTS TO MEASURE THESE TRACKS. YOU HAVE A FIGURE OF 165 FEET THAT WE WERE JUST TALKING ABOUT; ISN'T THAT CORRECT?

A YES, THAT WAS ONE OF THE DISTANCES.

Q YES.

AND, AS I UNDERSTAND IT, IT IS YOUR TESTIMONY THAT THE TROOP COMPARTMENT WAS IN SOME WAY NOT ON THE GROUND IN HERE?

I DIDN'T QUITE UNDERSTAND ALL OF IT.

A THAT IS CORRECT. THE TROOP COMPARTMENT WASN'T ALWAYS IN CONTACT WITH THE GROUND.

Q. YES.

AND IN YOUR REPORT YOU ESTIMATED SOME G-FORCES AT TEN TO 30 G'S, OR MAYBE YOU SAID SOMETHING DIFFERENT TODAY. YOU HAD TEN TO 30 IN YOUR REPORT.

ARE THOSE THE G-FORCES YOU WOULD EXPECT, AT LEAST IN YOUR OPINION, THE PEOPLE IN THE TROOP COMPARTMENT EXPERIENCED WHEN THIS HIT THE GROUND AGAIN?

A WELL, IF YOU ARE REFERRING TO THE TEN TO 30 G'S, THAT WAS A VERTICAL "G" THAT WE WERE LOOKING AT.

Q OKAY.

A OKAY.

THAT WAS NOT THE G-FORCE THAT THE OCCUPANTS WOULD HAVE SEEN IN THE AXIAL-TYPE DIRECTION. THAT WOULD BE THE VERTICAL G-FORCE THAT THEY EXPERIENCED.

Q. OKAY.

A. THERE IS ALSO A HORIZONTAL G-FORCE.

Q. THE HORIZONTAL G-FORCE WAS WHAT, SIR?

A WELL, THERE WAS A SUMMARY OF THOSE, AND IT WAS BASED ON TWO THINGS:

ONE IS WE USED THE LENGTH OF TRACK OF THE FORWARD FLIGHT DECK, AND WE CALCULATED A DEACCELERATION.

WE APPLIED THAT DEACCELERATION TO THE AFT TROOP COMPARTMENT.

WE ALSO DID AN AVERAGE ON THE AFT TROOP COMPARTMENT. SO WE GOT A RANGE OF SEVEN TO 13 G'S, WITHOUT AN IMPACT. THIS FORMED OUR LOWER BOUND.

WITH THE IMPACT, WE SAW G-FORCES IN THE RANGE OF 220 TO SOME 400 G'S, SOMETHING ON THAT ORDER.

Q YOU ARE TALKING ABOUT A HILL?

A YES, WHEN IT IMPACTED THE HILL.

Q I AM BACK HERE. I AM BEFORE WE GET TO THE HILL. I AM ABOUT IN THIS AREA.

A OKAY.

IN THAT AREA, IN LOOKING AT THE TRACKS, WHAT WE SEE, AGAIN, EVEN THOUGH IF YOU LOOK AT THE TRACKS, THE DEPTHS OF THE TRACKS, IT IS REALLY NOT A CONSTANT DEACCELERATION.

BUT WE WENT AHEAD AND APPLIED IT ANYWAY, KNOWING THAT WE WOULDN'T GET A VALUE, BECAUSE IT IS DIFFICULT TO MEASURE DEPTHS THERE.

WE WOULD GET A LOWER BOUND.

AND, THEREFORE, WE USED AN AVERAGED DEACCELERATION ON THE AFT TROOP COMPARTMENT. WE ALSO USED THE DEACCELERATION

FROM THE FORWARD FLIGHT DECK.

AND THEN WE FORMED OUR LOWER BOUND.

Q. ALL RIGHT.

MR. DUBUC: THE NEXT SLIDE.

THE COURT: MR. DUBUC, WHY DON'T YOU ALL COME UP TO THE BENCH.

MR. DUBUC: YES, YOUR HONOR.

THE COURT: LADIES AND GENTLEMEN, YOU CAN TAKE A LITTLE STRETCH, IF YOU WANT.

(AT THE BENCH)

THE COURT: YOUR TIME HAS RUN OUT, BUT THIS IS NEW HISTORICAL MATERIAL, AND I AM NOT GOING TO --

MR. DUBUC: THANK YOU, SIR.

MR. MC MANUS: COULD WE HAVE AN ESTIMATE OF HOW MUCH LONGER?

MR. DUBUC: TWENTY MINUTES, MAYBE, AT THE MOST, YOUR HONOR.

THE COURT: ALL RIGHT.

(OPEN COURT)

MR. DUBUC: COULD WE HAVE THE NEXT SLIDE, PLEASE?

BY MR. DUBUC:

Q SIR, YOU HAVE SEEN THIS SLIDE BEFORE; HAVE YOU NOT, SIR?

