A. Well --

MR. DUBUC: Go ahead.

THE WITNESS: I will give you an upper limit.

BY MR. OREN LEWIS:

Q. All right.

A. It couldn't be longer than about nine seconds. 8.8 seconds, I think it is on the --

Q. 8.8 seconds?

A. Yes, sir.

Q. All right. Subjected to five Gs, right?

A. That is correct. And it is much, much less than that number, and I can tell you why, if you would like me to tell you.

Q. I'll be interested in a minute, but I am anxious for the measurement first, and then I will --

MR. DUBUC: The measurements?

MR. OREN LEWIS: Well, he said that there was a --

MR. DUBUC: What is the question? You made a statement.

MR. OREN LEWIS: Mr. Dubuc, if you are going to continue to interrupt my deposition, I am going to suspend it and then just seek the Court's assistance. This man is

an engineer and --

MR. DUBUC: I am looking for questions rather than statements. So what you are interested in -- ask him a question and he will answer the question.

MR. OREN LEWIS: Are you finished?

MR. DUBUC: Yes. What is the question?

BY MR. OREN LEWIS:

Q The question is how did you arrive at 8.8 seconds as an upper limit?

A Well, I know that the initial velocity of the aircraft was about 450 feet per second. Looking at the troop compartment, we know the final velocity was zero. So, we know the average velocity was half of 450or 225 feet per second, and we know that the aircraft went -- my scale of measurement was 1950 feet. If we take the individual measurements that we have just come up with, we get about 1990 feet. About a 40 foot difference, which is insignificant, so I will just assume that it is 1950 feet and I come up with 8.67 seconds as the time to decelerate, and that time has to be very close to the true time to decelerate. So, we know that whatever deceleration took place between X-1 and X-2, it could not have occurred for a longer period of time than about 8.67 seconds.

Q. All right. So that is how you have your upper limit?

A. (Nodding head, indicating in the affirmative.)

Q. Now, can you tell me, were there peaks and valleys in the Gs that the occupants were subjected to?

A. Where?

Q. Were there peaks and valleys?

MR. DUBUC: Were there.

THE WITNESS: Were there peaks? Yes, sir, there were peaks and valleys.

BY MR. OREN LEWIS:

Q. All right. Now, have you calculated the peak Gs?

A. Yes, sir.

Q. And how did you do that?

A. I multiplied the average value, 1.66.

Q. By?

A. By a factor of three.

Q. And why did you use the factor of three?

A. Because of various factors.

Q. Which include?

A. Which include my some ten years of experience in crash testing aircraft and making deceleration measurements

within the aircraft, from observing the physical facts associated with this accident. More specifically, that as the troop compartment is concerned, the nature of this accident, the terrain over which it passed, the nature of the gouge marks, the lack of any initial deep penetration of the fuselage proper, the lack of impact with any major obstructions like extremely large trees, bridge abutments, huge boulders, and so forth and so on, clearly indicates that this is an accident in which the G level over the deceleration distance of 1950 feet to 1990 feet for the troop compartment is very nearly a constant level deceleration. Much more so than occurs in many accidents and at other circumstances, have occurred in this accident, much more so than could have occurred in this accident.

MR. DUBUC: For the record, we are trying to finish the deposition and this is the third time we have had something brought in to interrupt it.

MR. OREN LEWIS: And how long is your estimate, Mr. Dubuc, that Mr. Fricker's giving me this note took?

MR. DUBUC: I haven't computed it.

MR. OREN LEWIS: Well, do you want to make an estimate?

MR. DUBUC: No, I'd like to hear your next

question.

(Discussion off the record.)

BY MR. OREN LEWIS:

Q. Sir, I don't see where you get the factor of three. What gives you the three?

A. Well, should I give it to you again?

Q. Well, I heard the items that you mentioned, sir. I don't see the connection between those and the three. Is that some kind of a formula that you have evolved yourself, sir, or is it in common use in the engineering profession, or where does it come from? In other words, do we use a three times average Gs under some circumstances and another factor under other circumstances?

A. That would be correct.

Q. All right. Would you tell me where I would find the reference for that?

A. You would find yourself a good expert and talk to him.

Q. But that is not published.

A. Not to my knowledge.

Q. And you haven't published on it, and to your knowledge, no one else has?

A. Not to my knowledge.

Q. All right. Now, did you undertake to calculate how many Gs it would take to break off any part of this?

A. I have not made a calculation, but I can give you a pretty good close number.

Q. All right.

A. About a thousandth of a G.

Q. A thousandth of a G?

A. Yes, sir.

Q. To break off what part?

A. To break off a landing gear door.

Q. All right. Any other factors? How much would it take to break off an engine?

A. I don't have a specific number on that, but let me see if I can --

Q. All right.

A. Now, if you understand that these are ballpark numbers.

Q. I understand that that is your best judgment, sir.

A. Well, I don't think it would take more than a quarter of a G.

Q. To break off an engine on a C5A?

A. Yes, sir.

Q Well, what factors would you take into consideration? Gee --

MR. DUBUC: What kind of Gs are you asking him for?

MR. OREN LEWIS: Well, G is a --

MR. DUBUC: Are you asking him for X factors? YX is G? Or what are you asking him?

MR. OREN LEWIS: Well, is there a difference in what Gs it would take to break off the engine?

THE WITNESS: Yes, sir. It would depend upon the circumstances.

BY MR. OREN LEWIS:

Q Under these circumstances. Under the circumstances of this crash as you understand it. I want you to tell me how many Gs it would take to break an engine free from its supports on the wing.

A Well, again, if you understand that this is pretty crude. I might be off by 100 percent.

Q Well, what is the range, then?

A I'll say anywhere from zero to a half a G.

Q Half a G?

A Yeah. But a quarter of a G would probably do it pretty well.

Q And what force would it take to break the wing off, in Gs?

A Well, again, it depends upon the nature of the failure and I am not sure that we know in this particular case just exactly how the failures occurred, but it could be done as a very low load, like certainly below five Gs.

Q A load before five Gs?

A Even below a couple of Gs.

Q All right. Now, the wing is an outboard of the hull, a series of fuel tanks, is it not?

A I presume that that is the case, yes, sir. That is my understanding.

Q Are there any dry bays?

A Are there any dry bays?

Q Yes.

A I don't know whether there are or not.

Q Do you know how many gallons of fuel there were in the wing tanks, either separately or together, at the time of impact?

A No, sir, but there would have been quite a bit.

Q Do you have any idea how much?

A I'd say maybe a railroad tank car.

Q How many gallons in a railroad tank car?

A. Eight thousand gallons.

Q. So your judgment is that there were 8,000 gallons of fuel in each wing or together?

A. I don't know. I don't have the faintest idea. We are talking about thousands of gallons rather than gallons.

Q. There is many, many gallons, right?

A. Yeah.

Q. And it would weigh a great deal; is that correct?

A. It would weigh quite a bit, that is right.

Q. And how many pounds is a gallon of aviation fuel?

A. About six and a half pounds.

Q. Did you make any calculations as to how much the wing structure weighed, either individually or together?

A. The wing structure itself?

Q. Yes.

A. I have made no such calculations.

Q. Either with the engines or separated from the engine?

A. Either with the engine or separated -- I made no calculations, no, sir.

Q. But I am still trying to get why you used a factor of three, for example, instead of five or two or eight.

MR. DUBUC: He has told you that.

