NATIONAL TRANSPORTATION SAFETY BOARD

AIRCRAFT ACCIDENT OF ALASKA AIRLINES FLIGHT 261
BOEING MD-83, N963AS
PACIFIC OCEAN NEAR PORT HUENEME, CALIFORNIA
JANUARY 31, 2000
ACCIDENT: DCA-00-MA-023
PUBLIC HEARING

Board Room and Conference Center
National Transportation Safety Board
429 L'Enfant Plaza, SW
Washington, D.C. 20594

Thursday, December 14, 2000
11:00 a.m.

Board of Inquiry

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JOHN C. CLARK, Acting Director
Office of Aviation Safety

DR. VERN ELLINGSTAD, Director
Office of Research and Engineering

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P R O C E E D I N G S

11:01 a.m.

MR. HAMMERSCHMIDT: Thank you for the sound. We seem to be having technical problems at the beginning of these morning sessions, but maybe we'll get that straightened out.

Good morning, all, and welcome to this second day of the National Transportation Safety Board's Public Hearing concerning the accident that occurred on January 31 of this year, involving an MD-83 aircraft that impacted into the Pacific Ocean off the coast of California, near Port Hueneme, California.

Yesterday, we spent pretty much the entire day on a very informative witness panel of four witnesses. We had hoped we would get further into the hearing, but we ran late last night, for those that were not here. We continued until about 9 in the evening, which was much later than anticipated. We do not anticipate doing that again today or tonight, and without further ado, we will continue with business.

I would ask the Technical Panel, before we move into our witness questioning, if there's any loose ends that we need to address from yesterday.

Mr. Rodriguez?

MR. RODRIGUEZ: Yes, sir, Mr. Chairman. We are incorporating into the list of exhibits a new exhibit, 7-V, that will be labeled as -- time out.

(Pause)

MR. RODRIGUEZ: "Witness Statements from Alaska Airlines Personnel Reference Jackscrew Observations". 7-V. That will be distributed later today.

MR. HAMMERSCHMIDT: Very good. Mr. Rodriguez, this is in -- just to clarify your addition, for those that may not have been, let's say, viewing this public hearing yesterday, this is in response to a specific request by the Alaska Airlines Party Spokesperson to include a couple of letters.

MR. RODRIGUEZ: Yes, sir. The letters are from two individuals who were working on the -- one on the Systems and one on the Structures Group, who observed the jackscrew when it was brought to the pier at Port Hueneme after the accident.

The letters are dated December 7th, 2000, and December 8th, 2000.

MR. HAMMERSCHMIDT: All right. Thank you, sir.

I'd like to ask the Parties to the public

hearing if they have any housekeeping questions or comments. Hope everyone's comfortable.

(No response)

MR. HAMMERSCHMIDT: Very good. In that case, we will go to our first witness of the day, who is Mr. Michael O'Neil. Mr. O'Neil, would you please take the witness table, please?

MR. RODRIGUEZ: Before you sit down, Mr. O'Neil, would you be sworn, please? You affirm?

Whereupon,

MICHAEL O'NEIL

having been first duly affirmed, was called as a witness herein and was examined and testified as follows:

INTERVIEW OF MICHAEL O'NEIL

MR. RODRIGUEZ: Please be seated, and state your full name and occupation.

MR. O'NEIL: Is this one?

MR. HAMMERSCHMIDT: It should be on when the button is in the up position.

MR. O'NEIL: Okay.

MR. HAMMERSCHMIDT: But you -- I would advise you to pull that microphone as close as you can. There you go.

MR. O'NEIL: How's that?

MR. HAMMERSCHMIDT: That's all right.

MR. O'NEIL: My name is Michael Edward O'Neil. I'm an Aerospace Engineer, Senior Aerospace Engineer with the Federal Aviation Administration in the Air Frame Branch, at the Los Angeles Aircraft Certification Office.

MR. RODRIGUEZ: Thank you, sir. Would you briefly describe your aviation background?

MR. O'NEIL: I received a Bachelor of Science Degree from the Department of Aeronautics and Astronautics in Aeronautical Engineering from the University of Washington in 1965.

Upon graduation, I was employed by the Douglas Aircraft Company in Long Beach as a stress analyst on the commercial products. Subsequent to leaving Douglas, I joined the FAA at the Aircraft Engineering Division in Los Angeles, which has since been remanded or revised to the Los Angeles Aircraft Certification Office.

MR. RODRIGUEZ: Mr. Guzzetti will question the witness.

MR. GUZZETTI: Good morning, Mr. O'Neil.

MR. O'NEIL: Good morning, sir.

MR. GUZZETTI: How -- you mentioned that you were -- you used to work for Douglas. When did you leave Douglas to come to work for the FAA? What year was that?

MR. O'NEIL: 1978.

MR. GUZZETTI: '78? Were you present yesterday during Boeing's -- during our panel with the three Boeing witnesses and the FAA witness?

MR. O'NEIL: Yes, sir.

MR. GUZZETTI: I guess to start out, I'd like to ask you what the -- have you verify what the basic -- the certification basis is for the original DC-9 Series 10 Aircraft.

MR. O'NEIL: Certification basis for the DC-9/10 Series is Civil Air Regulations, Part 4.b, through Amendment 16, plus special regulations.

MR. GUZZETTI: Thank you. And that is contained -- the Type Certificate Data Sheet is contained in Exhibit 9-E, which verifies that.

Could you please, with your breadth of experience, and I know it's considerable, could you just provide a brief summary of the evolution of aircraft certification regulations from the early days, what existed just prior CAR 4.b, to what we have today?

MR. O'NEIL: Prior to CAR 4.b, there was a collection of regulations, CAR 3, CAR 03, CAR 04, and prior to that, there were design requirement bulletins. Those were incorporated and codified as Civil Air Regulations, CAR 4.b, for transport category airplanes in 1953.

MR. GUZZETTI: And beyond 1953, what happened then?

MR. O'NEIL: As the regulations were revised, amendments were added, up through Amendment 16. There were some special regulations, particularly applicable to transport category airplanes, and these were eventually codified as FAR, Federal Air Regulations, Part 25 in 1965.

MR. GUZZETTI: Okay. So, basically the same text, if you will, just transferred over to new codes in 1965?

MR. O'NEIL: Essentially, but there were slight revisions to separate particular thoughts from CAR 4.b and identify them as particular paragraphs in Part 25.

MR. GUZZETTI: Okay. And then, beyond 1965, did the FARs continue to evolve, and do they exist today?

MR. O'NEIL: They continue to be revised, and I believe we're up to Amendment 102 at the current time.

MR. GUZZETTI: Okay. Thank you. I -- some of the questions I'll be asking you are the same that were asked of the Boeing engineers, and again to facilitate the two of us getting to the pertinent issues, I wanted to go through excerpts of certain CAR 4.b regulations that are germane to the original design of the DC-9, and these are contained in Exhibit 9-F, which is the original 1953 entire CAR 4.b, and Exhibit 9-W, which is -- has excerpts from Amendment 16, that were applicable to the DC-9 back in the mid-'60s.

So, I guess if I could have Dana put up the first PowerPoint slide. This is -- addresses CAR 4.b320(a). The exhibit, by the way, for this excerpt is Exhibit 9 -- this particular exhibit is 9-W, Page 6.

Okay. In this -- Mr. O'Neil, this particular excerpt that we have up here, I won't have you read it, but what's the major heading that precedes this excerpt?

MR. O'NEIL: Control Systems.

MR. GUZZETTI: And the last sentence of that paragraph addresses the occurrence of any reasonably

probable single failure of the actuating system.

Did this specific regulation, this excerpt, did the FAA require then Douglas to comply with this regulation on the DC-9 horizontal stabilizer jackscrew system?

MR. O'NEIL: Before I answer that, I'd like to say that the regulations as a whole define the requirements that the applicant, in this case Douglas, were required to demonstrate compliance to.

As such, it is really not fair to pick out a specific regulation without the context of the whole set of regulations.

Car 4.b defines a level of safety, and that -- of a type design, and the safety of that type design is maintained by the requirement that the type certificate holder is required to recommend a maintenance program for whomever uses the airplane, such that that level of safety is maintained.

MR. GUZZETTI: Okay. Well, let me ask the question this way. Did -- to your knowledge, did Douglas provide any data to show compliance with this section of the regulations?

MR. O'NEIL: Yes.

MR. GUZZETTI: And did that data meet the

needs of the FAA during the certification of the DC-9?

MR. O'NEIL: The data provided allowed the FAA to determine that the -- that compliance had been demonstrated by the type certificate holder or by the applicant at that time.

MR. GUZZETTI: Okay. Can you be more specific? Do you know what form that data took?

MR. O'NEIL: Not specifically, no.

MR. GUZZETTI: Okay. Generally, what types of reports or -- is it mathematical data? Is it test data?

MR. O'NEIL: Well, this would probably be type design data, meaning an analysis and drawings.

MR. GUZZETTI: Okay. Did that data address specifically and formally the -- a failure of stripped Acme nuts?

MR. O'NEIL: No.

MR. GUZZETTI: Excuse me. Stripped threads inside of the Acme nut --

MR. O'NEIL: No.

MR. GUZZETTI: -- as a failure? It did not? Okay. Why in your opinion does that data not exist?

MR. O'NEIL: Wear is not considered as a mode of failure for either a systems safety analysis or for

structural considerations.

The jackscrew assembly and the Acme nut in particular, in addition to this particular regulation, also have to comply with the ultimate strength and limit load deflection criteria which provides for their strength.

MR. GUZZETTI: Okay. I guess you mixed two concepts there, wear and strength. So, in this regulation, are either of those addressed or does this address another --

MR. O'NEIL: They are specifically addressed in other regulations.

MR. GUZZETTI: In other regulations?

MR. O'NEIL: Yes.

MR. GUZZETTI: Okay. We'll get back to wear in a moment. This -- would you consider the horizontal stabilizer actuation system a system, a control system that would fall under this regulation?

MR. O'NEIL: It's a combination structural element and systems element, and as such, the systems portion would fall under the systems requirements, and the structures portion would be required to address the structural requirements.

MR. GUZZETTI: Okay. Would the interface

between the Acme screw and the Acme nut threads -- would that be addressed, more appropriately addressed or was it addressed in this regulation or would it have been addressed, more appropriately addressed in another regulation in the CAR 4.bs?

MR. O'NEIL: In another regulation.

MR. GUZZETTI: In another regulation. Okay. Great. Thank you.

Let's go to other regulations then. Let's move on to the next slide, CAR 4.b270(b), and the -- as you know, as the audience may recognize, I corrected the heading. It actually says 270(b) and not 320, like it did.

But you can see the excerpt there, and again this is in Exhibit 9-W, Page 3. We'll start with Page 3. First of all, what is the overall heading of that entire Section 4.b270?

MR. O'NEIL: "Fatigue Evaluation of Flight Structure".

MR. GUZZETTI: Okay. And I noticed that there's two paragraphs -- there's a Paragraph A and a Paragraph B beneath it. "Fatigue Strength" and "Fail-Safe Strength".

Well, first of all, did the FAA -- did you

find any data to show that Douglas complied with this specific -- any compliance data related to this specific section of CAR 4.b?

MR. O'NEIL: Let me address in the general portion of the paragraph, if I may. "The strength detailed design and fabrication of those portions of the airplane's flight structure in which fatigue may be critical shall be evaluated in accordance with the provisions of either Paragraph A or B of this section."

So, after having met the limit load required deflection requirements and the ultimate strength -- be able to support ultimate strength without failure requirements, if the structure is such that fatigue may be critical, then an evaluation under 270(a) or 270(b) is required.

MR. GUZZETTI: Okay. So, would -- from your read on this, was fatigue considered critical to the point where -- that would drive them to this regulation?

MR. O'NEIL: If we recall Dr. Khaled's testimony yesterday, that an Acme nut with full threads is capable of supporting over two million pounds, and if we recall Boeing's testimony that the normal flight load for the -- in the jackscrew to be transmitted from

the screw through the nut to the vertical stabilizer is in the neighborhood of 4 or 5,000 pounds, it is possible to determine that the fatigue loads are of such magnitude that they would not be sufficient to initiate or propagate the crack in the Acme nut.

MR. GUZZETTI: Okay. So, was that more of a -- well, before I get to that question. So, in your analysis, Douglas -- it was -- did not need to comply with this specific section, based on their judgment and the FAA's judgment that fatigue was not an issue? Would that be correct?

MR. O'NEIL: It would be correct to say that based on the evaluation by Douglas, and concurrence by the FAA, that fatigue is not a critical mode of analysis for the Acme nut.

MR. GUZZETTI: Okay.

MR. CLARK: Is that Part A and Part B that you're referring to? Either or?