A. YES. I HAVE SEEN EITHER THAT ONE OR A SIMILAR SLIDE.

Q. AND THAT IS THE TRACK OF THE TROOP COMPARTMENT?

A. YES, THE AFT TROOP COMPARTMENT.

Q. BACK INTO WHERE -- WHERE THE TRACKS START BACK HERE TO THE END; IS THAT CORRECT?

A. THAT IS CORRECT.

Q. ALL RIGHT.

DID YOU NOTICE IN DR. MORAIN'S REPORT THAT HE INDICATED THAT HE THOUGHT THE TRACKS WERE DEEPER ON THIS END THAN ON THIS END?

A. THAT IS CORRECT.

Q. DID YOU AGREE WITH THAT?

A. JUST FROM LOOKING AT A NUMBER OF PHOTOGRAPHS, IT INDICATED THAT THE AFT TROOP COMPARTMENT INITIALLY CAME DOWN PROBABLY AND DID NOT FULLY CONTACT THE GROUND.

THE AFT END KIND OF SKIDDED ACROSS, AND THEN LATER IT KIND OF DUG IN.

Q. DOCTOR, DID YOU READ DR. MORAIN'S REPORT WHERE IT SAID THAT THE AREA OF THE WATER IN THIS AREA WAS ALL LEVEL, AND IT IS THAT SAME WET KIND OF CONSISTENCY THAT WE SAW IN THE PRIOR SLIDES?

A. WELL, HE WAS TALKING ABOUT THIS BEING -- IF I REMEMBER, THERE WAS A LITTLE, SLIGHT DEPRESSION, WITH A RISE FOLLOWING IT.

Q. I AM NOT TALKING ABOUT THE RISE. I KNOW THAT YOU ARE ANXIOUS TO GET BACK THERE TO THE RISE.

THE COURT: DON'T TELL HIM WHAT HE IS.

BY MR. DUBUC:

Q. BUT I AM TALKING ABOUT BEFORE WE GET THERE. I AM TALKING ABOUT THIS WATER THAT APPEARS TO BE IN THESE TRACKS.

IT WAS DESCRIBED IN DR. MORAIN'S REPORT, AND I AM JUST ASKING YOU IF YOU REMEMBER IT?

A. YES, I READ HIS REPORT.

Q. AND, IN FORMING YOUR OPINION, YOU RELY ON HIM SO FAR AS THE WATER TABLE AND THE WATER LEVELS?

A. THAT'S CORRECT.

Q. ALL RIGHT.

A. I ACCEPTED HIS ANALYSIS OF THE AREA.

Q. NOW, THE QUESTION I HAVE, DOCTOR, IS THIS:

ASSUMING THAT THIS LAND IS WET ON THAT WATER TABLE, AS DESCRIBED BY DR. MORAIN, AND IT IS LEVEL, AND IT HAS THAT MUDDY CONSISTENCY THAT HE DESCRIBED, AND ASSUMING THOSE LARGE GOUGE MARKS THAT WE SAW IN THAT PRIOR PICTURE ON THE INITIAL TOUCHDOWN, WHERE WE HAVE, AS YOU SAID, DEEPER RUTS WHERE WE HAVE GREATER FORCE, I AM WONDERING WHY WE DON'T HAVE DEEPER RUTS ON THIS END OF THIS SLIDE, WHICH YOU SAY IS SHALLOWER THAN THE OTHER END, IF, IN FACT, THE TROOP COMPARTMENT WAS OFF THE GROUND AND IMPACTED INTO THIS MUDDY CONSISTENCY.

MR. MC MANUS: I OBJECT TO THE FORM OF THAT

QUESTION, YOUR HONOR.

BY MR. DUBUC:

Q. HAVE YOU CONSIDERED THAT, SIR?

THE COURT: JUST A MOMENT. THERE IS AN OBJECTION

MR. MC MANUS: I OBJECT TO THE FORM OF THAT QUESTION, YOUR HONOR.

I DON'T BELIEVE THAT IT WAS A QUESTION DIRECTED AT ASKING IF THIS WITNESS HAD INFORMATION, AS SUCH.

THE COURT: OVERRULED.

MR. DUBUC: I JUST -- I BEG YOUR PARDON?

THE COURT: OVERRULED.

MR. DUBUC: THANK YOU, YOUR HONOR.

BY MR. DUBUC:

Q. HAVE YOU CONSIDERED THAT IN YOUR OPINION, AND CAN YOU GIVE US AN EXPLANATION OF WHY WE DON'T HAVE A BIG GOUGE AT THIS END OF THIS TRACK WHERE YOU SAY IT CAME BACK ON THE GROUND WITH THESE G-FORCES, WITH THAT WET MUD, SIMILAR TO THE OTHER ONE?