BY MR. OREN LEWIS:

Q That is just a judgment, is that right?

MR. DUBUC: It is based upon his experience. He explained it all in a long paragraph. Do you want to have her read that back or something?

MR. OREN LEWIS: I am trying to find out the basis for his opinion.

MR. DUBUC: But you asked him this before, and he's answered that.

MR. OREN LEWIS: I fully understand --

MR. DUBUC: And you are not permitted to ask questions three times.

MR. OREN LEWIS: I am permitted to ask questions --

MR. DUBUC: The same question.

MR. OREN LEWIS: -- Mr. Dubuc, to the point that I can understand it.

MR. DUBUC: No, you are not, Mr. Lewis.

MR. OREN LEWIS: We'll see. We'll see.

MR. DUBUC: You are permitted to ask questions if there is a common objection, I think, sustained universally by Courts as to asked and answered question. He has told you this already.

MR. OREN LEWIS: In a discovery situation of this kind?

MR. DUBUC: Yes, sir.

MR. OREN LEWIS: Well, I am willing to stop now and certify it to the Court. We have a hearing Tuesday, and we can take this up. This is an expert that has obviously looked at these facts --

MR. DUBUC: We will just note another objection.

MR. OREN LEWIS: -- and I think I have a right to try to understand how he arrived at the factor of three. He has already told me it is not public, and so there is no other source that I can get it from, other than this gentleman here.

MR. DUBUC: It is based on his experience. Do you want him to tell you about his experience?

MR. OREN LEWIS: I am going to ask him, sir, some of these details. Now, that is a preliminary question, but if you don't want him to answer any of that, why don't you instruct him not to answer any more questions along this line, and we will certify that to the Court.

MR. DUBUC: All right.

MR. OREN LEWIS: If that is your position. I am telling you I want to ask him how he arrived at the three. I

understand that he says it is from his experience and so forth. I want to know what percentage experience, what percentage terrain, what percentage of these other things. I want to understand how he arrived at the three.

MR. DUBUC: Percentage of terrain?

MR. OREN LEWIS: Yes. He gave me a number of factors. He said that he comes up with the three because of the physical facts of the accident, the terrain, the lack of impact with heavy objects, and all those different things, and I want to know what percentage of his thinking went into each element. Now, if you don't want me to inquire, I will just have to certify it to the Court.

MR. DUBUC: Tell him your percentage or estimate, if you can, as to the factors, and if you have got experience in accidents, how you evolve in formulating.

THE WITNESS: Well, again, I base it upon what I see taking place with respect to the aircraft structure and the ground. That is the nature of the gouge marks that appear in the ground.

BY MR. OREN LEWIS:

Q All right. Go on.

A They are much, much closer to being uniform gouge marks than one sees in, I would say, 90 percent of the

accidents which occur.

Q All right.

A This airplane basically landed at high speed. I base it in part on --

Q I want to stop you right there.

MR. DUBUC: No. No. Let him finish his answer.

MR. OREN LEWIS: I want to get each element. This is one element, and if you finish this answer on that element as to the nature --

MR. DUBUC: No. Please let him finish.

MR. OREN LEWIS: Oh, I am anxious to have him finish.

I'd like to take up each element at a time as we go on.

MR. DUBUC: But you've asked him the general question, so let him finish his answer, and then you can go back and pick at it.

THE WITNESS: I think I finished that answer.

BY MR. OREN LEWIS:

Q All right. Now, then, are you then saying that the gouge marks are, in your judgment, uniform from throughout the crash landing process; is that correct?

A Much more so than one finds in most accidents.

Q All right. Did you measure the depth of gouge marks or the width of the gouge marks?

A You don't have to measure them.

Q I'm not asking you do you have to. I am saying, did you measure any gouge marks or make any attempt to calculate how much dirt was misplaced, or what the resistance of the material through which parts of the airplane were passing?

A No, sir.

Q You did not; is that correct?

A That is correct.

Q All right. Now, what percentage of -- what weight did you give that particular aspect?

A What weight did I give it?

Q Yes.

A I didn't give it any particular weight.

Q In coming up with your formula three X?

A I have no formula.

Q I beg your pardon, sir? You mentioned three times the gravity, which was 1.6 something. I have a note on that here. I believe you said three times 1.66.

A Yes, sir.

Q All right. Now, if that is not a formula, then

I apologize to you. I just thought that it was.

So, you can't tell me how much weight you gave to the terrain itself?

A. I gave a very high weight to that fact. Now, percentage-wise, I have not attempted to address that problem.

Q. All right.

A. Whether that is 50 percent of the total or 75 percent of the total. I trust that is what you are asking me.

Q. Yes.

A. I haven't done that. I'll try to do that for you before the trial, if you so desire.

Q. Well, if you can't tell me now, I want to know -- if you have not done that, then you haven't done that.

MR. DUBUC: He is offering to do it for you.

BY MR. OREN LEWIS:

Q. Do you want to do it now?

A. No, I don't propose to do it now.

Q. All right. Now, tell me, you say you have crash tested aircraft?

A. Yes, sir.

Q. What is the largest aircraft that you have crash

tested?

A. Four engine transport.

Q. What is the name of this airplane?

A. DC-7. Well, that might not be right. 1649 Super Connie (phonetic) might conceivably weighed more than the DC-7.

Q. All right. Where did you crash test the 649? Is that the name of it, sir?

A. 1649.

Q. 1649 Super Constellation?

A. Yes, sir.

Q. When did you do that?

A. When did I do it?

Q. Yes.

A. About 1967.

Q. Who for?

A. For the F.A.A., NASA, U.S. Air Force, and the Navy, I think all participated.

Q. And also did you say a Douglas aircraft 7, sir?

A. Yes, sir.

Q. And who did you do that for?

A. Same program.

Q. In the same year?

A. About the same year.

Q. 1967?

A. Yes, sir, about.

Q. Okay. Where abouts did it crash?

A. In Phoenix, Arizona -- near Phoenix, Arizona.

Q. All right. And now were there any other crash tests that you considered comparable to the C5A crash?

A. Well --

Q. That you did?

A. Well, there are all comparable in a way, if you understand the difference between the characteristic decelerations that take place on a large aircraft and a snaller aircraft.

Q. Well, then tell me all of the crashes.

A. All of the crashes?

Q. Yes.

A. Well, I could best give it to you this way. I think there were about 34 full-scale crashes.

Q. All right. For whom?

A. The the U.S. Army, U.S. Air Force, the F.A.A., U.S. Navy.

Q. And this was all the same program, sir?

A. Flight Safety Foundation, yes, sir. Well, no,

there were more than one program involved.

Q All right. Well, who paid for the airplanes, the start-up?

A Who paid for the airplanes?

Q Yes.

A It depends on a particular test.

Q Well, who paid for the Super Constellation?

A I believe the F.A.A.

Q It was destroyed as far as its usefulness, was it not?

A Yes, sir. That is correct.

Q And is that true in all of these cases?