MR. O'NEIL: Yes, sir.

MR. CLARK: Well, let me -- in this case then, that Acme nut does not have to comply with either Part A or Part B? Is that what you're saying?

MR. O'NEIL: It has to comply with the limit load deflection and ultimate strength requirements, but

because of the evaluation which indicates that the fatigue stresses are so low as to preclude the initiation or propagation of a crack in the thread, they need not be considered under Part A or Part B of 4.b270.

MR. CLARK: Okay. Where do the limit loads and ultimate loads come in? Is that -- that's a different Part 4?

MR. O'NEIL: That's 4.b201, sir.

MR. CLARK: Okay. So, this one is -- from your review of the situation, 270, Part A or Part B, is not applicable in this design?

MR. O'NEIL: It's applicable in that the evaluation has to be accomplished to make that determination.

MR. CLARK: Okay. And one way to do that is this strength is so great, that it's not likely to develop into a fatigue scenario?

MR. O'NEIL: Yes, sir.

MR. CLARK: That's one. Okay.

MR. GUZZETTI: Thank you. Mr. O'Neil, in looking at some of the proprietary certification documents that Douglas had, there's a mention of some calculations, handwritten calculations regarding fail-

safe tension of the jackscrew, and there's a reference here that it exceeds the requirements of CAM 4.b270(b). Is that different than CAR 4.b270(b)?

MR. O'NEIL: It's similar. All of the information in CAR 4.b is in CAM 4.b. At that time, we included advisory -- advisory material was included with the identification of the CAR regulations, and that was called the CAM, Civil Air Manual.

MR. GUZZETTI: Okay. And just to clarify, this certification document wasn't compliance data, it was a design criteria document. Can you describe what design -- what that is?

MR. O'NEIL: The design criteria?

MR. GUZZETTI: Yes.

MR. O'NEIL: That's -- yeah.

MR. GUZZETTI: Well, is it -- is that --

MR. O'NEIL: I have an answer. I just want to be sure I couch it in the proper terms.

The design criteria is the set of requirements that the company established for themselves to ensure that their product accomplished what they want that product to do.

In almost all of the -- well, in all of the design criteria I've seen, the regulatory requirements

are included as part of the design criteria.

MR. GUZZETTI: Okay. But why, in your opinion, didn't that thought that this engineer had about CAM 4.b270(b) didn't carry over to the actual compliance data that was needed?

MR. O'NEIL: I don't know that.

MR. GUZZETTI: Okay.

MR. O'NEIL: Let me say, though, in reviewing the design -- that particular design criteria that you're referring to, --

MR. GUZZETTI: Hm-hmm.

MR. O'NEIL: -- for the structural portions of the jackscrew assembly, as identified yesterday by Boeing, there are multiple load paths from the horizontal stabilizer down to the attachment to the vertical stabilizer.

MR. GUZZETTI: I understand that. But I'm talking specifically about the -- again, the engagement of the Acme screw threads and the Acme nut threads.

The -- and in that regard, this specific section, and we'll leave it here very soon, it talks about a fail-safe strength, and how catastrophic failures are not probable after fatigue failure or obvious partial failure.

So, if this doesn't address it, this specific part of the regulation doesn't address the failure of the engagement between the Acme screw and the Acme nut, would there be other parts of the CAR 4.b that I could refer to to find how that -- find out how that was addressed by the design?

MR. O'NEIL: Not specifically.

MR. GUZZETTI: Okay.

MR. O'NEIL: But the design criteria include the fail-safe requirements or the intent of the fail-safe requirements of 270(b), and part of that -- part of requirement to 4.b270 is an evaluation to determine which parts might be fatigue critical.

MR. GUZZETTI: Okay. Would you consider the jackscrew a principal structural element?

MR. O'NEIL: Negative.

MR. GUZZETTI: Okay. Can you define what a principal structural element is with regard to the regulations?

MR. O'NEIL: It's easier to define by reference to Advisory Circular 25.571, which is the successor to 4.b270 in -- 25.571 is the successor regulation to these requirements in Part 25, and Advisory Circular 25.571 is the advisory material that

the FAA has gathered in particular to 25.571, and it would have been included as CAM material in the CAM or advisory material in the CAM.

MR. GUZZETTI: Can you educate me on just generally what a principal structural element is, and how it -- what its context is within the regulations?

MR. O'NEIL: Well, in a damage tolerance philosophy, a principal structural element is one whose failure, if it remained undetected, could lead to loss of the aircraft.

MR. GUZZETTI: Okay. And that's damage tolerance. So, that goes into a damage tolerance philosophy.

MR. O'NEIL: Damage tolerance again as related to fatigue.

MR. GUZZETTI: As related to fatigue. So, if you're talking -- is it correct to state if you're talking about principal structural elements, you're talking under the umbrella of fatigue?

MR. O'NEIL: Yes, sir.

MR. GUZZETTI: Okay. And would you consider the jackscrew primary structure?

MR. O'NEIL: In this design, yes.

MR. GUZZETTI: Okay. And is that a different

definition or does that take on a different meaning than principal structural element?

MR. O'NEIL: Yes.

MR. GUZZETTI: And in what sense?

MR. O'NEIL: All principal structural elements are primary structure, but not all primary structure is a principal structural element.

MR. GUZZETTI: Okay. Can you refer me to any parts of the regulations that address primary structure?

MR. O'NEIL: Yes, sir. 4.b201.

MR. GUZZETTI: 4.b201. I don't have a slide of that, but it is in Exhibit -- let me find it. 9-F, I think it is. Yes, it is F. Page 11.

MR. CLARK: Mr. Guzzetti, let me ask a question. I lost track in this -- what type of structure do you consider the jackscrew system?

MR. O'NEIL: In this design, it's primary structure because it is the primary load-carrying load path from the horizontal to the vertical, other than the pivot attaches at the rear spar.

MR. CLARK: Okay. Thank you.

MR. GUZZETTI: Page 11 and 12 of Exhibit 9-F has 4.b201, and the title of that is "Strength and

Deformation". I'm not going to read it here, but what's -- what exactly does this regulation address, and can you please, when you answer the question, apply it to the, if you can, Acme screw and Acme nut thread interface?

MR. O'NEIL: Okay. 4.b201(a) says, "The structure shall be capable of supporting limit loads without suffering detrimental permanent deformation."

That means, as Boeing identified yesterday, at the maximum operating load for the design, that the jackscrew assembly will not experience any permanent deformation which would be detrimental to its ability to carry the required loads.

MR. GUZZETTI: Would you consider deflection of other than brand-new Acme nut threads as deformation in this context?

MR. O'NEIL: I don't believe so, no.

MR. GUZZETTI: Okay. Well, that's -- it -- would it be correct to state that the issue of failure and its effects and how to safeguard against effects -- its effects, are not addressed in either CAR 4.b320(a) or CAR 4.b270(b) for this specific application? Would you say that is correct?

MR. O'NEIL: Could you repeat that, please?

MR. GUZZETTI: I'm sure -- let me rephrase and make it a little bit simpler. Is catastrophic failure of the -- is the complete failure of the Acme nut threads addressed in -- it is not addressed in either CAR 4.b320(a) or CAR 4.b270(b), is that correct?

MR. O'NEIL: That is correct.

MR. GUZZETTI: Okay.

MR. O'NEIL: There is the assumption, as I stated earlier, the requirement in the type design, as I stated earlier, that the maintenance program recommended by the manufacturer will assure that -- well, will not assure, but it will allow the type design to be maintained in the condition that the type design requirements will be met.

MR. GUZZETTI: Okay. Let's move on to that subject then, regarding maintenance, and let's turn to -- I think I have a slide for CAR 4.b305. I hope I do. I might be mistaken on that. Yeah. There it is.

Is this the regulation that you're referring to? It's an excerpt, and it's again from Exhibit -- the earlier exhibit, 9-F, Page 30. Thank you.

Is this the regulation that you're referring to that would cover that issue that you just discussed regarding essential maintenance?

MR. O'NEIL: No. This regulation addresses the requirement that a means to inspect be provided by the design, by the type design.

MR. GUZZETTI: Okay. Is there a specific regulation that addresses how maintenance must be considered in lieu of a fail-safe design or how maintenance is essential to a specific component on the airplane?

MR. O'NEIL: I would disagree with the classification that this is not a fail-safe design.

MR. GUZZETTI: Okay. Why would you disagree with that?

MR. O'NEIL: The type design requirements, which is what we assure or what we -- what the applicant is required to demonstrate compliance to provides for the ultimate strength, no detrimental permanent deformation of limit load, and if the structure is fatigue critical or could be classified as fatigue critical, then an evaluation under 4.b270.

In the design criteria for the jackscrew assembly, the intent of 4.b270(b) fail-safe is incorporated for all of the structure associated with carrying primary flight load and ground loads in the jackscrew assembly, and the Acme nut itself is

evaluated to determine whether or not it is potentially fatigue critical, and as we stated earlier, as I stated earlier, that evaluation can be shown that it is not likely to be fatigue critical.

MR. GUZZETTI: Okay. Well, is there, in your opinion, is there a problem with these regulations that were in force in the '60s in terms of there not being a specific regulation to address a failure of the Acme nut threads, a common failure of the Acme nut threads?

MR. O'NEIL: No, sir. I don't believe that to be true.

MR. GUZZETTI: Okay. What about wear-critical items? How are they addressed in the regulations?

MR. CLARK: Excuse me, Mr. Guzzetti. Let me ask. If that's not true, then how did we end up with this failure? If there's -- what in the regulations -- if the regulations are good, then what happened to this jackscrew for it to end up being stripped?

MR. O'NEIL: I don't know that, sir. I don't believe we've had sufficient opportunity to evaluate the data to arrive at that kind of a conclusion.

MR. CLARK: Okay. But you would still sit there and say that the regulations are okay right now?

MR. O'NEIL: Yes, sir.

MR. CLARK: Without knowing what happened to the jackscrew?

MR. O'NEIL: Yes, sir.

MR. CLARK: Okay.

MR. GUZZETTI: The wear-critical items, is that -- is the Acme nut in the FAA's view considered a wear-critical item, and, if so, how is it addressed in CAR 4.b?

MR. O'NEIL: Well, would you define what you mean by "wear critical"?

MR. GUZZETTI: That a part -- I would define wear critical as a part that is critical in terms of it could be a catastrophic failure if it wears out.

MR. O'NEIL: The Acme nut is considered primary structure, and I presume we're speaking specifically to the Acme nut in this case.

MR. GUZZETTI: That's correct.

MR. O'NEIL: The Acme nut is considered as primary structure. Therefore, it meets the 4.b201 requirements for ultimate strength and deflection at limit load.

MR. GUZZETTI: Okay. Oh, I'm sorry.

MR. O'NEIL: I lost track of the question.

I'm sorry.

MR. GUZZETTI: I'm sorry. I knocked you off track. Is this jackscrew life limited or was it life limited initially in the design?

MR. O'NEIL: Not from the type design design requirements. No, sir, it was not.

MR. GUZZETTI: Okay. And if a part is not life limited, is it addressed -- is its health addressed in some other fashion?

MR. O'NEIL: In the recommended maintenance program proposed by the operator for that type design.

MR. GUZZETTI: Okay. Do you know if ball screws are life limited?

MR. O'NEIL: I know of the existence of ball screws, and Boeing's explanation of them yesterday is about as much as I know about them.

MR. GUZZETTI: Okay. Let me move on to another topic, and that's the DC-9 fault analysis that was performed in 1965. Was -- why was that required of Douglas back then?

MR. O'NEIL: That was required in the regulations for any application for a type design.

MR. GUZZETTI: Okay.

MR. O'NEIL: And I presume you're referring

to 4.b606.

MR. GUZZETTI: That's correct, and I actually have a slide for that, but I'm not going to throw it up there.

And was that DC-9 fault analysis acceptable -- oh, there it is. Thank you very much, Dana. Was that fault analysis acceptable to the FAA as adequate compliance for the DC-9 certification?

MR. O'NEIL: Yes.

MR. GUZZETTI: Did -- in your opinion, did that fault analysis address specifically a failure of the Acme nut threads?

MR. O'NEIL: No, it did not.

MR. GUZZETTI: Why, in your opinion, did it not address that, and why was that -- why did it not address that?

MR. O'NEIL: Failure analyses at that time and at this time as well or safety analyses do not consider wear as a mode of failure to be considered in the analysis, either a -- now I've lost the words -- either in a numerical analysis or a subjective analysis.

MR. GUZZETTI: Okay. Were follow-on models of the DC-9, like the MD-80 and the 717, were they

required to receive a new updated fault analysis for the horizontal stabilizer jackscrew assembly?