A. WELL, I DIDN'T SAY IT CAME TOTALLY TO THE GROUND AT THAT POINT. I SAID THAT THE AFT END OF IT CAME DOWN, TOUCHING, SKIPPING, AND THEN THE ENTIRE THING BOTH -- IT STOPPED; IT KIND OF FLOPPED DOWN AT THE FAR END.

AND YOU GOT BOTH THE VERTICAL AND THE ROTATIONAL COMPONENT AND THE FORWARD STOPPING ALL AT ONE POINT.

THAT IS WHAT MY ANALYSIS WOULD BE BASED ON. I

DIDN'T INDICATE -- OR I DIDN'T THINK I HAD INDICATED ANY PARTICULAR POINT WHERE THE TEN TO 30 G'S VERTICAL WOULD HAVE OCCURRED.

Q. I THOUGHT YOU MENTIONED IN YOUR REPORT: SMASHED INTO THE GROUND AT THAT POINT.

DID YOU SAY THAT IN YOUR REPORT?

A. WELL, IF I --

Q. LOOK AT PAGE FIVE OF YOUR REPORT, DOCTOR, PARAGRAPH 3. I MAY HAVE MISREAD IT, BUT I UNDERSTOOD YOU TO USE MUCH MORE DESCRIPTIVE TERMS THAN THIS SKIPPING YOU JUST MENTIONED.

I READ THAT YOU SAID THAT THE TROOP COMPARTMENT WAS AIRBORNE, AS INDICATED BY THE PHOTOGRAPHS, FOR APPROXIMATELY 175 YARDS, AND SMASHED DOWN INTO THE GROUND AT THE END OF ITS TRAJECTORY.

WHY DON'T WE HAVE A BIG MARK IN THAT WET GROUND, IF IT DID THAT?

A. WELL, WHEN I --

Q. COULD YOU EXPLAIN THAT, SIR?

A. WELL, WHEN I WROTE THE REPORT, I PROBABLY DIDN'T -- HADN'T OBSERVED IT AT THAT TIME.

I AM NOT SURE WHY I WROTE IT AT THAT TIME, BUT WHAT I AM SAYING NOW IS THAT, WHEN IT CAME ACROSS, IT DIDN'T INITIALLY SMASH DOWN. I GUESS I GOT A LITTLE WORDY THERE.

BUT WHAT IT DID WAS COME DOWN. THE SLIGHT IMPACTS AND THE SMASHING DOWN ACTUALLY OCCURRED AT A LATER POINT WHERE

YOU SEE THE DEEP MARKS, WHERE IT IS SITTING.

Q. WHERE ARE THE DEEP MARKS? DO YOU WANT TO SHOW ME WHERE THOSE DEEP MARKS ARE?

A. IT IS PROBABLY SITTING RIGHT ON TOP OF THEM, BECAUSE IT HAS ROTATED. AS IT LOST SPEED, IT ROTATED. IT STARTED DIGGING IN, IN THAT REGION, AND THEN ROTATED DOWN.

Q. IT IS PROBABLY SITTING ON TOP OF THEM?

A. YES, IT IS SITTING ON PART OF ITS TRACKS.

Q. WELL, HOW DO YOU KNOW WHETHER IT IS DEEPER OR SHALLOWER UNDERNEATH THE TROOP COMPARTMENT?

HAVE YOU READ ANYTHING THAT MEASURES THE DEPTH OF THE TRACKS UNDERNEATH THE TROOP COMPARTMENT?

A. NO, I HAVE SEEN NOTHING ON THE DEPTH. THIS IS WHY IT IS AN ESTIMATION, AND IT IS A RANGE OF VALUES. AGAIN, WE ARE FORMING AN UPPER AND A LOWER BOUND, TO DETERMINE WHERE WE HAVE STRUCTURAL FAILURES, WE ARE LOOKING FOR AN INTEGRATION TECHNIQUE.

THAT ALSO SUBSTANTIATES THESE TYPES OF FAILURES.

Q. YOU HAVE AN ESTIMATE HERE ABOUT THIS HILL. YOU DESCRIBE IT AS A HILL IN YOUR REPORT ON PAGE 5, IF YOU WANT TO LOOK WHERE I AM REFERRING TO.

I NOTICE THAT YOU DESCRIBED IT, IN ANSWER TO MR. MC MANUS' QUESTIONS, AS A SLIGHT ELEVATION. DOES THAT MEAN THE SAME THING TO YOU?

A. WELL, IN LOOKING AT THE PHOTOGRAPH, THIS ANGLE,

WHEN I LOOKED AT IT MYSELF INITIALLY, I FELT IT WAS HIGHER. IT WAS PROBABLY THE BRUSH ON IT.

AND THEN LATER, IN TALKING TO DR. MORAIN, AND ALL, HE EXPLAINED IT TO ME. IT WAS A DEPRESSION LEADING INTO A RISE.