A Yes, sir.

Q All right. The F.A.A., did they buy a new Super Constellation or was it a used one?

A No. They were used airplanes.

Q How many hours on it?

A I don't recall. They were flyable. They were flown in to Phoenix.

Q All right, sir. And under what circumstances was this Super Constellation crashed?

A For the purposes of investigating a post-crash fire, the performance of transport forward-facing seats,

performance of cargo and litter tie downs, performance of air bags for use as decelerators for the occupants, and other experiments.

Q Was there a test protocol?

A Yes, sir. There would have been.

Q Who was in charge of the test?

A I was in charge of the scientific efforts.

Q All right. And the government then has the records on this? Did you turn your records over to the government?

A Yes, sir. There are records available. They would most likely be with the F.A.A.

Q All right. Now, how fast was the airplane going when it struck the ground?

A As I recall, the DC-7 was doing about 160 and I don't remember whether that was knots or miles per hour, knots probably. And the Super Connie was about 100 and -- about 135, 36 miles an hour.

Q That is not knots, that is miles per hour?

A That is miles per hour.

Q Okay. Well, how many miles per hour is 160 knots?

A 160 knots?

Q Yes.

A. It would be 184 miles an hour, but the speed was probably 160 miles an hour and not knots.

Q. All right. 160 miles per hour. All right. Now, in the 1649 Super Constellation, where was this airplane crash?

A. Near Phoenix.

Q. Is it an air base or does it have a location?

A. It was an airport, yes, sir.

Q. An airport?

A. Yes, sir.

Q. Which airport?

A. Deer Valley.

Q. Deer Valley?

A. Yes, sir.

Q. Was it crashed on the runway?

A. On a specially built runway.

Q What kind of a specially built runway was it?

A Well, it consisted of a railroad track, as a monorail, to guide the nose gear and then two paved strips to provide support for the main gear.

Q So then this wasn't an airplane that was flown through the air and crashed into the ground?

A No, it was flown through the air for part of the time. Yes, sir.

Q Well, how much of the time?

A Well, how many feet?

Q Well, I am just trying to get some understanding of the test protocol, what was done.

A Well, we ran the airplane 3,000 feet down the track, at which time it reached the speed of 160 miles an hour. We knocked both of the main gears and the nose gear out from underneath the airplane simultaneously, took off basically all four engines and ran the airplane through two telephone poles, struck the left wing with a hill, struck the fuselage with an eight degree slope on hard compacted ground, nodded to impact on that slope and continue the impact of twenty degrees slope and then go over that hill and impact beyond the hill with basically a free-fall of about 60 feet for the fuselage.

Q And is it your statement that that is comparable to this crash?

A No, it isn't comparable in the sense that it is not a one to one situation. That was a fairly high G situation as far as large fixed-wing transports are concerned because of the steepness of the slope, the nature of the soil and the nature of the impact angle. Well, that is about it, I guess.

Q Were there any people in it?

A No, sir. We had one man that offered to ride it.

Q You declined?

A We declined. Yes, sir.

Q Do you have any of these crashes, these 34, that where the airplane was flying through the air at 310 miles an hour and struck the ground?

A Do I have what?

Q Are there any of these crashes where the airplane was a large structure, large transport type airplane and struck the ground at or around 310 miles an hour?

A I am not familiar with any test crash in which that has been done. There have been some crashes which have, of course -- real crashes that have occurred in that configuration, in addition to this one.

Q Which ones?

A Well, the L1011 that crashed in the Everglades would have -- have some of the characteristics of this crash.

Q All right.

A I am not sure of the exact speed of the L1011, but it would not have been, I think, under 200 miles an hour. I am familiar with one accident that occurred at 450 miles an hour in a B51 Mustang in which the occupants survived with basically only a spinal fracture.

Q How many people lived in the L1011 crash?

A I think about half of them or something like that. Maybe more than half.

Q That was a Lockheed Aircraft?

A That was a Lockheed Aircraft. Yes, sir, that is correct.

Q And was the speed in the vicinity of 310?

A I don't recall the exact speed, but I would say probably between 200 and 300.

Q All right. And were there a number of serious injuries in addition to --

A Sure.

Q -- the people that died?

A. Sure.

Q. What was the angle that the airplane struck the ground?

A. I don't have a number for you on that.

Q. Any other large aircraft crashes that you feel are -- I am talking about where there was a speed of comparable -- roughly comparable speed of the large transport aircraft?

A. Well, I can think of one other at least, and this was a DC6 or DC7 accident that occurred in Florida in probably the 1950's. I think the speed was around 205, but I could be in error on that. That was a long time ago.

Q. Well, I am interested in 300 category, which is, I believe, roughly a third more than 205.

A. I don't recall any others at the moment.

Q. But the closest would be the L1011 in the Everglades?

A. I don't know whether that is the closest or not.

Q. Is the closest one that you can think of?

A. The closest one that I can think of at the moment. Sure.

Q. Sir, did you look into the, when you were doing this investigation into the crash, whether or not the wing supports were weaker than designed?

A Were weaker than designed?

Q Yes, sir.

A No, sir. I have not looked at that.

Q Had any defects?

A No, sir, I have not looked at that.

Q Are you familiar with a program to reinstall or replace the wings on the C5A fleet.

A I have heard of that program. Yes, sir.

Q And that was because there were a number of fractures or faults found in the structural members of the wings, is that not correct?

A I would presume that that would be perhaps the reason.

Q And do you know whether that program is actually going forward at this time?

A I do not know.

Q But you didn't take that into consideration in your analysis?

A No, sir. It has no significance.

Q Can you tell me what the resistance of the -- in any measurement -- well, let me withdraw that.

When you are talking about resistance of moving through a material like soil, how is that measured, in foot

pound? How would you describe that?

A. Well, generally the term resistance implies a force and forces are measured in pounds.

Q. All right. So then in pounds, sir?

A. Yes, sir.

Q. So if we had a soil of the type that was in this west bank and we were able to take a test and propel a particular sized object through it to a certain depth and width, then the result would be -- you would come out and you would find out how many pounds that would take, is that right sir?

A. Are you talking about this dike over here?

Q. No. I'm speaking of soil --

A. You said soil, west bank.

Q. Well, when I say west bank, it is opposed to the east bank of the Saigon river. I am not speaking of the dike itself.

A. You are talking about the general level terrain?

Q. Yes, sir. The terrain there.

A. Well, I don't know what you have in mind with regard to what you're talking about here. There are all types of soil tests that could be conducted that would give one some feel for the resistance of the soil to compressive

loading and so forth and so on. Sure.

Q In other words, but the force would depend upon the weight of the objects and the size of the face that was presented to the soil would it not, and the speed that it was -- initially impacted the soil?

A Yes, sir, I think it would depend upon certainly the size of the object, talking about the force in pounds, it would depend upon -- what else did you say? The speed?

Q Yes.

A Yes, sir. I think -- probably depend certainly on the speed. The specific amount of plowing or moving, in other words, that was being done at the time of the question.

Q And then by doing that, you would come up with an analysis of how fast you could stop a given object moving through that material, to that depth?