MR. O'NEIL: As a derivative design, the new portions of the MD-80 and the MD-90 and the 717 were required to meet the then current regulations. The jackscrew assembly, as it was essentially the same, at least in design principles, from the DC-9 and had exhibited a satisfactory or acceptable service history over the life of the DC-9 up to the certification of the MD-80, did not have to require -- did not have to comply with later regulations.

However, the FAA and the Boeing -- the Douglas Airplane -- Douglas Aircraft Company, McDonnell-Douglas at the time, elected to comply with later regulations in effect on the date of application for the MD-80 series airplanes.

MR. GUZZETTI: Okay. Boeing testified yesterday that maintenance intervention basically provides an equivalent degree of safety to a part that's designed such that the hardware is fail-safe. Would you agree with that?

MR. O'NEIL: Would you repeat that? Because one of the first words I would not agree with.

MR. GUZZETTI: Okay. Boeing testified

yesterday that the Acme nut design was -- provided "an equivalent degree of safety" with maintenance intervention as opposed to a part that, regardless of maintenance intervention, was fail-safe or was impervious to any kind of catastrophic effect due to failure.

MR. O'NEIL: Let me offer that no parts of the airplane are impervious to failure from any reason. The type design includes maintenance requirements as part of the type design that are expected to maintain the airplane in such a condition that it will meet the type design requirements.

In this particular case, the Douglas design of the Acme nut and Acme screw provided enough over-strength so that the regulatory requirements could be met with a significant amount of wear.

If you go to -- back to Dr. Khaled's observations that the new threads can carry well over two million pounds, if you wear half the threads, you might conclude that that worn nut could then carry over one million pounds, and as Boeing testified, there are still very high factors of safety or margins of safety with the nut in worn conditions.

MR. GUZZETTI: Well, let me go back to the

first part of your answer that you just gave. You talked about the type certificate data sheet does account for maintenance requirements.

MR. O'NEIL: The type design requirements do.

MR. GUZZETTI: Okay. And are those known as certification maintenance requirements?

MR. O'NEIL: No, sir.

MR. GUZZETTI: They're not? What are they known as or how are they addressed?

MR. O'NEIL: Certification maintenance requirements are related to a numerical analysis, numerical safety analysis of systems, and they are provided to assure that the failure rates presumed or in the safety analysis are indeed satisfied.

That is to say, that if a failure rate is assumed in the analysis, and there is insufficient data at that time to demonstrate that that failure rate is justified, then certification maintenance requirements are imposed to assure that that component does indeed meet the assumed failure rate.

MR. GUZZETTI: Was the horizontal stabilizer actuation jackscrew maintenance tasks? Were they certification maintenance requirements in the type design of the DC-9?

MR. O'NEIL: No, sir.

MR. GUZZETTI: They were not? Well, then I'll go back to my previous question, where you indicated that the type design does consider maintenance.

If the jackscrew isn't under the certification maintenance requirements, is there another part of the regulation or is maintenance addressed in another way than CMRs?

MR. O'NEIL: It's in the maintenance program recommended by the type design holder or type certificate holder --

MR. GUZZETTI: Okay.

MR. O'NEIL: -- as a regulatory requirement.

MR. GUZZETTI: Is there a specific tie-in or language within the CAR 4.b that connects the maintenance program with catastrophic failure or the fact that it is -- it must be required to ensure the safety of the airplane?

MR. O'NEIL: Not in the certification requirements.

MR. GUZZETTI: Okay. Let's talk a little more about the fault analysis. This was something that was done back in the early '60s. Have there -- has the

FAA put out guidance since then with the FAR 25 about other types of analyses?

MR. O'NEIL: Yes.

MR. GUZZETTI: And can you briefly describe what some of those analyses are?

MR. O'NEIL: Well, let's go back to, say, the 4.b606 was recodified as Part 25, Paragraph 1309. There is an advisory circular, Advisory Circular 25.1309, that addresses the requirements for a system to meet -- to comply with that portion of the regulations, and the advisory circular, among other things, identifies that both flight crew and ground crew, meaning maintenance activities, can reasonably expect it to be performed properly and at the times that they are supposed to be accomplished, as an assumption, in the failure analysis -- safety analyses.

MR. GUZZETTI: Okay. Is that -- is 1309 a risk analysis, in your opinion?

MR. O'NEIL: 1309's a safety analysis.

MR. GUZZETTI: Safety analysis? And does 1309 guarantee that it will identify all potential deficiencies in an aircraft certification?

MR. O'NEIL: I don't believe there's anything as absolute -- as an absolute in identifying all the

potential failure modes. The failure modes that are addressed are the failure modes in the system that we can identify at the time.

MR. GUZZETTI: Okay. Along those lines, was the design of the jackscrew, specifically the Acme nut and Acme screw, as well as the lower stop collar, was that required to meet 1309 analysis, either back in the '60s or beyond?

MR. O'NEIL: No, sir. Because 1309 is specific to systems, and an analysis of 1309 type analysis of structure is not appropriate.

MR. GUZZETTI: Okay.

MR. CLARK: What is the equivalent? Is there an equivalent to 1309 for structures?

MR. O'NEIL: It would probably be 25.571, where you do the fatigue evaluation to determine if fatigue is likely or identify any principal structural elements, and then provide for a threshold and repetitive intervals for inspection to assure that any cracks which may develop in principal structural elements would be detected before they become critical at limit load.

MR. CLARK: You said that 25.571?

MR. O'NEIL: Yes, sir.

MR. CLARK: Okay. Then, 1309, is that the systems safety type of -- where systems safety-type analyses would play into 1309?

MR. O'NEIL: Yes, sir.

MR. CLARK: Okay. But you're saying that for the jackscrew and the nut, that 1309 doesn't apply, but if we have -- but 571 deals solely with fatigue. How do we -- what regulation would apply to this excessive wear that went on? What goes into that to assure that we don't end up in an excessive wear situation to have a catastrophic failure?

MR. O'NEIL: As there were or as there was in CAR 4.b, there is a requirement that the type certificate holder prepare a recommended maintenance program as part of the type design.

MR. CLARK: Okay. So, it goes back to the maintenance program as the assurance that that isn't going to go into an excessive wear state. That's the regulation basis to --

MR. O'NEIL: That's the regulatory basis under the type certification requirements, yes.

MR. CLARK: Okay.

MR. BERMAN: Mr. O'Neil, how can you make -- this is Ben Berman. How can you maintain that the stop

collar is structure and not a system when Boeing explained yesterday that its purpose is to transmit the torque from the torque tube to the Acme screw?

MR. O'NEIL: I don't recall making that statement, sir. The lower mechanical stop is a rotational stop which only acts in the event that the electrical shut-off controls fail to shut off the motors.

MR. BERMAN: And you say that's structure and not system?

MR. O'NEIL: The system aspect of the design has to do primarily with everything above the gear box, from the gear box through the motors back to the indication system in the cockpit.

MR. BERMAN: How did you determine that or how does the FAA make that classification?

MR. O'NEIL: Because those portions of the structure don't carry primary loads, primary flight loads, that portion of the jackscrew system, the pitch trim system. From the transmission case through the engines -- I'm sorry -- through the motors, back through the cockpit, does not carry primary flight loads.

MR. BERMAN: So, because this part carries

primary flight loads, the FAA didn't require Boeing to conduct a systematic safety analysis?

MR. O'NEIL: The regulations don't require a 1309-type analysis. No, sir. But they do require that ultimate strength, limit strength and fatigue strength be addressed.

MR. GUZZETTI: So, Mr. O'Neil, basically 1309 is for systems and doesn't really apply to primary structure, is that --

MR. O'NEIL: That's correct.

MR. GUZZETTI: Okay. So, let's talk a little bit about what the FAA does whenever they discover -- well, how -- whenever they discover an unsafe situation or an unsafe condition, does -- if an unsafe condition is discovered that wasn't previously caught in the design of the airplane, does the FAA have a process by which to address that?

MR. O'NEIL: Yes, sir.

MR. GUZZETTI: And what is that process?

MR. O'NEIL: That process is found under Part 39, Airworthiness Directives.

MR. GUZZETTI: What is an airworthiness directive?

MR. O'NEIL: An airworthiness directive is,

as it says, it's a directive to address an airworthiness condition that either exists or is likely to exist in a certificated product. In this particular case, an airplane.

MR. GUZZETTI: Did the FAA issue an airworthiness directive as a result of this accident?

MR. O'NEIL: Yes, sir.

MR. GUZZETTI: And --

MR. O'NEIL: Three days after the horizontal stabilizer and jackscrew were raised from the ocean floor, the FAA issued an emergency airworthiness directive.

Myself and several others, both in Long Beach and Seattle, worked through the night to approve the service bulletin that was referenced in that airworthiness directive and to publish that airworthiness directive.

MR. GUZZETTI: Why did you issue that airworthiness directive?

MR. O'NEIL: Because it appeared the safe thing to do at that time, because we didn't know, and we still don't know, what caused that accident.

MR. GUZZETTI: Basically, what did that initial airworthiness directive state? What did it

require operators to do?

MR. O'NEIL: It required very short compliance time to perform an inspection of the jackscrew assembly area and lubricate the jackscrew assembly every 650 hours flight time, hours time in service.

It also required the accomplishment of the end play inspection at 2,000 hour intervals. 2,000 flight hour intervals.

MR. GUZZETTI: What was the specific concern that drove you to those requirements?

MR. O'NEIL: Well, as was stated in previous testimony yesterday, when the jackscrew was -- I don't want to say inspected because of the connotation, but when it was examined after being raised from the ocean floor and washed on the ship and washed on the shore, there was very little evidence of lubricant on the screw assembly, on the jackscrew itself, and it seemed the most prudent action to assure safety for the remainder of those airplanes to require an inspection of the jackscrew assembly, to require lubrication of the jackscrew assembly, and to do repetitive inspections to evaluate the screw nut thread interface.

MR. GUZZETTI: There's -- to be even more

specific, the -- what was the inspection -- what was the main part of the inspection trying to check for? What were some of the things, the major things that the operators were required to check for?

MR. O'NEIL: Oh, pitting and gouging condition of the screw itself, the existence of lubricant, and if there is no lubricant or little lubricant, apply lubricant, which I don't recall exactly when the nut itself was raised, but again as was testified to yesterday, that there was little or no thread in the nut itself nor was there evidence of lubricant.

MR. GUZZETTI: Was one of the inspection procedures to perform an end play check?

MR. O'NEIL: Yes, sir.

MR. GUZZETTI: Was that check to determine if the thickness of the Acme nut thread was sufficient?

MR. O'NEIL: That was to determine that the wear of the Acme nut was within the limits prescribed by the type design.

MR. GUZZETTI: And did I understand you correctly that another part of that airworthiness directive was for more frequent lubrication or to ensure that the jackscrew was lubricated properly?

MR. O'NEIL: Yes, sir. That was in compliance with the manufacturer's recommendations.

MR. GUZZETTI: And was that concern driven out of observations that FAA representatives had made as a result of the accident investigation and examination of the wreckage?

MR. O'NEIL: As I believe I already stated that the evidence -- when the horizontal was raised with the jackscrew assembly, that there was little evidence of grease or lubricant on the threads of the jackscrew, and as with any assembly where there's relative motion, you need to have a lubricant to assure that the presumed wear rates are maintained.

MR. GUZZETTI: The end play portion of the airworthiness directive, do you believe that maintenance procedure and end play check is susceptible to human error?

MR. O'NEIL: I believe that any time you put men in the system, there is a possibility of human error.

MR. GUZZETTI: Are you -- because that procedure is susceptible to human error, are you concerned that the measures specified in that airworthiness directive will not sufficiently protect

the DC-9 and the MD-80 and the 717 fleet from the potentially catastrophic effect of an Acme nut thread failure?

MR. O'NEIL: Oh, no, sir. I believe that that inspection will determine the relative wear of the Acme nut and Acme screw and allow for their replacement as prescribed in the type design or in the maintenance instructions.

MR. GUZZETTI: What is your level of confidence that that procedure will be done properly in order to yield an accurate end play result?

MR. O'NEIL: You're asking for a probability and level of confidence that that inspection will be accomplished properly?

MR. GUZZETTI: That's correct.

MR. O'NEIL: I don't have a number for that.

MR. GUZZETTI: Just generally, though, is it high confidence, low confidence?

MR. O'NEIL: It's not low confidence. We have witnessed and observed the end play inspections on several airplanes several different times, and with properly-trained and equipped mechanics doing the inspection, it seems to be quite reliable.

MR. GUZZETTI: Okay. There was a second

airworthiness directive that was issued by the FAA as a result of this accident, is that correct?

MR. O'NEIL: There was a final rule following the issuance of the emergency AD which the requirements remained the same.