Q. DID HE TELL YOU HOW HIGH THE RISE WAS?

A. I BELIEVE IT IS IN HIS REPORT. I DON'T RECALL.

Q. WHEN WAS THE LAST TIME YOU DISCUSSED THAT WITH DR. MORAIN?

A. I DON'T RECALL THAT.

Q. A WEEK, DAYS, MONTHS?

A. WE COULD HAVE DISCUSSED IT LAST WEEK. I DON'T RECALL.

Q. ALL RIGHT.

AND YOU DO RELY UPON HIS ANALYSIS --

THE COURT: THAT HAS BEEN ASKED AND ANSWERED, MR. DUBUC.

MR. DUBUC: THE ONLY REASON I WAS ASKING IT AGAIN, YOUR HONOR, WAS BECAUSE HE SAID HE HAD A DISCUSSION.

THE COURT: WELL, DON'T DO THAT.

MR. DUBUC: EXCUSE ME, YOUR HONOR.

I HAVE NO FURTHER QUESTIONS.

THE COURT: VERY WELL. CROSS-EXAMINATION. I AM SORRY. REDIRECT EXAMINATION.

MR. MC MANUS: THANK YOU, YOUR HONOR.

REDIRECT EXAMINATION

BY MR. MC MANUS:

Q. DOCTOR, DO YOU KNOW WHAT THE NORMAL G-LOAD IS WHEN AN AIRCRAFT LANDS?

A. I AM JUST TRYING TO REMEMBER, IN DESIGNING THE LANDING GEAR ON THE AIRPLANES, WHAT OUR NORMAL G-LOADING WOULD BE.

BUT IT IS USUALLY A "G" OR LESS. I COULD NOT REALLY GIVE YOU A GUESS AT THIS TIME, BUT THEY ARE USUALLY FAIRLY LOW, JUST A COUPLE OF "G'S" AT MOST.

Q. DOCTOR, ARE PLANES DESIGNED TO BREAK APART IN PIECES LIKE THIS UPON A NORMAL LANDING?

MR. DUBUC: OBJECTION, YOUR HONOR.

THE COURT: SUSTAINED.

BY MR. MC MANUS:

Q. NOW, DOCTOR, YOU MENTIONED THE PATH OF THE FLIGHT DECK IN RESPONSE TO SOME OF MR. DUBUC'S QUESTIONS. DO YOU RECALL THAT, SIR?

A. YES.

WE DISCUSSED THE PATH OF THE FLIGHT DECK.

Q. IS THERE ANYTHING RELEVANT ABOUT THE REMAINS OF THE FLIGHT DECK IN REGARD TO YOUR OPINION THAT THE FLIGHT DECK PROCEEDED ON THE GROUND IN AN UPSIDE-DOWN POSITION?

A. I BASED MY OPINION ON THAT, AND THE FACT THAT THE FLIGHT DECK HAS A LARGE AMOUNT OF VERY SMALL, LIGHT

STRUCTURES PROTRUDING FROM IT.

THESE ARE JUST FORMERS, THEMSELVES. AND THESE FORMERS WERE NOT SNAPPED OR BROKEN OFF.

AND IF IT TRAVELED A GREAT DEAL OF DISTANCE, AND THEN ROLLED OVER, THEN THESE WOULD HAVE BEEN SCRUBBED AWAY, BECAUSE THEY ARE VERY LIGHT STRUCTURES.

AND SINCE THEY WERE NOT SCRUBBED AWAY --

Q. ALL RIGHT.

DOCTOR, I WOULD LIKE YOU TO ASSUME THAT THE CAPTAIN OF THIS AIRPLANE DID NOT REALIZE THAT HE WAS UPSIDE DOWN WHEN THE FLIGHT CAME TO A STOP; AND THAT HE ALSO TESTIFIED THAT, WHEN HE GOT OUT OF THE PLANE, HE WAS SURPRISED THAT THE REST OF THE PLANE WASN'T STILL BEHIND HIM.

WOULD THAT TESTIMONY BE CONSISTENT WITH YOUR OPINION THAT THE FLIGHT DECK PROCEEDED ON THE GROUND IN AN UPSIDE-DOWN POSITION?

A. WELL, IF HE HADN'T EXPERIENCED THE G-FORCES FOR SOME REASON AND STILL THOUGHT THE AIRPLANE WAS ATTACHED, AND HE WAS SURPRISED, THEN, THAT WOULD BE CONSISTENT.

Q. NOW, DOCTOR, YOU HAVE MENTIONED STRUCTURAL ANALYSIS IN REGARD TO THE G-FORCE MEASUREMENTS OF THE FORCES EXERTED ON THE TROOP COMPARTMENT.

COULD YOU EXPLAIN THAT, SIR?