A Well, some people have attempted to do this. I think in all probability -- I don't think it is a very good approach, but --

Q No, I just wanted to know if that -- in this case, you say?

A In any case.

Q No. No. I am saying did you say somebody has attempted to do that in this case?

A Well, I think people have attempted to do that, yes. I'm sure they have.

Q Who?

A I don't know, but, you know, you talk to various hundreds of people that are composing computer programs to try to do this and that. Where they take into account that it is all characteristic --

Q Who did you talk to that suggested that?

A I haven't the faintest idea.

Q Well, who have you talked to about this case?

A This case? I haven't talked to anybody about this case except this law firm.

Q When you say this law firm you mean --

A And the other experts that are involved. I have talked to one or two of those, I guess. One.

Q Who?

A John Edwards.

Q Anybody else?

A Well, let's see. I have talked very, very briefly with Doctor McMeekin.

Q Anybody else?

A Yes. I'm sure one or two other two other people who were present at the meeting and, of course, I heard their

input.

Q At what meeting?

A At the meeting.

Q Which meeting, sir.

A The meeting of Mr. Dubuc's experts in late July -- 27th, I think.

Q All right. Who was there?

A I don't know all of the people who were there, but --

Q Just tell me who you know.

A Doctor McMeekin, Mr. Edwards, and I would say probably -- maybe 10 or 15 other people, MD's, Psychologists --

Q Just --

A -- maybe even some other engineers. I don't know.

Q Can you tell me who you remember as being there, sir?

A I have told you who I remember. These are the only ones that I know.

Q Any others that you can tell me the name of?

A No, at the moment, I can't.

Q Can you tell me who was there, Mr. Dubuc, so I can ask the witness if he remembers X or Y?

MR. DUBUC: No, I am not going to tell you who was there.

BY MR. LEWIS:

Q Did you see any representatives of the Plaintiff there?

A Of what?

Q Did you see any representatives of the Plaintiff there at the meeting?

A I wouldn't have recognized that fact. Had there been, I don't know.

Q But nobody identified themselves to you?

A No, sir.

Q There were a number of lawyers there for the government and for the Lockheed Aircraft Corporation, sir?

A Yes, sir. There would have been.

Q Can you tell me who?

A Yes, sir. Maybe I can. I believe Mr. Piper may have been there. I could be in error about that. Let's see. One of the young -- couple of the young lawyers from Mr. Dubuc's office and Tom Almy.

Q Um-hmm. Okay.

A And John Connors.

Q Anybody else?

A That is all I recall at this moment, but there were others there.

Q How much time have you devoted to the study of this material, sir.

A In total days?

Q Well, hours or days or any other units you want to use.

A Um-hmm. Well, I would say probably around 170 hours.

Q And what was your Consultant Fee? Was it on an hourly basis?

A No, sir. It is on a daily basis.

Q And how much is that, sir?

A $750 a day for the Routine Engineering Work, $850 for Deposition and $1,000 for Court Testimony.

Q I presume you get your expenses?

A Yes, sir. I hope so, anyway.

Q I hope you do, too.

MR. OREN LEWIS: Mr. Dubuc, I have a great deal more to ask the witness. I'm willing to go on --

MR. DUBUC: Well, you have another 25 minutes.

MR. OREN LEWIS: I'm willing to take the 25 minutes and I'm also, if there's any advantage to the witness,

I am going to suspend now.

MR. DUBUC: No, it isn't any advantage to the witness unless you are done --

MR. OREN LEWIS: No, I am a long way from being done.

MR. DUBUC: -- that would be to his advantage.

MR. OREN LEWIS: I beg your pardon, sir?

MR. DUBUC: That would be to his advantage.

BY MR. OREN LEWIS:

Q Do you have any idea, sir, what force, either in pounds or otherwise, any other unit of measurement that it takes to break any human bone?

A That it takes to break?

Q Any human bone.

A Any human bone?

Q Yes, sir.

A Yes, sir.

Q How much does it take to break the humerus in a one year old child?

A Well, I don't have a number for that

Q How about the femur?

A No, sir.

Q Any other bones?

A. The skull.

Q. How much does it take to break the skull on a one year old child?

A. I am not talking about a young child, but an adult.

Q. How much force does it take to break the skull in adult?

A. Well, it takes about 140 G's to -- between that and about 400 G's, depending upon the length of time for which the load is applied. And at 140 G's, which would be the lower level, if you allow about 12 pounds for the head, that would be 680 pounds.

Q. And how do you come to -- then what you're saying is you can do it in G's?

A. Yes, sir.

Q. Or translate it into pounds?

A. You can translate that into pounds, yes, sir.

Q. So you gave me the G figure and then the pounds, is that right, sir?

A. Yes, sir.

Q. All right. Did you make any investigation of the seats in this crash?

A. Did I make any investigation in the seats?

Q. Yes. Yes.

A Well, I did to this extent. I have questioned Mr. Edwards, who was on the site and claims that he went back and forth through this section of the troop compartments and that there were two exceptions. All of the seats were in place and the two exceptions were two forward facing seats at the very rear of the aircraft and it was discovered that both seats were not properly installed and as a result of the rear legs not being properly attached in the seat tracks. They rotated forward. They stayed in place, but they just rotated forward.

Q What seat tracks were they?

A What seat tracks?

Q Oh, I understand. But they never completely displaced, turned over or anything of that kind?

A No. Just rotated forward.

Q So the occupants in those seats still would have been safe?

A Yes, sir. I believe that to be the case and there is considerable questions as far as I can ascertain as to whether there were any occupants at all.

Q So you have assumed that there were no occupants of those seats?

A I haven't considered it either way. It is not

important, I think, really.

Q All right. And you have assumed that all the children were in rearward facing seats, is that correct?

A I have. Yes, sir.

Q And it is your opinion to an absolute scientific certainty I gather that the children in those seats would have sustained no physical injury.

MR. DUBUC: The standard I think is a reasonable --

MR. OREN LEWIS: I understand that. I'm just reading -- well, I am not reading from his report, But I am saying what I understood his report to be.

MR. DUBUC: Well, I understand your question to be absolute scientific certainty.

MR. OREN LEWIS: That is what it says. It is the opinion of this author that it is a scientific certainty, that the deccelerations occurring in the April 4, 1975 C5A accident did not provide any direct hazard to the life or health of the children or adults located in the troop compartment of that aircraft.

MR. DUBUC: You are reading from Exhibit D --

MR. LEWIS: I am reading from his report, the third sentence of the Conclusion.

MR. DUBUC: Exhibit D-1303?

MR. OREN LEWIS: Yes, sir.

THE WITNESS: Yes, sir. That is my conclusion.

MR. OREN LEWIS: I don't see any modifier in there.

MR. DUBUC: But your question had a modifier.

MR. OREN LEWIS: I beg your pardon.

MR. DUBUC: Your question had a modifier in it.

BY MR. OREN LEWIS:

Q Was it your understanding and did you assume that there were no injuries to the children in those seats?

A No, there were injuries.

Q You do understand that there were injuries?

A Yes, sir.

Q The children that were sitting in the seats?

A One or two did not survive, at least one did not survive.

Q All right. How about beyond that? Any orthopedic injuries?