MR. GUZZETTI: What were the differences between the one that was issued just after the accident and the one that was issued to supersede it, the one you just mentioned?

MR. O'NEIL: The superseding -- well, the one I just mentioned was the publication of the final rule following telegraphic AD.

MR. GUZZETTI: Okay.

MR. O'NEIL: Then there was a subsequent supersedure.

MR. GUZZETTI: The supersedure. Could you please describe the differences between the super -- the AD that superseded the initial final rule, the basic differences?

MR. O'NEIL: Yes. The basic differences are a revised requirement to do the inspections and end play checks per Revision 2 of the specific service bulletins, which, because of more experience, are slightly less conservative as far as the requirements

for removal and replacement of the jackscrew assembly, meaning that if you find what you expect to find in the grease, you don't have to replace the jackscrew.

If you find what you don't expect to find in the grease, then you still have to replace the jackscrew. It's --

MR. GUZZETTI: Okay.

MR. O'NEIL: -- a further refinement of the requirements for the inspections and maintenance -- lubrication requirements and the end play, and we added the free play check, which is, as mentioned yesterday, the examination of the spherical bearing at the top of the jackscrew assembly.

MR. GUZZETTI: The -- does that AD require operators to report back what the end play check is on all of their MD-80, DC-9, 717 units?

MR. O'NEIL: Yes, sir, as did the early one.

MR. GUZZETTI: Okay.

MR. O'NEIL: The original ADs. Those requirements -- the original reporting requirement was to the FAA. In Revision 2 and in the superseding AD, we changed that requirement to report directly to the Boeing Company, so that they would be able to have all the data that they might need to evaluate what happened

to this jackscrew or what happened on this particular airplane, and that data has been shared with both the NTSB and the Boeing Company.

MR. GUZZETTI: And the FAA, also?

MR. O'NEIL: Yes, sir.

MR. GUZZETTI: Okay. The -- what has -- will that AD stay in force with those requirements specified in that airworthiness directive -- well, let me make it more simple.

Will that airworthiness directive remain current and in force from here to eternity or is there some process for terminating action that will be involved?

MR. O'NEIL: If there is any terminating action proposed, the FAA will evaluate that proposal to assure or to determine whether it provides the level of safety expected by the certification requirements.

MR. GUZZETTI: How specifically will that -- what specifically is involved in that process of determining a terminating action?

MR. O'NEIL: In the general case, the type certificate holder, as one of the responsibilities of the possession of that type certificate, is required to address any service activities, and if there are

problems or service difficulties, and if there are problems with the design, they are required to create a remedy for that problem, and the FAA has discretionary authority whether or not to require that that -- whatever that modification or change might be.

MR. GUZZETTI: Have -- has the FAA made any final decisions on what the terminating action will be in regard to a final decision on end play check interval and lubrication interval --

MR. O'NEIL: No, sir.

MR. GUZZETTI: -- of the jackscrew?

MR. O'NEIL: Until that decision or determination is made, the AD, as currently written, will remain in effect.

MR. GUZZETTI: Do you know when -- can you estimate when that terminating action will take place?

MR. O'NEIL: No, sir.

MR. GUZZETTI: Okay. And do you know, can you estimate or do you know if those intervals will be expanded as part of the terminating action?

MR. O'NEIL: No, I do not.

MR. GUZZETTI: Okay. Let me turn to another airworthiness directive. It was mentioned yesterday. It's Exhibit 9-V as in Victor. It's an airworthiness

directive that was issued against the MD-11.

Are you familiar with this airworthiness directive?

MR. O'NEIL: Yes, sir.

MR. GUZZETTI: And why did the FAA issue this airworthiness directive?

MR. O'NEIL: This airworthiness directive was issued in response to an escape from the production quality control system of some jackscrews for the MD-11 horizontal stabilizer, in that the surface finish on those jackscrews were not within type design requirements.

MR. GUZZETTI: What was the result of those jackscrews that -- the effect of those jackscrews that were not in compliance?

MR. O'NEIL: As mentioned yesterday, one of them wore completely through on one jackscrew. However, the airplane remained within the fail-safe type design requirements for the airplane in that the remaining jackscrew is capable of supporting limit load without failure.

MR. GUZZETTI: If that was the case, why did the FAA issue the airworthiness directive then?

MR. O'NEIL: Because of the, I'll use the

term, "unlikely probability" that both jackscrews could wear or both Acme nuts could wear at the same rate and result in the failure of both Acme nuts at the same time.

MR. GUZZETTI: Would you agree that the installation of a second jackscrew in the MD-11 design provides a level of redundancy to the failure of the system with regard to Acme nut thread stripping? Would you agree with that?

MR. O'NEIL: Not as stated.

MR. GUZZETTI: How would --

MR. O'NEIL: I would agree that the type design requirements for the MD-11 are met through the design which includes two jackscrews.

It must be remembered that the DC-9 started off with about an 80,000-pound airplane. The MD-80s go up to about a 140,000-pound airplane. The DC-10 can get up to 900,000 pounds.

So, consequently, the loads on the horizontal tail are significantly greater than the loads on the DC-9, MD-80 or the twin jet series horizontal tail.

MR. GUZZETTI: Okay.

MR. O'NEIL: Therefore, -- and I don't know for sure if it's necessary that two jackscrews are

required to carry the type design loads, but it is necessary for one jackscrew to carry limit load.

MR. GUZZETTI: Okay.

MR. CLARK: Let me ask a question on that. What I hear you saying is that because the loads are so high, it's easier to use two jackscrews to carry those loads. Is that where you're getting that?

MR. O'NEIL: It may be necessary in the design. Again, the FAA does not dictate the design. The --

MR. CLARK: I understand that.

MR. O'NEIL: -- FAA provides certification requirements, that an applicant for the type design can provide whatever means they deem fit, provided it does satisfy the requirements, and the applicant is able to demonstrate those requirements to the FAA.

MR. CLARK: And the rough wear on the MD-11 -- the high wear rate on the MD-11 was because of a finish on the jackscrew?

MR. O'NEIL: Yes, sir.

MR. CLARK: Okay. In that case, had they -- is it conceivable to you that they could have designed that system with a single jackscrew unit and met all of the requirements?

MR. O'NEIL: It's conceivable, yes.

MR. CLARK: Yes. And if we would have had that high wear rate that wore through the brass nut, we could have had a catastrophic failure on that airplane, also. That airplane got to that point.

MR. O'NEIL: Well, the design requirements are such that again there is a maintenance program required as part of the type -- maintenance recommendation required by the type design, and we presume that that -- that those maintenance requirements are complied with when and by whom they're supposed to be accomplished.

MR. CLARK: Let me just follow up on that. You say the maintenance -- it's a maintenance recommended -- it's recommended maintenance. Does that mean the FAA doesn't require it or approve it?

MR. O'NEIL: As part of the type certification process, the FAA requires that the type certificate holder or the applicant provide a recommended maintenance program.

MR. CLARK: But the operator doesn't have to use it or does he have to use it? Let me ask you.

MR. O'NEIL: That's not in the certification venue and therefore out of my particular expertise.

MR. CLARK: Okay. But if it's recommended as you suggest, and the -- if the operator doesn't have to use it, is there going to be a hole there for what you assumed -- you assume something's going to happen, and, so, you can certify a certain part or piece, but if that recommended practice doesn't happen the way you assumed it was going to, could there be a hole there that could give us problems? Where's the problem in -- how does the FAA assure that all of these things fall into place?

MR. O'NEIL: Well, again the FAA for certification requires that the applicant demonstrate compliance to the applicable certification rules.

MR. CLARK: Right.

MR. O'NEIL: One of those certification requirements is the preparation of a recommended maintenance program.

MR. CLARK: And it can go out the door with that?

MR. O'NEIL: Yes, sir. And the type design will be maintained. Remember that the type design is not a product. It is not an airplane. The type design is the design from which that airplane can be built.

MR. CLARK: Okay. And if it goes out -- if

an airplane goes out the door, and that recommended practice isn't accomplished, then from a certification standpoint, is there any guarantee that that airplane could be operated safely?

MR. O'NEIL: Again, operations is not in my area of expertise.

MR. CLARK: Okay.

MR. GUZZETTI: I think Mr. Rodriguez has a question before I finish up.

MR. RODRIGUEZ: Before we get too far afield from my interest of the AD on the MD-80s, did not the AD essentially return to the original recommendations of the manufacturer at the time of certification for end play and lubrication?

MR. O'NEIL: I cannot say with certainty that that is true. All I can say is that the type certificate holder presented a recommendation -- a recommended maintenance program.

I believe from my service history or service -- in-service problem experience, that the 650 hour lubrication interval is what was recommended by the company. Yes, sir, from that standpoint.

MR. RODRIGUEZ: All right, sir. And at the time that you were working all night long after the

accident, what was the manufacturer's recommendation as to the standards that should be used for that AD?

MR. O'NEIL: They recommended -- the Boeing Company created three service bulletins applicable to the DC-9, MD-90, 717, that reiterated their recommendation for lubrication intervals, and at that time, that was 650 hour repetitive lubrication and a 2,000 hour end play check, and the --

MR. RODRIGUEZ: So, the AD reflects the manufacturer's recommendation?

MR. O'NEIL: Yes, sir, in this case.

MR. RODRIGUEZ: Now, I'm interested in the life of an AD. How do you -- I know how it gets started. I'm wondering how does it end? What process takes place typically? Are you familiar with ADs and that sort of thing --

MR. O'NEIL: Yes, sir.

MR. RODRIGUEZ: -- in that respect? Do you initiate it? Does an operator initiate it? Does a manufacturer -- where does it come from?

MR. O'NEIL: As the AD is published, it identifies what the FAA believes is necessary to assure the safety of the fleet, and if no one recommends or suggests or proposes to us any alternative method of

compliance, then the FAA is happy with the level of safety provided by that particular airworthiness directive, in general.

MR. RODRIGUEZ: Well, let me lead you a little. Does it require something like redesign or strengthening of a part or something of that nature before that AD is ever rescinded?

MR. O'NEIL: Those are options that may be proposed for terminating action, yes.

MR. RODRIGUEZ: Would in-service experience be an option? That is how we got to the standards that were being used at the time of the accident, isn't it?

MR. O'NEIL: Yeah. It's an acceptable service history that may be used in the type certification for follow-on models.

MR. RODRIGUEZ: And what role do you play in any activity that would -- with respect to an AD, that would be predicated on in-service experience? What standards do you apply as the Aircraft Certification Office?

MR. O'NEIL: Type certification requirements. Any modification that is proposed for the type design must continue to meet the type certification requirements before it would be approved by the FAA.

MR. RODRIGUEZ: Well, the DC-9, as I've understood your testimony, and I'm subject to error, of course, was certificated with a maintenance recommended program, which required or -- I don't know whether -- I don't know -- basically your testimony, I don't know whether it's a request, a requirement or a recommendation.

MR. O'NEIL: It's a requirement that the type certificate -- the applicant for a type certificate must create a recommended maintenance program.

MR. RODRIGUEZ: Okay. But when we move the aircraft on to the operator, and he begins to operate the aircraft, at what point, from your perspective, the FAA Aircraft Certification, from what perspective do you apply standards with respect to experience of the aircraft to increase the intervals at which that maintenance program could be changed?

MR. O'NEIL: Aircraft certification as such in the scenario you present would not be involved. The maintenance program must exist. The maintenance recommendation must exist.

MR. RODRIGUEZ: May I ask, is Mr. Koegel listening to the testimony?

MR. KOEGEL: I am.

MR. RODRIGUEZ: Thank you, sir. I guess what I'm concerned about is can the industry, an operator, based on his in-flight experience or in-service experience, generate sufficient motivation or pressure to rescind an AD, such as we're talking about here on the DC-9 that came out of this accident?

MR. O'NEIL: Any operator is eligible to propose an alternative method of compliance to an airworthiness directive. In evaluating that proposal, the FAA would have to determine that that proposal meets the type design or demonstrates compliance to the type design requirements.

MR. RODRIGUEZ: That would be a Flight Standards function for them to accept that alternate thing or would it be -- would it involve Aircraft Certification as well?

MR. O'NEIL: No. The Aircraft Certification Offices or the Aircraft Certification Service is responsible for the maintenance of ADs. The --

MR. RODRIGUEZ: Well, if I was Alaska Airlines, and I went to my Aircraft Certification Office or -- at Seattle and said to my principal maintenance inspector, I have now flown this thing for one year, lubricating this thing every 650 hours, it's

very cumbersome, and it's very expensive, and I want -- I've flown these airplanes 10,000 hours this year. I'd like to increase it to 10,000 hour interval. Could I do that?

MR. O'NEIL: You could do it, but the principal maintenance inspector is not authorized to relieve the requirements of an airworthiness directive.