A. OKAY.

THE STRUCTURAL ANALYSIS -- THE TROOP COMPARTMENT

WOULD HAVE SEEN THE SAME G-LOADINGS AS THE T-TAIL FAILURE. IT WOULD HAVE ALSO SEEN THE SAME G-FORCES -- OKAY. GOING INTO THE COMPARTMENT, ITSELF, LOOKING AT THE SEATS, THE OCCUPANTS IN THE SEATS WOULD BE SUBJECT TO THE SAME G-FORCES.

OKAY.

SOMEWHERE IN THE FINAL, WHAT I GUESS YOU WOULD CALL, IMPACT OF THE AFT TROOP COMPARTMENT, THERE WERE SEVERAL SEATS THAT FAILED.

OKAY. AND AN ANALYSIS --

Q. WHAT DO YOU MEAN BY "SEATS HAVING FAILED," SIR?

A. OKAY.

ACCORDING TO THE DEPOSITIONS OF TWO PEOPLE ON BOARD, THE SEATS ROTATED FORWARD, RIPPING FROM THE FLOOR ON THE AFT MOUNTING STRUCTURE.

OKAY. THERE WAS EITHER A BEAM-TYPE FAILURE OR -- THE ANALYSIS OF THE SEATS, THEMSELVES, IS IN THE LOCKHEED REPORTS.

OKAY. SO THERE IS A STRUCTURAL FAILURE OF THE SEAT ATTACHMENT TO THE SEAT-SUPPORT BEAMS. AND, THEREFORE, I GOT A BOUND, BASED ON STRUCTURAL FAILURE. I GUESS YOU WOULD CALL IT THE INTERNAL BOUND.

THIS WAS THE 40 TO 100 G'S THAT I SPOKE OF EARLIER, SIR.

Q. ALL RIGHT.

AND IS THAT OPINION, OF 40 TO 100 G'S, EXCLUSIVE OF

ANY MEASUREMENTS OF GROUND MARKS? IS THAT MADE EXCLUSIVE OF ANY MEASUREMENTS OF GROUND MARKS?

A. THIS IS STRICTLY BASED ON A STRUCTURAL FAILURE OF THE SEATS.

AND THE LOWER BOUNDS THAT I TALKED ABOUT ON THE TRACKS POINT UPWARD TO A HIGHER G-LOADING THAN 20.

THIS IS BASED ON THE GROUND TRACKS.

THE HIGHER LOADING, SOME 220 TO 400 G'S, IS A VERY UPPER BOUND, AND IT POINTS TO THE FACT THAT THE ACTUAL G-LOADING WOULD BE SOMETHING LESS THAN THAT.

THE COURT: YOU ARE NOT ANSWERING THE QUESTION, DOCTOR.

THE QUESTION WAS WHETHER THESE ESTIMATES WHICH WERE BASED ON SEAT FAILURE ARE DEPENDENT ON THE GROUND MEASUREMENTS.

THE WITNESS: OKAY.

THESE ARE NOT BASED ON GROUND MEASUREMENTS, OR ANYTHING LIKE THAT. THEY ARE STRICTLY A STRUCTURAL FAILURE.

BY MR. MC MANUS:

Q. THANK YOU, SIR.

IS THERE ANY SIGNIFICANCE TO THE BOUNDS THAT YOU HAVE GIVEN, THE 40 TO 100 G'S?

A. WITHIN ALL SCIENTIFIC PROBABILITY, THIS WOULD BE THE RANGE OF G-LOADING THAT THE OCCUPANTS WOULD HAVE SEEN.

IF THE G-LOADING HAD BEEN LESS THAN THE 40 G'S, THERE WOULD HAVE BEEN NO SEAT FAILURES.

IF THE G-LOADING HAD BEEN HIGHER, CLOSER TO 100 G'S, THEN THERE WOULD HAVE BEEN ALMOST -- ALMOST ALL OF THE SEATS WOULD HAVE FAILED.

AND, THEREFORE, THE TYPE OF FAILURE WE HAVE KIND OF GIVES US A VERY GOOD BOUND ON IT. IT IS A STRUCTURAL-TYPE MEMBER, AND, THEREFORE, WE WOULD BE VERY POSITIVE IT IS SOMEWHERE IN THIS RANGE.

Q. THANK YOU, SIR.

MR. MC MANUS: YOUR HONOR, MAY WE APPROACH THE BENCH FOR A MOMENT?

THE COURT: YES.

(AT THE BENCH)

MR. MC MANUS: JUST SO THERE IS NO CHANCE OF ERROR --

THE COURT: WHAT DO YOU MEAN, NO CHANCE OF ERROR?

MR. MC MANUS: THAT IS WHY I AM BRINGING THIS UP AT THE BENCH WITHOUT ASKING THE QUESTION, YOUR HONOR.

THE COURT: ALL RIGHT. THAT WILL NOT DO YOU ANY GOOD. THERE IS PLENTY OF CHANCE FOR ERROR.

MR. MC MANUS: LET ME REPHRASE MYSELF, YOUR HONOR.