A I have no further information than that.

Q Would that be important to know?

A It would depend upon what is known about a situation.

Q All right. Did anyone tell you that one of the

children --

A Well, no. No. Standby. I don't think it is important.

Q Why not?

A Simply because of the fact that the decceleration that occurred in this accident were so low compared with the tolerance of the human head to the solidity level, that brain injuries simply could not have occurred as a direct result of these decceleration levels.

Q Do you know what a coup-counter-coup injury is?

A Yes, sir, I do.

Q What is it?

A It means a blow to one side of the head resulting in a tendency for the brain to separate from the skull cavity on the opposite side of the head producing a contusion or bruises. In other words, to the skull.

Q All right. How much force does it take to the outside of the head to cause the brain to move around inside the skull?

A Well, apparently the tolerance of the human head, to blows of this type are at least something in the order of 140 PG's.

Q So what you're saying is that any loading under

140 PG's wouldn't injure the brain in the skulls of any of these children seated as they were, is that correct?

A. Would not produce any permanent injury.

Q. Well, you mean you might get some kind of a temporary or nonpermanent --

A. Yes, you might be knocked out, for example. You might even have a hairline skull fracture, for example.

Q. I understand. So what you're saying is you could have a hairline skull fracture and not injure the brain?

A. I believe that to be correct, at least people do have skull fractures from time to time and don't discover the fact that they have had one. Now, whether the brain was injured in this process or not, that might be a little bit of a technical question. There might be a very minor injury to the brain.

Q. I understand.

A. But, you know, if you don't find out about it and you don't suffer any ill effects, that is what I'm talking about.

Q. I understand. So what was the thickness of the padding, if any, on the chairs here?

A. I don't have a number for you on that.

Q. Do you know to what it's resistance to compression

is?

A The resistance of the padding?

Q Yes.

A As contrasted to the chair itself?

Q Well, the chair -- yes, I am speaking, as opposed to the chair frame.

MR. DUBUC: The thickness of the cushion on the back of the chairs?

MR. OREN LEWIS: Yes. That is what I'm asking him.

Different padding has different compression rates, is that right?

THE WITNESS: Yes, sir. They do.

BY MR. OREN LEWIS:

Q And if you have a very quick compression rate, then that decreases the padding effect, does not?

A Well, not necessarily. In fact, it may actually increase the thickness. The effect of thickness.

Q How is that?

A It is very rapidly applied in very rapidly applied loads. Materials can appear to be stiffer, if you will, than they really are.

Q So, do you know what the padding -- you don't know

what the padding is, the material is?

A. No, sir. I don't.

Q. You don't know?

A. I have assumed it is consistent with the general aircraft seat.

Q. Alright. And what is that?

A. I would use the term foam rubber. Generally, it is not really rubber, but some type of plastic.

Q. Foam rubber or plastic?

A. Yes, sir.

Q. How thick is it?

A. A resilient and of the order of -- well, the order of a couple of inches.

Q. We're speaking two inches?

A. Um-hmm.

Q. And how fast will that compress under what circumstances?

A. I have no numbers for you on that today.

Q. Pardon?

A. I don't have any numbers on that for you today.

Q. At 310 miles an hour, can you tell me how many --

A. Well, that 310 miles an hour would have nothing to do with it really.

Q. But unless the G factor was over 140 then your testimony is that there would be any possibility of injury to

these babies' brains?

A. The possibility would be extremely rare.

Q. Alright. And it wouldn't make any difference how often the brain was moved from side to side or vibration as long as it was under 142?

MR. DUBUC: Side to side he is talking about.

MR. LEWIS: Yeah, that would be moving back and forth inside the skull.

MR. DUBUC: Forward and aft is one way.

MR. LEWIS: Forward and aft. Alright. Let's stick with forward and aft.

In any direction, would it make any difference?

THE WITNESS: Are you talking about this accident or hypothetical situations?

BY MR. LEWIS:

Q. This accident. This accident.

A. In this accident, no, I don't think that it would have made any difference.

Q. So side to side or forward to back wouldn't make any difference?

A. No, sir. I don't think so.

Q. Alright. Or up and down?

A. Or up and down even, no, sir.

Q. Alright. Did you calculate whether there was any up or down G's?

A. Yes, sir. I did that. At least I considered that.

Q. What did you calculate?

A. Well, the design people at Lockheed have calculated a vertical load as a result of, we will say, "a normal landing" -- that is perhaps not quite right. A hard landing at sink speeds of the order, I think they used eleven to sixteen feet per second. I'm sure you've got this information, and they concluded that the G load, not counting the static one G which we all have on us, was somewhere between, I think, about seven tenths and one point zero five or one point zero two.

Q. One point zero two to one point zero five?

A. Yes, sir.

Q. What would be the peak load?

A. That is the peak load that they computed.

Q. Who did this computation, do you know?

A. No. It would have been done by the structures department, I believe, with Lockheed.

Q. You didn't do it?

A. I did not compute that, no.

Q. And other than assuming that they know how to do

that, you wouldn't know if their computation was accurate, right?

A. I think their computation is realistic because the sink speeds at which this aircraft touched down was in the order of 500, 600 feet per minute. And that is about normal sink speed, and there is a normal landing that we are talking about. The vertical loads would have been insignificant.

Q. Now, what experience do you have in human tolerance to deceleration?

A. Well, I have quite a bit of experience in that area. I teach it from time to time. I have taught it from time to time.

Q. In what school, sir?

A. At Arizona State University and to --

Q. In what course?

A. Say again?

MR. DUBUC: He didn't finish his answer yet.

MR. LEWIS: I apologize.

MR. DUBUC: Arizona State University and?

THE WITNESS: And one of my senior dynamics courses. I have also taught it to the U. S. Army. U. S. Air Force people do cover certain aspects of it in conjunction with the

short course that I have been involved in for the past eleven or twelve years -- more than than. Twenty-one years. I have witnessed some human subject sled rides at Holoman Air Force Base. I have acted as a guinea pig myself with suddenly applied loads to the head. I have been involved in tests of animals, specifically bears in crash tests of aircrafts. Although they're not human, their anatomy is surprisingly quite similar to that of a human. That is about my experience.

BY MR. LEWIS:

Q. Okay. What training have you had in -- you call it human dynamics? I don't know, whatever you call it. Did you use the word --

A. I used the word dynamics.

Q. Dynamics.

A. It is a college senior level course in which this material that we are discussing, human tolerance to decelerating loading was covered.

Q. I just want to know what training you have had, sir.

A. What training have I had?

Q. Yes.

A. Well, about twenty years practical experience, I

guess.

Q. But you haven't had any educational background in any aspect of the human tolerance to deceleration, is that correct?

A. No, sir. That is not correct.

Q. Alright. What have you had?

A. I am a graduate engineer, Ph.D. and while that particular subject was not covered, I still consider that education to be most appropriate to this particular topic which has to do with really the engineering aspects of the human body.

Q. And then you feel that you are an expert in how the human body would react under various engineering circumstances, is that correct?