MR. RODRIGUEZ: I thought you said they could. I thought there were alternate plans or options available.

MR. O'NEIL: An operator may request from the ACO -- in this particular case, it would be the Los Angeles Aircraft Certification Office. They could propose an alternative method of compliance to the requirements of the AD.

If the FAA, meaning the ACO, determine that that alternative -- that proposed alternative method of compliance demonstrated compliance to the regulations and provided an acceptable level of safety, that proposal could be accepted by the Los Angeles ACO. Any operator has that option.

MR. RODRIGUEZ: Have you had any discussions or input or any comments from the operators with respect to this AD?

MR. O'NEIL: I'm sorry?

MR. RODRIGUEZ: Have you had any comments, input, discussions, reports with respect to the terminating or complying with the AD, continued compliance with the AD?

MR. O'NEIL: Not to my knowledge. I have not. No, sir.

MR. RODRIGUEZ: Would you get some of that feedback?

MR. O'NEIL: I would be in the loop of evaluating that proposal, yes.

MR. RODRIGUEZ: All right, sir. Now, I have one other area that I was curious about. With respect to the AD on the MD-11s, and you were saying that you have that second jackscrew applied there, I may have missed it, but what is the reason for the second jack-screw?

MR. O'NEIL: The reason for the jackscrew would have to be addressed by the Boeing Company. It's their type design.

MR. RODRIGUEZ: Well, if it was the remedy for -- and resulted in an AD, you would be involved in making the decision that that was adequate, wouldn't you?

MR. O'NEIL: Yes, sir.

MR. RODRIGUEZ: So, what was the reason that you found that that was adequate for whatever the problem was?

MR. O'NEIL: I'm not sure I understand the question.

MR. RODRIGUEZ: I don't need to take up the time here to get the answer. Thank you.

MR. GUZZETTI: Just -- I'm at the end here. I just want to ask you, Mr. O'Neil. Do you consider the MD-80, DC-9 and 717 horizontal stabilizer jackscrew assembly a critical flight control system?

MR. O'NEIL: I consider the pitch trim system --

MR. GUZZETTI: You consider the pitch trim system a critical flight control system?

MR. O'NEIL: I consider the pitch trim system to be primary structure, portions of it to be primary structure, and therefore required to demonstrate compliance to the structural requirements.

MR. GUZZETTI: Okay. Do you believe that redundancy is critical in primary structure as a basic tenet in the design of commercial transport airplanes?

MR. O'NEIL: If, by redundancy, you mean that

each and every element has to provide two separate and distinct load paths, no, sir.

MR. GUZZETTI: Do you believe that the DC-9 design of the horizontal stabilizer system is currently a safe design?

MR. O'NEIL: I believe that the current design of the MD-80, DC-9, 717, MD-90, pitch trim system demonstrates compliance to the applicable regulations and provides the level of safety associated with those certification requirements.

MR. GUZZETTI: Do you -- would you agree that the Acme screw and the Acme nut is part of the pitch trim system?

MR. O'NEIL: I would agree that they are part of the primary structural load path.

MR. GUZZETTI: Would you agree that they're also part of the system, also?

MR. O'NEIL: They are -- if you mean does -- do the requirements of 1309 -- are the requirements of 1309 applicable to the structure portions of the pitch trim system, the answer is no.

MR. GUZZETTI: Well, that's not the question. The question is, is the Acme screw and nut required to have successful operation of the pitch trim system?

MR. O'NEIL: I'm sorry. When I was coughing, I missed the question.

MR. GUZZETTI: That's okay. Is the Acme nut and Acme screw required to successfully operate the pitch trim system?

MR. O'NEIL: For operation of the pitch trim system, to be able to change the pitch trim, the Acme screw and Acme nut must be in compliance with their type design requirements.

MR. GUZZETTI: Okay. Would you agree, though, that those two components are needed -- are required to be in that assembly in order to make the horizontal stabilizer trim system operate?

MR. O'NEIL: For this design, yes.

MR. GUZZETTI: Okay. Would you agree with -- do you agree that there was a common process that was occurring inside of the Acme nut that caused both load paths, i.e. both thread spirals, to fail, thus defeating the redundancy of the intent of those -- of both thread load paths?

MR. O'NEIL: I agree that that's what we are here to help determine.

MR. GUZZETTI: Okay. Mr. Chairman, I have no further questions.

MR. HAMMERSCHMIDT: Thank you, Mr. Guzzetti. Currently, are there any other questions from the Technical Panel?

(No response)

MR. HAMMERSCHMIDT: Very good. Well, we are almost exactly one and one-half hours into this second day of the hearing, and as I indicated yesterday, our time line plan for each day will be to go for close to an hour and a half, take a break, and then we'll have a lunch break between 2 and 3 p.m., and realizing that we each have operating systems that sometimes need attention, we will recess for 15 minutes.

(Whereupon, a recess was taken.)

MR. HAMMERSCHMIDT: Could we please take our seats? Our 15-minute break stretched to about 23 minutes. Sometimes that happens, and for those viewing this public hearing via closed-circuit television out on the West Coast, I would just say that sometimes our breaks are not precisely what we have indicated they will be.

They vary by a few minutes, and in terms of situational awareness, on everyone's part, especially those here in the hearing room, as we mentioned yesterday, this public hearing is being carried as a

live webcast on the Internet. Therefore, there may be people in all the continents watching this.

It's time now to continue the -- with Witness Mike O'Neil. Are there other questions at this point from the Technical Panel before we go to the Parties?

(No response)

MR. HAMMERSCHMIDT: Very good. Now, we go to the Parties to the public hearing for questions, and we begin with the Air Line Pilots Association.

CAPTAIN WOLF: Thank you, Mr. Chairman.

Mr. O'Neil, as I understand it, and please correct me if I'm wrong on this, as a structural component, doesn't the Acme nut require a fail-safe design for certification?

MR. O'NEIL: As a certification requirement, the Acme nut is required to be evaluated to determine whether it is -- could be considered fatigue -- an element which is conducive to fatigue failure, but it must meet the ultimate strength and deflection at limit load requirements.

CAPTAIN WOLF: Well, in this design certification as it relates to the wear, would it be reliant upon the operator establishing and implementing an FAA-approved maintenance program?

MR. O'NEIL: The question of the operator or the subject of an operator having an FAA-approved or accepted maintenance program is not a type certification question, sir, and therefore is outside my expertise.

CAPTAIN WOLF: Okay. I guess what I'm partially concerned with then is that in the case of this -- with the Acme nut, the human interaction would be used to replace any type of physical fail-safe design. So, we're asking for a human interaction to come in here and help with this fail-safe design, whatever that might be. Would you agree with that?

MR. O'NEIL: Would you repeat that, please? I'm not sure I agree with it as stated.

CAPTAIN WOLF: Well, with the -- in the case of the Acme nut here, any human interaction that we have, whether it's a maintenance crew, other personnel within the company's organization, that if we do not have a true fail-safe design on this particular nut, then we're relying upon maintenance or operations to interact and to supplement into the fail-safe design program.

MR. O'NEIL: I don't think I can say I agree with that a hundred percent in that you're requiring --

you're saying -- you're asking me to state that human intervention is absolutely, positively necessary. Is that the statement?

CAPTAIN WOLF: Well, if we're looking at end play checks, and we're looking at proper lubrication schedules, and proper grease is being used, then this is something that is going to help detect failure or failure rates within the jackscrew itself.

So, what we're doing is we are calling upon the human interaction to detect wear or failure wear within the system itself, and this is dependent upon the maintenance program.

So, I guess that's what I'm trying to get at, is that the maintenance program is -- it either is or isn't going to back up the fail-safe design. So, there's not a proper fail-safe design.

Did the FAA feel that perhaps the maintenance program then was going to somehow supplement that?

MR. O'NEIL: Not as stated. Not supplement the type design. Newtonian physics tell us that we're all limited by in this world require that whenever two pieces of material rub together or are in close contact and moving, there is going to be wear. That wear is to be addressed or the fact that that wear exists is

evidenced in the recommended maintenance program by the type certificate holder, and there will be other folks testifying after myself as to the particulars of the maintenance program requirements.

CAPTAIN WOLF: Okay. Let me move on to another question here, and the question I have is on the failure of the -- the possible failure of the redundancies of the jackscrew and the gimbal nut itself.

If we look at the jackscrew having a fracture, and let's say this fracture occurs above the gimbal nut, at that point, the stabilizer trim system would be inoperative, correct?

MR. O'NEIL: Yes, sir.

CAPTAIN WOLF: Okay. If you have a failure of the jackscrew itself within the gimbal nut or below the gimbal nut, would the trim system be operative?

MR. O'NEIL: That's a subjective question, and I don't have a good answer for that.

CAPTAIN WOLF: We're trying to look here as far as the redundancies that are built into the program here, and to look at the various failure modes that we would have. For instance, if you end up -- these three examples of the failure mode, whether in fact the crew

would know it.

So, perhaps it would be better if you could explain to us then these various failure modes and the redundancy built into that particular system there.

MR. O'NEIL: I think the Boeing Company did that quite adequately yesterday, but let me try and summarize, that if the jackscrew fails, then the torque tube remains to carry primary flight loads, and the system will stall. The horizontal stabilizer will no longer be movable.

During the certification program of the MD-80, because there were differences, although slight, in the pitch trim, the length of the jackscrew and the pitch trim system, it was required to do flight tests to assure that with that new jackscrew, even though it's only slight change in length, that the trim capability of the airplane was still maintained, and that was accomplished.

CAPTAIN WOLF: Okay. But how about in these four specific modes? As I tried to explain just a little earlier here, the jackscrew failure above the nut -- want me to give you all four of them at once or do you want to take one at a time?

MR. O'NEIL: No. Let's do them one at a

time, please.

CAPTAIN WOLF: Okay. All right. The jackscrew failure above the nut.

MR. O'NEIL: Depending upon how far above the nut that failure is, you probably will notice very little difference in the pitch trim capability of the airplane.

As the horizontal is moved or commanded movement, when the failure moves into the nut, I don't know what will happen, but the worse probability I can think of is that the stabilizer jams, and during our assessment of the pitch trim system, wherever the stabilizer might jam or run away to during its normal positioning in flight, the airplane is capable of continued safe flight and landing with the normal pitch control system.

CAPTAIN WOLF: All right. What about the jackscrew failure below the nut?

MR. O'NEIL: The jackscrew would have failed below the nut. I think as Boeing mentioned yesterday, there would be a loss of capability to rotate the jackscrew, so the horizontal would be in effect jammed in that position and again is capable of continued safe flight and landing.

CAPTAIN WOLF: Okay. And you would know that was transmitted to the cockpit because you would not have any stabilizer motion?

MR. O'NEIL: Not having -- yes. Not having stabilizer motion, yes.

CAPTAIN WOLF: Okay. What about with a complete torque tube failure?

MR. O'NEIL: As Boeing testified with the complete torque tube failure, the primary load is then carried by the jackscrew, but there is no means by which to transmit torsion to the screw to cause the screw to turn. So, you're again in a locked position, which would be enunciated to the flight crew by the fact that there was no capability to move the horizontal.

CAPTAIN WOLF: All right. Would the failure of the gimbal nut be essentially the same as a jackscrew failure below the nut?

MR. O'NEIL: I think you need to identify what you mean by a failure --

CAPTAIN WOLF: In terms of --

MR. O'NEIL: -- the nut.

CAPTAIN WOLF: -- the load that's being transferred to.

MR. O'NEIL: I don't think I understand the question well enough to respond.

CAPTAIN WOLF: Would the -- just a second, please.

(Pause)

CAPTAIN WOLF: If the gimbal nut fails, is the torque tube going to be able to maintain the entire load?

MR. O'NEIL: If the torque tube fails?

CAPTAIN WOLF: The gimbal nut.

MR. O'NEIL: If the gimbal nut fails -- again it's not easy to characterize what you mean by if the gimbal nut fails. I don't understand how you're defining failure.

CAPTAIN WOLF: Like in this particular case, if you look at the inside threads of the gimbal nut, I mean, if they're all stripped out, is the torque tube going to be able to hold?

MR. O'NEIL: In that -- well, in that situation, we're hypothesizing a lot of things, and I don't care to speculate on exactly what -- how you're characterizing failure.

CAPTAIN WOLF: Okay. Would you consider the dual thread design redundant in and of itself, and, if

so, why?

MR. O'NEIL: If you consider redundant being providing a separate independent load path, then, yes, it is.

CAPTAIN WOLF: Mr. Guzzetti had talked earlier today, and this is in reference to CAR 4.b320(a), and we had a further discussion here where CAR 4.b322 discusses connecting and transmitting elements of the primary flight control systems. Does this apply to that whatsoever?