I DON'T WANT TO ASK A QUESTION WITHOUT BRINGING

UP THIS MATTER TO YOUR HONOR FIRST, BECAUSE IT MIGHT BE A DELICATE MATTER.

MR. DUBUC ASKED DR. TURNER ABOUT SOME MATERIALS, TO WHICH QUESTION DR. TURNER RESPONDED THAT HE DIDN'T HAVE THOSE MATERIALS.

THOSE MATERIALS HAD BEEN REQUESTED OF LOCKHEED AND NOT PRODUCED TO US.

MR. DUBUC: WHAT MATERIAL?

MR. MC MANUS: AND I WOULD LIKE TO ASK DR. TURNER: DID WE ASK FOR LOAD CAPACITIES AND OTHER --

MR. DUBUC: OH, NO. NO.

THE QUESTION I ASKED WAS ABOUT MADAR MATERIAL THAT WAS PRODUCED AT THE FIRST TRIAL.

THE COURT: THERE WAS SOME COLLOQUY LATER ON THAT HE HAD NOT RECEIVED CERTAIN MATERIAL THAT HAD BEEN REQUESTED.

MR. DUBUC: I THINK HE SAID "MADAR," YOUR HONOR.

MR. MC MANUS: HE SAID THAT CERTAIN MATERIAL WAS REQUESTED, AND DID NOT COME, AND IT WAS NOT MADAR, YOUR HONOR.

IT WAS MATERIAL THAT WE ASKED FOR, AND IT HAS NOT BEEN PROVIDED.

MR. DUBUC: I ASKED HIM WHETHER HE READ THE ENTIRE MADAR DATA, AND THAT IS WHEN HE LAUNCHED INTO THIS ENTIRE OTHER THING.

TO MY KNOWLEDGE, THE MADAR DATA WAS PRODUCED FOR THE SCHNEIDER AND MARCHETTI TRIALS.

MR. MC MANUS: THE MATERIAL THAT HE REQUESTED WAS NOT PRODUCED.

MR. DUBUC: WHAT MATERIAL?

MR. MC MANUS: IT IS TECHNICAL MATERIAL THAT WE REQUESTED OF YOU, AND IT IS NOT THE MATERIAL THAT WAS PROVIDED AFTER HE GOT THE FIRST LOAD INFORMATION ABOUT THE T-TAIL LOAD.

THE COURT: WHY DO YOU NOT TAKE THIS UP IN THE SANCTION MATERIAL?

MR. MC MANUS: FINE.

MR. DUBUC: YOUR HONOR, I JUST WANT TO STATE FOR THE RECORD --

THE COURT: SURELY.

MR. DUBUC: (CONTINUING) -- THAT MY QUESTIONS ARE IN MY NOTES, AND THE ONLY THING I ASKED ABOUT, SIR, WITH RESPECT TO WHETHER HE READ THE ENTIRE RECORD, WAS ABOUT THE MADAR INFORMATION.

AND THE MADAR INFORMATION WAS PROVIDED LONG AGO, AND IS THE SUBJECT OF MUCH TESTIMONY.

THE COURT: I GOT THE IMPRESSION THAT THERE WAS SOME PART OF IT THAT HE WANTED TO HAVE, OR THAT YOU ASKED HIM ABOUT A PART THAT HE HAD NOT CONSIDERED, AND THAT YOU HAVE SOME WITNESS WHO HAS.

MR. DUBUC: I THINK, IF YOU READ THE TRANSCRIPT, YOU WILL SEE THAT THE QUESTION ON MADAR WAS INTERPRETED BY HIM BEYOND THE SCOPE.

BUT IF YOU LOOK AT THE QUESTION, IT WAS DIRECTED AT MADAR.

I KNOW THIS WITNESS WENT INTO LOTS OF VERY BROAD ANSWERS.

THE COURT: WELL, LET'S TABLE IT HERE. YOU GO ON TO SOMETHING ELSE.

MR. MC MANUS: YES, SIR.

(OPEN COURT)

MR. MC MANUS: THOSE ARE ALL THE QUESTIONS I HAVE, YOUR HONOR.

THE COURT: RECROSS, MR. DUBUC?

MR. DUBUC: YES, YOUR HONOR.

RECROSS-EXAMINATION

BY MR. DUBUC:

Q. SIR, I THOUGHT I HEARD YOU SAY IF THERE WERE 100 G'S, ALL OF THE SEATS WOULD HAVE FAILED. DID I HEAR YOU SAY THAT?

A. WELL, BASED ON --

Q. WAS THAT YOUR ANSWER TO MR. MC MANUS' QUESTION, SIR?

A. THAT IS CORRECT.

Q. DO YOU KNOW WHAT THE G-LOADING-FAILURE FIGURE

IS FOR THESE SEATS?