A. I am at least an expert with regard to certain areas in this field.

Q. Including the head?

A. Yes, sir. I have some knowledge having to do with the impact of the head.

Q. How about the knee?

A. Say again?

Q. The knee.

A. I have not looked into that.

Q. Do you know what force it takes to break any of the arm or leg bones in a child from say one to four?

A. Well, that information may be available, surprisingly, but --

Q. You don't know?

A. I don't have it, no, sir. I have not had occasion to make use of it.

Q. You say it couldn't have happened to any of the children in the seats?

A. That is correct. And from the fact that the deceleration levels were just so low compared with the tolerance of the overall human body to deceleration in a rearward situation.

Q. I understand that. So, there certainly wouldn't be enough Gs or force or whatever way you want to put it to to fracture any of the leg bones in these children, is that correct?

A. Not as long as they were seated.

Q. And you have assumed that they were seated. And that is part of the data that you got, isn't it?

A. That is correct.

Q. Now, do you know whether Barbara Adams just was crushed or not?

MR. DUBUC: We have already been through that.

MR. LEWIS: No.

MR. DUBUC: Yes, you asked him before whether he knew the injuries to Barbara Adams, and he answered he did not, no.

MR. LEWIS: Alright.

Then I am going to ask you to assume that she had a crushed chest.

THE WITNESS: Yes, sir.

MR. DUBUC: Are you reading from something?

MR. LEWIS: I just want him to assume that she had a crushed chest.

Do you know what force it takes to crush a human chest.

THE WITNESS: Well, that depends upon exactly how the load was applied. It could be a relatively low force if it were applied over a relatively small area. It could be at a relatively large force like the order -- well --

BY MR. LEWIS:

Q. What would be the range of force required to cross --

A. Well, it would depend entirely upon the distribution of the load over the chest.

Q. Well, now, you have told us that she was located between rows four and five.

A. Yes, sir.

Q. On the right side of the airplane?

A. Yes, sir.

Q. Alright. At that location --

A. Yes, sir.

Q. -- under these circumstances, how much force would it take to crush her chest?

A. It would depend upon the area in which the load was distributed, and I have no knowledge of what that area was.

Q. I believe you said in your report, doctor, that the accident did not provide hazard to the life or health of the children or adult located in the troop compartment.

A. No, sir. I didn't say that.

Q. Well, that is what I read.

A. Well, read it carefully.

Q. It is a scientific certainty that deceleration occurring in the April 4, 1975 Saigon C5A accident did not provide a direct hazard to the life or health of the children or adults located in the troop compartment of that aircraft.

A. Yes, sir. That is what I said.

Q. Alright. Now, how do you explain that she died?

A. The fact that she was standing adjacent to the isle and that she went forward down the isle and wound up at the bulkhead and in the process of doing that, she achieved appreciable velocity with respect to the airplane. She did not participate in the G level associated with the airplane proper, that is the troop compartment proper and the rest of the children who were seated in the seats. She, in effect, had a fall, if you will, from between rows four and five to the bulkhead and a G level somewhere between we'll say one point six and five. And so, she hit the end of the bulkhead with appreciable speed.

Q. How fast was she going?

A. Well, If you'll let me approximate.

Q. Surely.

A. I would say the distance from her position at the front of the bulkhead might have been, I'd say 12 ft. Now, that could have been 15 ft. Let's see. This thing is 60 ft. long -- let's say about 12 ft., and she would have hit the bulkhead at about 44 ft. per second or about 30 miles an hour.

Q. And what was the G load on her?

A. I don't know what the G load would have been on

her at that particular point. It would have, depending upon --

Q. What factors?

A. What she hit, it would depend upon her --

Q. What did she hit?

A. I don't know what she hit. She hit something that was pofficient to cause her not to survive the accident.

Q. Did she hit a bulkhead?

A. She may have.

Q. Is your testimony that you have calculated from some of these reports that she was standing?

A. She was standing?

Q. Yes.

A. Did I calculate that? I didn't calculate that.

Q. Well, how do you come to the conclusion that she was standing?

A. Did I say she was standing?

Q. You just did.

A. I could well be in error, but she may have been standing.

Q. Well, was she standing?

A. Nobody knows the answer to that question.

Q. Well, there may be people that know. You mean you

don't know?

A. Well, I don't know, and Neil doesn't know, and Neil was standing in the isle adjacent to her.

Q. Looking at her?

A. Say again?

Q. Looking at her?

A. Oh, I don't know whether she was looking at her or not, but she doesn't know.--

Q. Was Neil communicating with her, do you know?

A. -- that is what I get from Neil's statement.

Q. Do you know whether Neil was communicating with her or not?

A. I don't know.

Q. Do you know whether anybody was talking with her? Do you know whether any of the people in the troop compartment were talking with her or not?

A. No.

Q. And so you don't know whether she was braced behind those seats or how she was, do you?

A. I know she wasn't braced enough to prevent her from going down the isle.

Q. How do you know she didn't go over the top of the seats?

A. You mean if she stood up?

Q. No, wonder if she was thrown up? Why couldn't she have been thrown up over the top of the seats and flung down against the bulkhead?

A. Well, that is a good question. Well, had that been the case, she would have wound up against the lavatory.

Q. Do you know that she didn't? Where did she end up?

A. My understanding is that she wound up down near the bulkhead.

Q. Which bulkhead?

A. Just about station or just in front of chairs in row one.

Q. Was there a bulkhead there?

A. I guess there must have been.

Q. Well, do you know whether there was a bulkhead there or not, sir?

A. No, I don't know whether there was one there or not, but she must have hit something in that area.

Q. And your testimony is that she then went to the left around the lavatory and struck a bulkhead which was just ahead of station one; is that your testimony?

A. That would be the implication of what I get,

from what I'm able to read in the various depositions and statements.

Q. Have you looked at the pictures of the troop compartment?

A. Have I looked at the pictures of the troop compartment?

Q. Um-hmm.

A. Yes, sir. I have looked at some.

Q. And are you telling me whether there was a bulkhead there, just prior to seat one?

A. No, I am not telling you that. I'm telling you that in the various statements that several of these people used, they refer to the bulkhead at the end -- forward end of the troop compartment. So, I presume, you know, that there was one there. Maybe I am wrong.

Q. Well, the partition at the lavatory would be a bulkhead, at least by my standard, would it not?

A. Sure.

Q. I mean, that partition, wall is another word for bulkhead, isn't it?

A. Something across there, yes.

Q. That's right. And so the lavatory has a bulkhead in its rearward orientation?

A. Yes, sir. It does have.

Q. So, if she left,-- you have her daughter to the right of her, is that right? The way I see this diagram here --

A. Yes, sir. That is correct.

Q. You have Barbara next to her daughter there?

A. That is correct. That is correct.

Q. Now, you don't know that she wasn't flung up over those seats, do you?

A. No, I don't know that.

Q. And if she was flung up over those seats from a braced position between the seats striking anything forward there, meaning several rows of seats forward, that would suggest that your calculations are off, wouldn't it?

A. No, not at all.

Q. How many Gs --

A. Oh, you mean with regard to the speed at which she hit the bulkhead?

Q. Or the G bars or anything else.

A. I have not computed the G bars. I have calculated the speed based upon an estimated distance.

Q. What kind of force would it take to propel her out of that position and up over the seat and down the isle

to strike anything at thirty miles an hour?