MR. O'NEIL: Does -- I'm -- I have to claim brain failure again. Could you define exactly what you mean, please?

CAPTAIN WOLF: Well, does the system comply with that particular CAR? In other words, transmitting elements of the primary flight control systems, and whether in a connecting mode or a transmitting element?

In other words, does this assembly just comply with 4.b322?

MR. O'NEIL: Let me read that and be sure. Do you know where that is, Mr. Guzzetti?

MR. GUZZETTI: Yes. It's Exhibit 9. It's a later exhibit here. 9-W, Excerpt of CAR 4.b, Amendment Applicable to DC-9. 9-W, and the page is -- just a

moment.

(Pause)

MR. GUZZETTI: I don't know which page it is.

MR. O'NEIL: We're speaking of 322?

MR. GUZZETTI: 320, Paragraph A.

MR. O'NEIL: 320, Paragraph A. That's on Page 6 of 9-W.

MR. GUZZETTI: Thank you.

MR. O'NEIL: And the question is, does the pitch trim assembly demonstrate compliance with that requirement?

CAPTAIN WOLF: Yes. With the 4.b322?

MR. O'NEIL: Yes, sir.

CAPTAIN WOLF: Okay. This discusses a connecting and a transmitting element to the primary flight control system. Could you identify each of these elements of the horizontal stabilizer system, you know, the screw or the torque tube, the stop nuts, and whether it would be a connecting or a transmitting element?

MR. O'NEIL: I believe that if you recall the Boeing testimony yesterday, they went through all of the portions of the pitch trim assembly. Which particular element do you have reference to?

MR. HAMMERSCHMIDT: Well, Mr. O'Neil --

MR. O'NEIL: Sir?

MR. HAMMERSCHMIDT: -- and Captain Wolf, it appears like we're plowing over the same ground we plowed yesterday to a large degree, which is all right, if there's a good reason for it.

CAPTAIN WOLF: I'm just wanting to make sure that Boeing's interpretation and the FAA's standards are the same thing, that we're talking on the same line.

MR. HAMMERSCHMIDT: Okay. That's what I thought you were coming from. So, we will continue, but I would remind everyone that we are behind schedule in this hearing, and we don't want to cut off any questioning that needs to be conducted, but I just remind everyone that we are trying to run an efficient hearing.

Thank you.

CAPTAIN WOLF: Is the Acme screw itself considered a connecting or a transmitting element? Could you just answer that?

MR. O'NEIL: The Acme nut in this system is an element that connects the vertical stabilizer to the horizontal and transmits the primary flight loads.

Does that answer your question?

CAPTAIN WOLF: I was thinking the Acme nut did both of them, but that's the reason I was trying to get a clarification from yourself.

MR. O'NEIL: I believe I just said that, didn't I? That the Acme nut both connects the vertical stabilizer to the horizontal stabilizer at the leading edge, and it transmits the load from the jackscrew to the vertical stabilizer as Boeing testified to yesterday.

CAPTAIN WOLF: Okay. What about the screw itself?

MR. O'NEIL: Again, the screw itself both carries the primary loads and transmits the primary loads.

CAPTAIN WOLF: Okay. And the torque tube itself, same thing?

MR. O'NEIL: The torque tube transmits -- well, the torque tube carries primary loads and transmits them to the jackscrew.

CAPTAIN WOLF: Okay. Thank you very much. Just a few other quick questions here. On CAR 4.b305, that talked about periodic inspections and lubricating of moving parts, and I'm just wondering, yesterday

Boeing had talked a little bit about the access panel for lubricating the jackscrew, and as the original design expanded to the -80, -90, and 717, was there any thought or consideration given into putting a larger access door, ergonomically thinking, as far as perhaps making it easier access for maintenance to get in there and lubricate the required parts?

MR. O'NEIL: I think that question would best be addressed by the Boeing Company, but as a partial response, the DC-9 had accumulated about 15 years of experience and demonstrated an acceptable service history during that 15 years.

You would have to --

CAPTAIN WOLF: So, --

MR. O'NEIL: -- ask Boeing whether they were requested or decided not to increase the area or the access capability.

CAPTAIN WOLF: So, in other words, you're not aware of any type of negative feedback from the company themselves as far as saying, well, we need a bigger area or if we're looking at a different derivative of the DC-9 here as far as any feedback that possibly went to Boeing, and that might have been passed on to you folks here as far as saying maybe we need some larger

access panels, whatever, to make the lubrication a little bit better? You're not aware of anything like that?

MR. O'NEIL: No, sir, I am not.

CAPTAIN WOLF: Okay. Is there a rule -- this kind of pertains to FAR Part 25.152, that requires the applicant to furnish a continuous airworthiness maintenance program, and, if so, are you familiar with it at all, or what is it?

MR. O'NEIL: That could be better addressed by other witnesses to follow.

CAPTAIN WOLF: Do you have a particular witness, have you looked at the list, that would -- this would -- I could ask this to that would be better qualified?

MR. O'NEIL: Yes. Mr. Koegel.

CAPTAIN WOLF: Okay. I've got two other questions that kind of pertain to that area. So, if you don't feel qualified, then go ahead and let me know, but what elements of this -- well, obviously if you don't, we're talking about the continuous airworthiness maintenance program, whether we thought it was -- whether you thought it was critical to the proper operation of the MD-80 jackscrew assembly.

Would you rather have me ask Mr. Koegel that?

MR. O'NEIL: If you're asking for an opinion?

CAPTAIN WOLF: Yes. In other words, what elements of this continuous airworthiness maintenance program would you consider critical to the proper operation of the MD-80 jackscrew assembly?

MR. O'NEIL: Well, again, all I can do is iterate that as part of the type certificate requirements, the certificate holder is required to recommend a maintenance program, and if any of those elements are deemed appropriate to be included in the instructions for continued airworthiness, then they would be.

I guess I don't -- I guess I really don't feel comfortable in answering that question.

CAPTAIN WOLF: Okay. I've got two other questions that pertains to that, and I'll just save those for Mr. Koegel to come back later.

Just two last questions. You stated earlier that Mr. Guzzetti -- you stated with Mr. Guzzetti there that you feel that the system meets the fail-safe design concept.

Fail-safe design concept states that, "Many system or subsystem, the failure of any single element,

component or connection should not prevent continued safe flight."

In this particular case, failure of a system or component of that system did not allow continued safe flight. For that reason, how does this system comply with the fail-safe design concept?

MR. O'NEIL: You're referring to the 4.b270(b)?

CAPTAIN WOLF: I believe so. It's whatever discussions you had with Mr. Guzzetti. I can't remember the exact --

MR. O'NEIL: As I mentioned earlier, the type design is a design that the type certificate holder or the applicant in that case has demonstrated compliance to the FAA, and the FAA has reviewed what the applicant has presented and concurred with it and accepted it, as demonstrating compliance to the requirements of the regulations for the type design.

There seems to be a concept that wear is a readily-quantifiable item. It's not. Newtonian physics will tell you that every time two things rub together, first of all, heat's generated, and something probably will give because one's usually harder than the other.

That wear as part of a design is -- wear is considered as part of a design is absolutely necessary, and it is absolutely necessary that as with any mechanism, maintenance is necessary, whether it be an airplane, a car, your house.

If you don't maintain it, it's going to fall apart.

CAPTAIN WOLF: That was kind of my earlier question, too, was that -- I think you just answered that we are relying upon maintenance to maintain this as a fail-safe design.

So, in layman's terms, I know it's very difficult --

MR. O'NEIL: I know agree with the statement that to maintain this as a fail-safe design. Fail-safe is a property that you've built into it. In this particular case, the Acme nut is, for wont of better terms, is so over-designed, so as to indicate that the type design requirements for addressing fatigue concerns are addressed by the over-strength condition, and that's what everybody here, I believe, is terming as fail-safe.

The fatigue requirements of the design are such that you have two options. You can make a fatigue

design, which is generally considered safe life, and you do analysis supported by tests or do a test to indicate what the safe life is, and then you require that part to be replaced.

You have the fail-safe concept. If the structure is subject to fatigue failure, that you must address the fatigue aspects of the design, and in this case, the design addresses that particular portion of the rule. Because of its over-strength, it doesn't qualify as a fatigue-critical part, and wear is not considered a mode of failure.

Wear is considered something that must be addressed in the design. There -- if you refer to a 1309-type safety analysis to try and determine a failure rate for a wear item, there are none, and there's really no such thing as a wear-critical item, never has been.

I hope that addresses your concern. While it might not be the answer you want, I think that's about the best that I can answer you.

CAPTAIN WOLF: Well, I appreciate your efforts in doing that. Those are the only questions I had, Mr. Chairman.

MR. HAMMERSCHMIDT: Thank you, Captain Wolf.

Now we go to the Aircraft Mechanics Fraternal Association. Any questions?

MR. PATRICK: Yes. Thank you, Mr. Chairman.

MR. HAMMERSCHMIDT: Yes.

MR. PATRICK: Mr. O'Neil, you stated that wear is considered part of the design, of excessive or abnormal wear. Is that considered in the -- as part of the design or certification process?

MR. O'NEIL: Excessive or abnormal wear. Would you care to define those terms, please?

The instances that were addressed by Boeing yesterday, where there were wear -- excessive wear was identified for the jackscrew in '67, '84, '91, I believe are the dates. In none of those instances were the Acme nuts worn to the point that they did not or could not have been shown to comply with type design requirements.

The wear rate was designed -- was defined as excessive, which, to my definition, means that when I designed the part, I presumed a wear, identified a wear rate that I expected to see in service, --

MR. PATRICK: Okay.

MR. O'NEIL: -- and that wear rate was exceeded.

MR. PATRICK: Okay. So, in other words, any wear that wasn't predicted or forecast wouldn't really be considered in the certification process, is that correct?

MR. O'NEIL: Would you restate that, please?

MR. PATRICK: Well, any wear that was not really predicted or forecast in the product, would that be considered in the certification process?

MR. O'NEIL: That would be considered in the design, and I believe Boeing addressed that yesterday when they said they conservatively assigned an end play value of 026 with the original DC-9 requiring a placement at that time or any end play beyond that level. That was subsequently re-evaluated based on service history and evaluation of the capability of the design and determined that 040 was an acceptable value.

MR. PATRICK: Okay. Thank you. In reference to Acme nut wear, Boeing indicated yesterday that one set of threads is a principal load element, and the second thread will become a load element if the first thread fails.

The Acme nuts examined by the Metallurgical Group indicated that there was even wear simultaneously on both threads. Knowing this to be true, how do you

consider this system to be redundant, and how do you explain this meets the requirements of CAR 4.b270?

I mean, if the threads wear together, they fail together, is that right? Wouldn't that be a correct statement?

MR. O'NEIL: Not necessarily. There are other things that could happen to one thread that would preclude its capability of supporting further load, and the remaining thread is there to support the load as the design requires or as required by the certification requirements.

MR. PATRICK: Okay. You stated earlier that wear is not considered a failure for the CAR 4.b requirements. I know we've been focusing primarily on the Acme nut here, but just for clarification of your earlier statement, would you consider the consequences of, say, an engine failure, if the failure was a result of excessive wear of one of the engine bearings to be a failure under CAR 4.b?

MR. O'NEIL: Well, the engines are not certificate under CAR 4.b, and I don't know what the predecessor to Part 33 is, but they would have been certificated under those requirements, and I don't know what those requirements are.

MR. PATRICK: Okay. That's all the questions I have for Mr. O'Neil, Mr. Chairman. Thank you.

MR. HAMMERSCHMIDT: Thank you very much, Mr. Patrick. Going next to Boeing for questions.

MR. HINDERBERGER: Good afternoon, Mr. O'Neil.

MR. O'NEIL: Good afternoon, sir.

MR. HINDERBERGER: As you have so patiently stated several times today, a recommended maintenance program is to be provided by the type certificate applicant in order to receive a type certificate.

So, in that context, would you consider maintenance tasks, such as brake inspections or tire inspections or structural inspections for fatigue, fatigue damage, and possibly engine inspections as one of the other parties mentioned today, would you consider those to be examples of maintenance actions that are required to assure continued safe operation of the airplane?

MR. O'NEIL: I would say that those are maintenance actions that are required to assure that the product, meaning the airplane, is capable of meeting its type design requirements at -- period.

MR. HINDERBERGER: Okay. Thank you. I have

no other questions.

MR. HAMMERSCHMIDT: Thank you, Mr. Hinderberger. Going next to Alaska Airlines for questions.

CAPTAIN FINAN: Thank you, Mr. Chairman. Good afternoon, Mr. O'Neil.

MR. O'NEIL: Good afternoon.

CAPTAIN FINAN: I believe you mentioned earlier that you worked for the Douglas Aircraft Corporation?