A. THESE SEATS WERE DESIGNED TO TAKE 2500 POUNDS OF LOAD.

Q. WITH WHAT WEIGHT OF PERSON IN IT?

A. OH, IT WOULDN'T MATTER ON THE WEIGHT OF THE PERSON, IF THE LOAD IS 2500 POUNDS FOR FAILURE.

Q. IF IT WERE A 250-POUND MAN, TEN G'S WOULD DO IT; IS THAT RIGHT?

A. THAT IS CORRECT.

Q. OKAY.

AND IF IT WERE A 125-POUND MAN, 20 G'S WOULD DO IT; IS THAT CORRECT?

A. THAT IS CORRECT.

Q. OKAY.

SO WHAT YOU ARE SAYING IS THAT YOU HAVE TO HAVE -- WITHDRAWN.

DID YOU READ IN THE DESCRIPTION BY EITHER MISS LIEVERMANN -- I THINK IT WAS MISS LIEVERMANN. YOU SAID YOU READ HER DEPOSITION?

A. THAT IS CORRECT.

Q. AND DID YOU NOTE IN THERE SOMETHING TO THE EFFECT THAT THERE WERE SOME OLDER CHILDREN IN THE TROOP COMPARTMENT?

A. THAT IS CORRECT.

Q. AND IF WE HAD OLDER CHILDREN, THEY WOULD, PRESUMABLY, BE BIGGER; IS THAT CORRECT?

A. THAT IS CORRECT.

Q. OKAY.

DID YOU MAKE ANY DETERMINATION AS TO THE WEIGHTS OF ANY OF THE CHILDREN, OR ASK THE PLAINTIFFS FOR ANY OF THAT INFORMATION?

A. NOT AS FAR AS AN INDIVIDUAL. I WAS TOLD THAT THE -- I WAS TOLD THE BASIC AGES. SO I USED A WEIGHT RANGE FOR THE INFANTS FROM 15 TO 20 POUNDS PER CHILD.

Q. OKAY.

BASED UPON YOUR FIGURES, EVEN AT 15 TO 20 POUNDS PER CHILD, ALL OF THE SEATS WOULD HAVE FAILED WHEN IT HIT THIS HILL YOU HAVE MENTIONED, IF THE G-FORCES WERE 400 G'S.

WOULDN'T THAT BE TRUE?

A. OKAY.

BUT YOU HAVE TO GO BACK AGAIN --

Q. WOULD THAT BE SO, SIR?

A. I GAVE YOU THE DESIGN WEIGHT OF 2500 POUNDS. THIS IS A DESIGN WEIGHT FOR INITIAL, I GUESS YOU WOULD CALL IT, YIELDING.

THERE IS A SAFETY FACTOR INVOLVED OF ONE-AND-A-HALF FOR ANY MAN-RATED VEHICLE.

THERE IS ALSO THE NON-LINEAR ASPECTS, BECAUSE THE YIELD POINT IS ALWAYS ABOUT 66 PERCENT LESS THAN THE FAILURE POINT.

SO, IN COMING UP WITH THE FIGURE OF 100 G'S, I

ACCOUNTED FOR THE SAFETY FACTOR, OR YIELD POINT, AS I GUESS I JUST MENTIONED.

Q. "G'S," IF WE TALKED ABOUT IT IN LAY TERMS, WOULD BE ONE TIMES YOUR OWN WEIGHT.

IS THAT TRUE, SIR?

A. IT DEPENDS ON WHAT TERMS YOU WANT TO USE. NOW, "G" IS ALSO THE ACCELERATION OF GRAVITY, WHICH IS 32.2 FEET PER SECOND.

Q. OKAY.

A. OR YOU CAN TALK ABOUT IN TERMS OF ONE "G" ON AN INDIVIDUAL, TO BE MULTIPLYING YOUR OWN WEIGHT BY THAT "G," YES.

Q. AS I STAND HERE, PRESUMABLY, IT IS ONE "G" FOR MY WEIGHT ON THE GROUND; IS THAT CORRECT?

A. THAT IS CORRECT.

Q. AS YOU SIT THERE, IT IS ONE "G" FOR YOUR WEIGHT IN THE CHAIR; IS THAT CORRECT?

A. FOR THE NORMAL PERSON'S UNDERSTANDING, THAT IS CORRECT.

Q. ALL RIGHT.

SO IF I WERE TO LIFT TWICE MY OWN WEIGHT, I WOULD BE LIFTING TWO "G'S"; IS THAT CORRECT? SUPPOSE I DID A PULL-UP. WOULD THAT BE TWO "G'S"? I WOULD BE LIFTING TWICE MY OWN WEIGHT?

A. WELL, YOU WOULD BE LIFTING TWICE YOUR WEIGHT.

NOW, WHEN YOU START TALKING ABOUT "G'S," IT IS ACTUALLY ACCELERATIONS YOU ARE TALKING ABOUT.

AND SO YOU ARE TALKING ABOUT -- THE RATE YOU WERE LIFTING IT COULD EXCEED THE "G'S." SO YOU'VE GOT TO MAKE SURE YOU ARE USING IT IN THE CORRECT SENSE.