A. Might not take virtually any force at all. It depends on what she does. Does she turn loose? Does she stand up? Does she move out in the isle to try to do whatever she has decided she's going to do? Does she think the first impact is it and it is all over, and she steps out into the isle and at the second impact and wham, down the isle she goes?

Q. Do you know whether she was killed at the first or second impact?

A. She was not killed at the first impact. That is an absolute certainty.

Q. How do you know that?

A. Because the change of velocity in the first impact was less than one foot per second, and so if she went down the isle, she did so at less than crawling speed.

Q. Tell me this --

A. She would not have been killed as a result of such action.

Q. How did the two babies die?

A. I am not sure that two did, first.

Q. Do you have any explanation?

A. The one that died --

Q. Right.

A. -- to my knowledge --

Q. Alright.

A. -- died because of strangulation.

Q. And how did that happen?

A. Because of some cord that got wrapped around the child's neck, having to do with a satchel or something that was placed around it's neck.

Q. How would that happen?

A. I don't know.

Q. No, I am talking about how would it happen mechanically that that child would die by the cord being around its neck?

A. If you got strangled?

Q. Yes.

A. Just by getting strangled.

Q. But where would the cord have to be? The pressure would have to be on the front of the neck not the back of it, is that right?

A. It would have to be on the front of the neck?

Q. Yes.

A. It would have to be all the -- well, it would have to close off the air passage.

Q. Alright. Now, how would that cord then strangle the child?

A. Well, let's just -- do we know where the child was seated?

Q. I don't know if she was -- somebody and that child was in the troop compartment in a rearward facing seat. You have assumed all of them were. Did you assume that one was different?

A. You understand that I don't know, and I don't think you know, and I don't think anybody knows how this happened. We can only surmise at how it might have happened; and I'm willing to do that --

Q. Well, let me make sure that I understand this, Doctor Turnbow. Essentially much of what you have said about this crash is surmised, isn't that true?

A. Much of what I said? Much means more than 50%?

Q. Yes.

A. Well, you know, Mr. Lewis, this is not the first one of these that I have been through; but I think that this case is so straight forward with regard to the G levels associated with this troop compartment that, like I said in my statement, I think it is beyond any possibility that the deceleration were high enough to provide any direct hazard

to those children certainly who were seated and the adults who remained in position --

Q. Between the seats?

A. -- in the aircraft, wherever they were. Some of them remained in position in the isle.

Q. Well, let me ask you this --

A. Or even who restricted the motion to the point to where they didn't develop a relatively large velocity with respect to the aircraft and hit down here at the "the bulkhead" and whatever that is. Maybe it isn't a bulkhead.

Q. You're speaking of forward end?

A. Forward end.

Q. Let me ask you this, then, sir. If G loadings of five Gs or less would damage a baby's brain, then you could be wrong, is that right? I'm not asking you to agree, doctor, but if that were true, then you could be wrong about the capacity to injure babies' brains, is that correct?

A. Yes, I guess that possibly would be correct because I can anticipate that peak accelerations in this accident could have been as high as five Gs.

Q. So if somebody who was very knowledgable in infants' brains, both as to their structure and what the anatomy is; and if both people concluded that five Gs could

injure babies' brains, then you would agree that there would be forces that could do so, otherwise not?

A. Yes, sir --

MR. DUBUC: Just a minute. Just a minute. I object to the form.

MR. LEWIS: Okay.

MR. DUBUC: Are you asking him to assume that or are you saying is that?

MR. LEWIS: I'm just asking him to assume that.

MR. DUBUC: Assume that. Without any disagreement, okay, even though somebody may disagree.

BY MR. LEWIS:

Q. Alright. But is that correct, sir? In other words, if five Gs could injure a baby's brain, and I'm not asking you to agree with their studies, but if that was established, then the capacity to injure baby's brains would be present, is that correct?

MR. DUBUC: Hold the question.

MR. LEWIS: I am happy to hold it. (Pause)

MR. LEWIS: Let me just get this one question, Carroll, and I know that the witness has to go.

Sir, I am just trying to establish this one thing. Assume, if you will, and I'm not asking you to agree that this

is the case, but assume, if you will, that loads of five Gs had the capacity to injure babies' brains. If that were true, then there would be the capacity -- then this airplane crash had the capacity to injure the children in the seats?

MR. DUBUC: When you say five Gs, you are talking about five Gs minus X, in rearward facing seats?

MR. LEWIS: I'm speaking as they were oriented here.

MR. DUBUC: Alright. You are assuming if, under those circumstances, minus X, five Gs had the capacity to injure children's brains, what?

MR. LEWIS: Then he would concede that this aircraft, there was enough force to injure their brains.

MR. DUBUC: Oh, the ones in there?

MR. LEWIS: Yes.

MR. DUBUC: I don't think you're asking him a positive question. These are individual people.

BY MR. LEWIS:

Q. But isn't that so, sir?

A. Well, that is not quite true because what I've told you here is that I don't think the G levels exceeded five Gs.

A. The question is what were they really. One?

Q. I believe you said there was a peak of five Gs.

A. Okay. Now, the question is how long is that load applied. The peaks imply very very short duration, okay. So, for me to go along with your supposition here about the only outcome of this --

Q. Yes.

A. -- you know, you are going to have to talk about how long this load was applied. Five Gs is not the whole story.

Q. Alright. I think we just better quit here, Mr. Dubuc, in fairness to the witness.

MR. DUBUC: Alright.

MR. LEWIS: We will suspend and I will agree with the time with counsel to resume.

(A discussion was held off the record.)

MR. LEWIS: Thank you, doctor.

Whereupon, at 5:25 o'clock p.m., the taking of the instant deposition ceased.

CERTIFICATE OF NOTARY PUBLIC

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF FAIRFAX)