MR. O'NEIL: Douglas Aircraft Company, yes.

CAPTAIN FINAN: Company. How long did you work for Douglas?

MR. O'NEIL: Nearly 13 years.

CAPTAIN FINAN: And did you work on the DC-9 or the MD-80?

MR. O'NEIL: I worked on the DC-9 fuselage structure, yes.

CAPTAIN FINAN: Okay. Thank you.

MR. O'NEIL: As a stress analyst.

CAPTAIN FINAN: You mentioned the washing of the jackscrew, 963's jackscrew, on the boat and on the dock, and your observation of lubrication of that jackscrew.

Were you on the boat or on the shore when the jackscrew --

MR. O'NEIL: Negative.

CAPTAIN FINAN: -- was recovered?

MR. O'NEIL: I was neither. I was in Long Beach.

CAPTAIN FINAN: When did you have the opportunity to observe the jackscrew?

MR. O'NEIL: I don't believe I have ever seen the accident jackscrew. I've seen the accident nut during a visit here with the NTSB.

CAPTAIN FINAN: Did you have the opportunity to read all the statements regarding observations of the jackscrew and the lubrication of it?

MR. O'NEIL: The ones that were just introduced into evidence?

CAPTAIN FINAN: Those, and the previous exhibits.

MR. O'NEIL: I have not seen the ones that were introduced last night. I don't recall having seen the existing exhibits regarding lubrication of the -- the condition of the jackscrew.

CAPTAIN FINAN: You -- just for clarification, you mentioned in your testimony that the

DC-9 was originally certified at 80,000 pounds max weight or in that neighborhood.

MR. O'NEIL: Approximately, yes.

CAPTAIN FINAN: Approximately. And I think you said that the MD-80 was a 140,000, approximately, pound airplane. I just wanted to make the Board aware that the Alaska Airlines operates MD-80s with a max take-off weight of a 160,000 pounds.

MR. O'NEIL: I stand corrected. Thank you, sir.

CAPTAIN FINAN: One last -- several questions, I guess. The jackscrew on 963 was recovered on the 8th of February. Are you familiar with the fleet campaign that Alaska conducted to inspect all the jackscrews on February 9th?

MR. O'NEIL: Not specifically. No, sir.

CAPTAIN FINAN: Then are you aware that two of the Alaska aircraft, 981 and 982, were -- when inspected were found well lubricated, and the end plays in excess of 50,000ths, and that those aircraft had -- each had a time-in-service of approximately 10,000 hours?

MR. O'NEIL: I recall the inspections because they were both witnessed by NTSB and FAA, I believe.

That was in Seattle and Portland.

CAPTAIN FINAN: Right.

MR. O'NEIL: Yes, I'm aware of the end play results. I don't believe I am aware of the amount or the quality of the lubrication when those inspections were accomplished.

CAPTAIN FINAN: Were you involved in developing the AD that was published on February 11th?

MR. O'NEIL: Yes, sir.

CAPTAIN FINAN: Was the notification of Boeing and the FAA by Alaska of the result of the end play inspections on 981 and 982 -- did that precipitate the AD?

MR. O'NEIL: In and of themselves?

CAPTAIN FINAN: Well, did it play a major part in the AD -- in the issuing of the AD?

MR. O'NEIL: I would say that those two facts were considered. I wouldn't say that they are the events that specifically precipitated issuance of the AD.

Remember, Part 39 states that the FAA can issue an airworthiness directive if an unsafe condition is known or expected to exist or may exist in a product or in a type design, and in this particular case,

because we did not know, and we still do not know what caused that action, it seemed prudent to act on the "or may exist" portion of the rule and issue an airworthiness directive for everyone to go and inspect the condition of the jackscrew and the condition of the Acme nut.

CAPTAIN FINAN: Mr. O'Neil, based on the observations that were passed -- the FAA's participation actually, I think, in the jackscrew inspections of 981 and 982, and the fact that they were well lubricated when inspected, can you explain the excessive wear found on those end play inspections?

MR. O'NEIL: No, sir, I can't.

CAPTAIN FINAN: Thank you, Mr. O'Neil. No further questions, Mr. Chairman.

MR. HAMMERSCHMIDT: Thank you, Captain Finan, and we now go lastly to the Federal Aviation Administration, Mr. Donner.

MR. DONNER: Thank you, Mr. Chairman, and Mr. O'Neil, I know that you've answered these questions in considerable detail, but I would like to cut through the detail and just get, if I can, some short answers to these questions.

The first one is, do the regulations require

that the Acme nut be fail-safe?

MR. O'NEIL: No, sir.

MR. DONNER: And if you could concisely explain why not?

MR. O'NEIL: Well, as stated earlier, the stress levels in the nut at the identified fatigue loads are so low as to preclude the initiation and propagation of a crack.

MR. DONNER: Thank you. And one final question. If this jackscrew design was presented to the FAA today for certification, do you believe it would comply with our current regulations?

MR. O'NEIL: Yes, I do.

MR. DONNER: Thank you very much. Thank you, sir.

MR. HAMMERSCHMIDT: Thank you, Mr. Donner. Going next to the Board of Inquiry, beginning with Dr. Ellingstad.

DR. ELLINGSTAD: Thank you, Mr. Chairman. Just a few questions. What seems like a long time ago now, you were talking to Mr. Guzzetti about some certification issues and basically had indicated that the original type design for the DC-9 included a requirement for a fault analysis back in 1965 --

MR. O'NEIL: Yes, sir.

DR. ELLINGSTAD: -- that was considered acceptable to the FAA?

MR. O'NEIL: Yes, sir.

DR. ELLINGSTAD: Okay. Yesterday, Mr. Kovacik described that fault analysis as a qualitative analysis. Would you agree with that interpretation?

MR. O'NEIL: Yes, sir.

DR. ELLINGSTAD: Were there specific standards in place for the approval of that analysis or the acceptance of it at that time?

MR. O'NEIL: Would you repeat the question?

DR. ELLINGSTAD: Some specific standards or criteria for the assessment and the acceptance or approval.

MR. O'NEIL: The requirements at that time were for the FAA to review that, submit a substantiation, if it was determined necessary to do so, and conclude that what was presented demonstrated compliance with the regulations.

DR. ELLINGSTAD: Okay. And who was the FAA with respect to the execution of that approval?

MR. O'NEIL: At that time, it was the Aircraft Engineering Division in Los Angeles.

DR. ELLINGSTAD: Okay. And that --

MR. O'NEIL: That has --

DR. ELLINGSTAD: -- determination --

MR. O'NEIL: -- subsequently become the Los Angeles ACO, yes.

DR. ELLINGSTAD: Okay. You also stated that derivative designs were not required to provide additional fault analyses.

MR. O'NEIL: Provided they had demonstrated an acceptable service history. Yes, sir.

DR. ELLINGSTAD: Okay. And you had indicated that that was the case for the MD-80?

MR. O'NEIL: For the DC-9. Yes, sir.

DR. ELLINGSTAD: But you also said that they had in fact provided such analyses, despite the fact that they weren't required to, is that -- did I mis-understand?

MR. O'NEIL: I think there was a misunderstanding. The FAA, in an effort to increase the level of safety of the MD-80, identified compliance with FAR 25 through Amendment 40 to be applicable to the MD-80 series, --

DR. ELLINGSTAD: Okay.

MR. O'NEIL: -- and new parts, new systems

were required to -- Boeing -- McDonnell-Douglas at the time was required to demonstrate compliance with those later requirements.

DR. ELLINGSTAD: And that was done?

MR. O'NEIL: Yes, sir, but not specifically for the jackscrew assembly.

DR. ELLINGSTAD: Okay. And were any of those -- the satisfaction of those requirements, did they require other than what's been described as a qualitative type analysis?

MR. O'NEIL: The new parts?

DR. ELLINGSTAD: Yeah.

MR. O'NEIL: Whatever was appropriate for Amendment 40. I'm not exactly familiar with which particular --

DR. ELLINGSTAD: Okay. Thank you.

MR. O'NEIL: What the particular requirements -- it would have been 1309 at that time, though.

DR. ELLINGSTAD: Okay. Thank you.

MR. HAMMERSCHMIDT: Thank you, Dr. Ellingstad. Going next to Mr. Clark.

MR. CLARK: Following up on several questions that Mr. Donner asked, the -- is the fact that this jackscrew and nut assembly over-designed, can that --

that's used in replacement for requirement for redundancy or fail-safe type of design?

MR. O'NEIL: Not as a replacement, sir. It's a requirement to evaluate whether the -- in this particular case, the nut would be considered a fatigue-critical structural element, and the answer to that is because of the over-design and the fatigue load level, no, --

MR. CLARK: Okay.

MR. O'NEIL: -- it would not be.

MR. CLARK: All right. If it's not, then is that twin thread arrangement required to be on that unit?

MR. O'NEIL: That was the design that was presented to us.

MR. CLARK: I understand, but if it's so over-designed, does that -- do you need to have that twin thread arrangement in that situation, if it's so over-designed?

MR. O'NEIL: It's not the FAA's task or charter to dictate the design.

MR. CLARK: I understand that.

MR. O'NEIL: The applicant, in this case McDonnell-Douglas, presented that design to us, and we

found that design acceptable, and McDonnell-Douglas demonstrated compliance to the applicable regulations.

MR. CLARK: That's what they did, and I'm asking you if they brought to you a single thread design, would that be acceptable to the FAA?

MR. O'NEIL: We would have to evaluate it to determine whether or not that demonstrated compliance to the regulations.

MR. CLARK: Okay. You also stated that the design today, you believe, meets today's regulations, the current requirements for new airplanes, is that correct?

MR. O'NEIL: Yes, sir.

MR. CLARK: Okay. And would that -- since we've had this dual failure of the dual threads and a catastrophic loss of an airplane, would that suggest to you that there's a problem with the regulations?

MR. O'NEIL: No, sir.

MR. CLARK: Going back a little further, we were trying to sort out in the questioning, the -- what parts were systems, what parts were structures. There was a line of questioning along that, and in this airplane, the -- basically, do you agree that the nut and the gimbal nut or the Acme nut and screw were

needed to control the horizontal stabilizer?

MR. O'NEIL: The Acme screw and the Acme nut are necessary to support the primary flight loads.

MR. CLARK: Okay. And to move -- it's part of the function to move the stabilizer?

MR. O'NEIL: The rotation of the -- the ability to rotate the jackscrew provides the ability to trim the airplane.

MR. CLARK: And doesn't that make it a part of the horizontal stabilizer control system?

MR. O'NEIL: As I believe I said earlier, this portion of the pitch trim assembly, from the gear box through the motors back to the cockpit, would be considered the system part and would be required to meet the applicable systems regulations. Yes, sir.

MR. CLARK: Okay. And -- okay. The FAA does not consider the drive components to be a part of the system then?

MR. O'NEIL: Not such that they would be subject to a 1309-type safety analysis, no.

MR. CLARK: Okay. And that's the -- 1309's where we get into system safety-type evaluations for the newer airplanes?

MR. O'NEIL: Yes, sir.

MR. CLARK: Okay. And is there any equivalent of any kind of systems safety-type approach that goes into the structure side, other than the fatigue?

MR. O'NEIL: Not that type of analysis. Not a quantitative analysis. No, sir.

MR. CLARK: Okay. Fault-tree analysis, failure modes -- I think failure modes in effect may be in there, but --

MR. O'NEIL: Not for the structural portion of the jackscrew system.

MR. CLARK: Okay. The gimbal nut and the jackscrew portion?

MR. O'NEIL: No. They're not -- 1309-type quantitative analyses are not applicable to structure.

MR. CLARK: Okay. In this case, for the -- we talked about this twin screw that provided structural redundancy, the twin threads. The -- for this redundancy to have worked, it seems that you have to rely on humans not to make human mistakes.

MR. O'NEIL: Well, one of the tenets identified in the Advisory Circular 1309, 25.1309, states that it is reasonable to assume that flight crew and ground crew will accomplish the tasks that they are

expected to accomplish when they are expected to accomplish them. That philosophy holds true for the whole airplane and all of the other tasks required to assure that the airplane is in compliance with the type design.

MR. CLARK: Okay. And if a mechanic makes a mistake out there, misses one lubrication or two or something like that, then we may expect a catastrophic failure?

MR. O'NEIL: I think Boeing addressed that yesterday, but the answer is no.

MR. CLARK: In what way? If a mechanic doesn't do his job, what's going to happen to this jackscrew? What may happen to it?

MR. O'NEIL: Well, based on past experience that the Boeing Company has testified to, the first evidence of that would probably be an excessive wear rate.

MR. CLARK: Okay.

MR. O'NEIL: And the -- okay.