Q. OKAY.

WELL, LET'S SAY I AM HANGING ON UNDER "G" FORCES. IF I AM HANGING ON, AND THERE ARE TWO "G" FORCES, I AM HOLDING MYSELF AGAINST TWO "G" FORCES. I AM HOLDING TWICE MY OWN WEIGHT; IS THAT RIGHT?

A. THAT IS CORRECT.

Q. AND IF I AM HOLDING MYSELF AGAINST THREE "G" FORCES, I WOULD BE HOLDING THREE TIMES MY OWN WEIGHT; ISN'T THAT CORRECT?

A. THAT IS CORRECT.

Q. YOU SAID YOU DID READ MISS LIEVERMANN'S TESTIMONY AND MISS NEILL'S TESTIMONY?

A. THAT IS CORRECT.

Q. DO YOU RECALL THAT NEITHER OF THEM HAD SEATBELTS OR SEATS OR RESTRAINTS OF ANY KIND?

A. THAT IS CORRECT.

Q. AND THAT THEY WERE HOLDING ON OR BRACING THEMSELVES?

A. THAT IS RIGHT.

Q. NOW, DO YOU HAVE ANY INFORMATION, OR ANY KNOWLEDGE, FROM YOUR BACKGROUND, AS TO HOW MUCH WEIGHT,

HOW MANY "G'S," HOW MANY TIMES THEIR OWN WEIGHT WOMEN SUCH AS MISS LIEVERMANN AND MISS NEILL MIGHT BE ABLE TO HOLD, WITHOUT BEING TORN LOOSE?

A. WELL, IN READING MRS. NEILL'S TESTIMONY, SHE INDICATED THAT SHE WAS THROWN.

Q. DID YOU READ MISS LIEVERMANN'S?

A. YES, I DID.

Q. SHE WASN'T THROWN; WAS SHE?

A. I THINK SHE INDICATED THAT SHE WAS WEDGED FORWARD. SO --

Q. BUT NOT THROWN?

A. NOT THROWN, THAT I REMEMBER, OR THAT I RECALL, SIR.

Q. OKAY.

I DON'T KNOW WHETHER YOU HAVE ANSWERED THE QUESTION OR NOT. DO YOU HAVE ANY IDEA HOW MUCH THEY CAN HOLD WITH THEIR OWN WEIGHT?

A. WELL, AN INDIVIDUAL CAN HOLD, AS FAR AS STATIC, PRESSING A WEIGHT, NORMALLY, YOUR OWN BODY WEIGHT. IF YOU CAN DO TWICE THAT, YOU ARE DOING VERY GOOD.

UNDER SHORT TIME SPANS, I HAVE NO IDEA. I HAVEN'T LOOKED INTO THAT.

Q. SO YOU WOULD AGREE THAT HOLDING TWICE YOUR OWN WEIGHT IS PRETTY GOOD, AND WOULD PROBABLY BE TRUE FOR SOMEONE LIKE A FLIGHT NURSE OR MISS LIEVERMANN, WHO WAS A PRACTICAL

NURSE?

A. WELL, AGAIN, I QUALIFIED THAT BY SAYING TIME. PRESSING YOUR OWN WEIGHT IS CONSIDERED VERY GOOD, BUT THAT IS A STATIC CASE.

WHEN YOU GO TO A DYNAMIC CASE, I DON'T KNOW HOW LONG YOU COULD HOLD ON UNDER A CERTAIN "G."

Q. NOW, YOU MENTIONED SIX OR EIGHT "G'S," FOR EXAMPLE, IN THE COCKPIT.

DO YOU THINK ANYBODY COULD HOLD ON SIX OR EIGHT TIMES THEIR OWN WEIGHT FOR ANY LENGTH OF TIME?

A. NOT FOR ANY LENGTH OF TIME.

MR. DUBUC: THANK YOU, SIR.

MR. MC MANUS: ONE MORE QUESTION, SIR.

THE COURT: ALL RIGHT.

FURTHER REDIRECT EXAMINATION

BY MR. MC MANUS:

Q. DOCTOR, DO YOU KNOW THE LENGTH OF TIME IT TOOK FOR THE ENTIRE ACCIDENT SEQUENCE?

A. IN THE CALCULATIONS I DID, THE GROUND-CONTACT TIME FOR THE ENTIRE AIRPLANE, AND THE DISINTEGRATION PROCESS, I CALCULATED TO BE ABOUT 1.2 TO 1.5 SECONDS.

THERE WAS ABOUT A 2-SECOND, OR SLIGHTLY GREATER THAN A 2-SECOND, INTERVAL BEFORE THE GROUND CONTACT STARTED AGAIN, AND THEN THESE GROUND CONTACTS RAN FOR ABOUT HALF A SECOND.