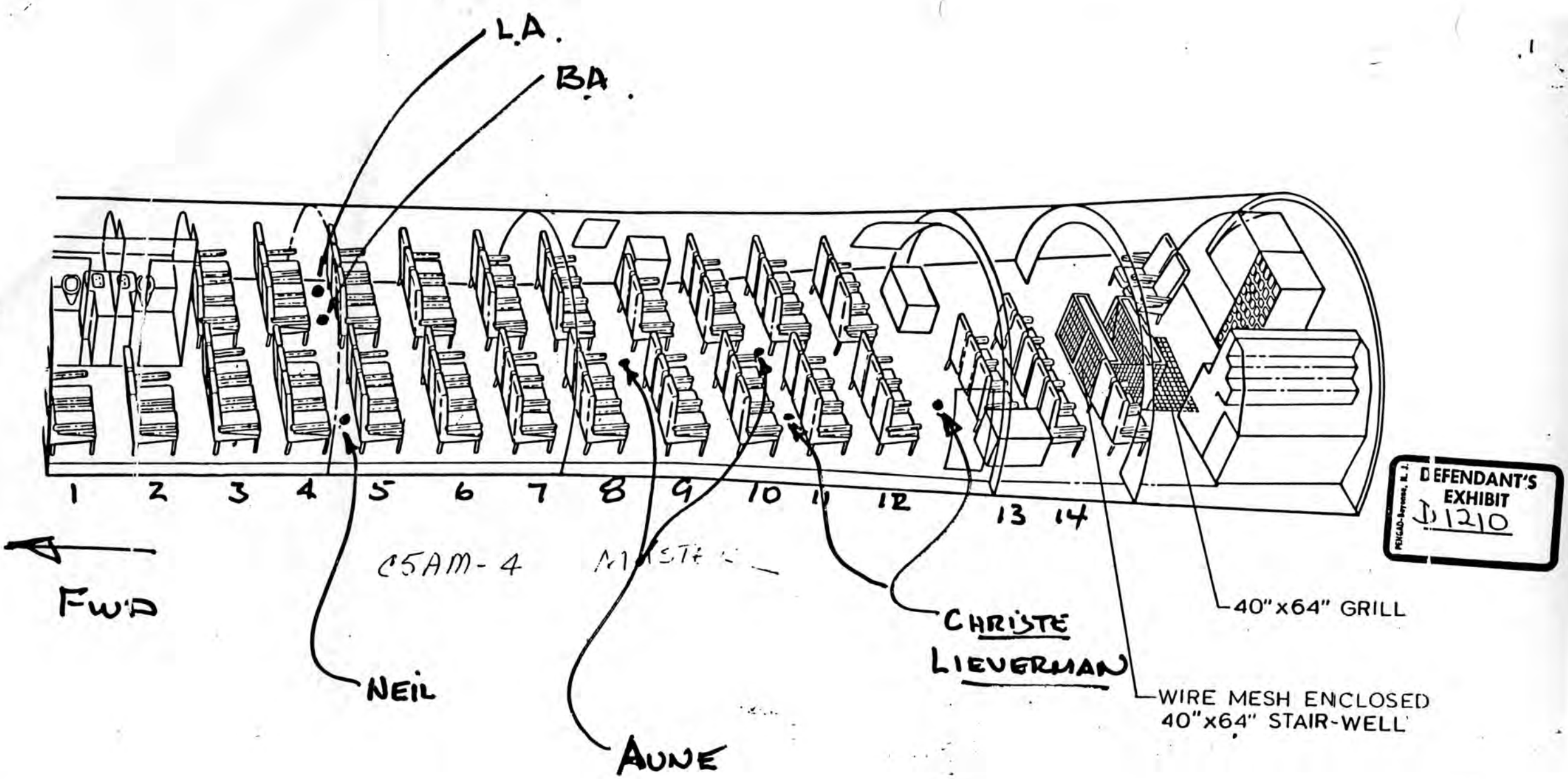
I, CLAIREEN M. HOLMES, the officer before whom the foregoing deposition was taken, do hereby certify that Dr. James Turnbow, whose testimony appears in the foregoing deposition, was duly sworn by me, a Notary Public in and for the Commonwealth of Virginia at Large; that the testimony of said witness was recorded by me by stenotype and thereafter reduced to typewritten form under my direction; that said deposition is a true record of the testimony given by said witness; that I am neither counsel for, related to, nor employed by any of the parties to the action in which this deposition was taken; and, further, that I am not a relative of or employee of any attorney ro counsel employed by the parties hereto, nor financially or otherwise interested in the outcome of the action.

Clareen M. Holmes

Notary Public in and for the
Commonwealth of Virginia

My Commission Expires:

February 8, 1985



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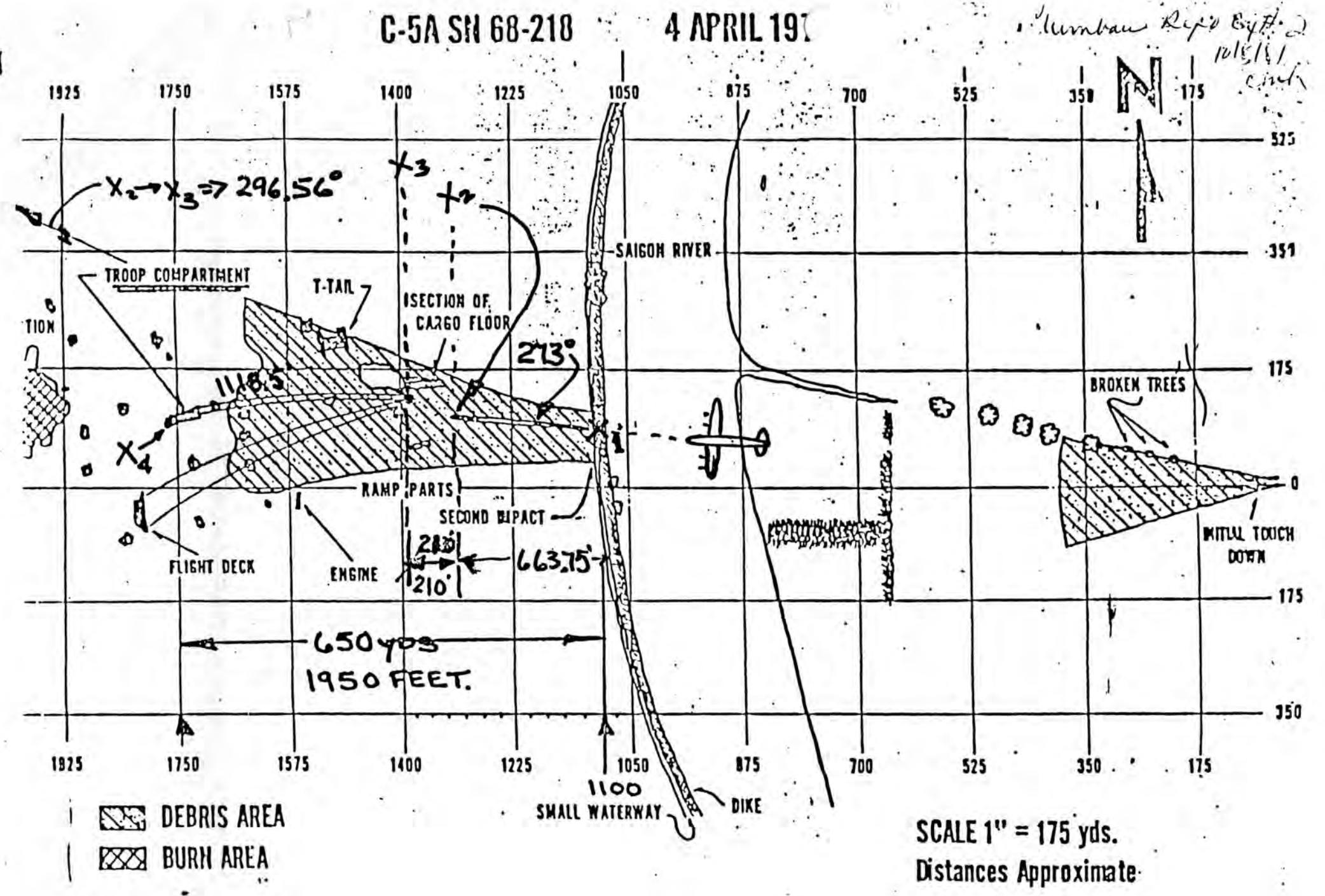
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