MR. CLARK: And if we have -- if mechanics are going to pick up on this excessive wear rate, and we believe they're going to be a hundred percent correct on that and never miss that, then we've got a

significantly-different problem going on on this airplane, is that correct or does that seem that way?

MR. O'NEIL: If we're addressing the requirements for maintenance of the airplane, again that's out of my expertise, sir.

MR. CLARK: Well, I understand that, but if the mechanics meet those requirements and are able to find those flaws or excessive wear, then we may have something else going on with this airplane.

MR. O'NEIL: That's indeed a possibility.

MR. CLARK: Okay. And if we may have something else going on on this airplane, and we're wearing out two threads at the same time, we don't have a type of redundancy in that system at all. Would you agree with that?

MR. O'NEIL: I think we're getting into the area of subjectivity, and I don't care to speculate.

MR. CLARK: Okay. But right now, we have two threads that are gone, and one of the suggestions was that one thread may be damaged, and the other thread would take up the slack.

In this case, at the time of the accident, both sets of threads are gone. Is it reasonable to conclude that they both disappeared at the same time or

progressively consistently with each other?

MR. O'NEIL: I don't know that, sir. I don't believe we have any -- have identified any evidence to suggest that.

MR. CLARK: Okay. Then if we had one fail or disappear, and then the second one failed or disappeared, wouldn't that leave us in a situation where we would have a latent failure of the one set of threads, and only the second set of threads remaining, and nobody would know about that?

MR. O'NEIL: I believe we would have a situation where we'd have -- where a double failure has occurred, and that's not specific -- a specific requirement for this structure.

MR. CLARK: Okay. Coming out of the -- from the certification side, which you're on, you've made the statement that you assume that this part's going to wear, it's designed to wear. There's -- it's designed to wear to a certain rate.

Do you provide or is that part of the certification side, is to provide guidance about wear rates, not just the magnitude but the rates?

MR. O'NEIL: As a certification requirement?

MR. CLARK: Yes.

MR. O'NEIL: No, sir.

MR. CLARK: So, a certification requirement, you're only required to set a magnitude of wear that you can tolerate before the thing needs to be replaced?

MR. O'NEIL: When the type design is presented to us, anticipated wear is to be considered by the applicant, such that whatever configuration the type design will be allowed to be in, compliance to the type design requirements are shown.

MR. CLARK: Okay. And if -- I think the status we're in right now is Boeing or previously McDonnell-Douglas provided you wear limits but no information on the wear rates, and you were willing to accept that as a properly-certified piece of equipment.

MR. O'NEIL: I think it is more correct to say that they provided -- they identified a configuration of the airplane for which they had demonstrated compliance to the regulations.

MR. CLARK: And part of that does include establishing a wear limit?

MR. O'NEIL: It establishes a configuration of the airplane. Yes, sir. Configuration of the type design.

MR. CLARK: How does that -- does that -- am

I saying something wrong? Does that -- defining a wear limit, does that not translate into establishing the configuration of the airplane? I don't know your terminology that well.

MR. O'NEIL: I'm not sure I understand the terminology being presented, but --

MR. CLARK: Okay.

MR. O'NEIL: -- in effect, it sounds as though we're saying, if not the same thing, something that's very, very similar.

MR. CLARK: Okay. Well, in the certification information that comes to the FAA for you to review and document, was there -- were there any numbers that said this is the amount of allowable wear we can tolerate on this Acme nut before it has to be replaced? Is that -- would that be embedded in part of that information that came to you?

MR. O'NEIL: It would be embedded in the documentation.

MR. CLARK: Okay. All right. Thank you. I have no more questions.

MR. HAMMERSCHMIDT: Thank you, Mr. Clark. Mr. Berman, any questions?

MR. BERMAN: I have just a couple, sir. Mr.

O'Neil, earlier, you testified about problems that occurred with the MD-11's jackscrew surface finish and how it wore out an Acme nut, one of the two jackscrews.

I think you testified that the airplane -- viewing the airplane as a whole, it maintained its fail-safe mode through the second jackscrew, is that correct?

MR. O'NEIL: It maintained the ability to meet the type design requirements with a single element failed and support limit load without failure.

MR. BERMAN: If a DC-9 or an MD-80 had had a similar problem with surface finish on its jackscrew, and I understand this has nothing to do with maintenance of the airplane, but if it had just happened to a DC-9, how would that airplane as a whole have maintained its fail-safe mode, as you put it?

MR. O'NEIL: Difficult question to answer, sir.

MR. BERMAN: Would you like -- sorry. Go ahead.

MR. O'NEIL: I'm not sure that I can correctly characterize it to either your satisfaction or mine.

MR. BERMAN: Would you like to think about it

some more here? We can pause?

MR. O'NEIL: If you'd rephrase the question again, please?

MR. BERMAN: Well, you provided a concept of a fail-safe mode of the entire airplane when you discussed the MD-11, and you said that that fail-safe mode rested upon the second jackscrew when the first one failed or the Acme nut failed.

A DC-9 or MD-80 has one jackscrew, one gimbal nut. If that failed for a similar reason of surface finish, how would that airplane as a whole maintain its fail-safe integrity or mode, as you put it?

MR. O'NEIL: In that particular case, the wear rates would more than likely have been excessive and/or be considered excessive in that they're beyond the type certificate holder's prediction, and the recommended maintenance program for the type design would be expected to detect that wear rate and take appropriate action to correct it.

MR. BERMAN: So, MD-11 with two jackscrews has the second one which can take over and provide the fail-safe mode, but a DC-9 and MD-80 rests only on the maintenance picking up on the excessive wear --

MR. O'NEIL: No, no. That's not quite true,

sir. The -- as we've mentioned before, and the Boeing Company has mentioned, the design of the Acme nut is such that it demonstrates by design a significant tolerance to that type of an event, and that the recommended maintenance program would detect that excessive wear before a situation occurred that the airplane could no longer -- that the type design could no longer maintain its design requirements.

MR. BERMAN: So, you have an MD-11 that also had substantial reserve strength built into each of its jackscrews, and because of a surface finish problem, that was -- it was eaten up, so to speak, in one jackscrew, and that was not picked up by inspections --

MR. O'NEIL: The airplane demonstrated that that was happening because the drive mechanism on the MD-11 is such that if there is a differential load between either of the jackscrews, the system shuts off, and the stabilizer locks in position.

MR. BERMAN: And by that time, had the Acme nut failed of the failed -- on the one jackscrew?

MR. O'NEIL: I don't know if that had happened, but that generally would occur prior to the complete wear-out of the Acme nut.

MR. BERMAN: And is there a wear rate

requirement? You mentioned that once again, that it would be picked up through excessive wear rate. What is that?

MR. O'NEIL: I'm sorry?

MR. BERMAN: What is the wear rate requirement? You mentioned that a problem would be picked up by excessive wear rate.

MR. O'NEIL: Again, that's a quality of the design. I don't know that number.

MR. BERMAN: You believe a number exists?

MR. O'NEIL: I believe that the design has an anticipated wear rate, and that the recommended maintenance program is predicated on the anticipated wear.

Again, the certification requirement is for the type certificate holder to present or to prepare a recommended maintenance program.

MR. BERMAN: Okay. I don't think we need to plow that ground again. It's just -- you know, if the surface finish problem had been worse, it could have grounded the --

(Technical problems)

MR. O'NEIL: I would offer the fact that there are two jackscrews in the trijet design, as a

feature of the design. It's the way that the type certificate applicant at that time elected to demonstrate compliance with the applicable regulations.

MR. BERMAN: Let me turn to a couple questions about the involvement of ACO personnel in this.

MR. HAMMERSCHMIDT: Mr. Berman, I was going to stop you when we reached 2:00. We will take our lunch recess and return -- it's 2:07, according to the Board Room clock. We will return, and we will be in recess until 3:07.

(Whereupon, at 2:07 p.m., the public hearing was recessed, to reconvene this same day, Thursday, December 14th, 2000, at 3:07 p.m.)

A F T E R N O O N S E S S I O N

3:07 p.m.

MR. HAMMERSCHMIDT: Let's please take our places. I see that the current witness, Mr. Mike O'Neil, is at his place at the witness table, and, Mr. Berman, on the Board of Inquiry, is at his place to continue the questioning.

Before we continue with Mr. O'Neil and conclude with him, conclude with his testimony, I would point out that the West Coast folks who are watching and listening to this public hearing via closed circuit television lost the transmissions about 30 minutes before we recessed for lunch, and I just want to acknowledge that for the record. We wish that had not happened.

My first observation on that is I don't believe that they probably missed a great deal of new information. It was just some refinements of earlier testimony during those 30 minutes. That would be my

off the top of my head observation.

But if, of course, there is a specific interest in those lost 30 minutes, then the written transcript will, of course, contain the testimony and the questions from that time frame, and, so, someone could always consult the written transcript, which, in a way, is a redundant system that we have, now that we have both video and the court reporter.

DR. ELLINGSTAD: Excuse me, Mr. Chairman. We also have another redundant element in that the web cast is also going to be archived and will be available, so that they can access it there.

MR. HAMMERSCHMIDT: Very good. That's an excellent point, and they can access that at the NTSB's web site, and that again is, to be redundant, www.ntsb.gov.

DR. ELLINGSTAD: It's reliably redundant, sir.

MR. HAMMERSCHMIDT: Okay. Thank you. We believe in redundancy, but let me -- we don't know what the problem was. It had something to do with the technical transmission that was not part of our control, but just wanted to acknowledge that and let the folks out at -- who are primarily family members of

those who were on this accident flight, Alaska Airlines Flight 261, and, of course, we want to do everything we can to keep the family members, perhaps most of all, informed as to what is happening in the investigation.

I know that the testimony and the hearing up to this point has been somewhat tedious and somewhat esoteric, and as we commented in my opening statement, these work sessions of the NTSB tend to be highly technical affairs, and you just have to understand the nature of the work, and hopefully much of it is understandable, and we try to cover everything thoroughly because this is the one opportunity to get the key players in a room and focus on specific subject areas that we think we need more information in.

Therefore, if you think we're being too thorough at times, well, sometimes some of us do, as well. So, with that, I go to Mr. Berman for his last few questions.

MR. BERMAN: Thank you, Mr. Chairman.

MR. HAMMERSCHMIDT: We need Mr. Berman's mike turned on, please.

MR. BERMAN: Okay. We're rolling. Mr. O'Neil, before the recess, you were speaking a little bit about wear rates, and it's clear that certification

requirements are to some degree based on a wear rate and take one into account.

What do you consider to be an excessive wear rate specifically on this jackscrew assembly?

MR. O'NEIL: On this particular jackscrew assembly, I have no idea what an excessive wear rate is.

The Boeing Company or McDonnell-Douglas at the time identified a wear rate that they expected to see in service. They designed the nut such that it was over-strength and identified a maintenance program that they expected to be followed or that was required for them to develop under the requirements of the type certificate.

So, I don't know what an excessive wear rate would be.

MR. BERMAN: Jackscrews and assemblies were removed during the 1960s and '80s and such for excessive wear, is that not right?

MR. O'NEIL: They were removed for wear rates which exceeded those anticipated by the type certificate holder, and I would reiterate again that none of those nuts wore beyond what they had been certificated at.

MR. BERMAN: Do you know if the folks who are coping with these situations out there in the real world, on the line, the mechanics and the operators that they work for, are they provided any information about what the anticipated wear rate is and what an excessive wear rate is?

MR. O'NEIL: Again, that's not in my area of expertise.

MR. BERMAN: Okay. I'd like to turn to a couple of questions, I think we just started on this one at lunch, that are related to maintenance but how the ACO relates and factors into that.

When there's a situation when a maintenance review board recommends a time extension for maintenance, are the ACO design engineers brought into the loop on that?

MR. O'NEIL: I can only attest to the original maintenance requirements for the MD-80, and at that time, I participated in some of the discussions which identified the inspection intervals for the areas of structure that I was specifically concerned with, which was effectively in this case the fuselage.

MR. BERMAN: Not to include the jackscrew?

MR. O'NEIL: No, sir.

MR. BERMAN: And on what basis, on what data did you base your recommendations for time extensions as a design engineer?

MR. O'NEIL: It was an evaluation of whether or not the proposed intervals sounded unreasonable.

MR. BERMAN: Sounded unreasonable?

MR. O'NEIL: Hm-hmm. Engineering judgment.

MR. BERMAN: Based on what data?

MR. O'NEIL: Based on at that time 20 years in industry.

MR. BERMAN: But no specific data regarding benchmarks of wear or --

MR. O'NEIL: No, sir. There seems to be an attempt to equate wear and the fail-safe concept, and that's really an erroneous assumption. Wear is -- wear happens, and in the fatigue aspects of the design requirements, like 4.b270, fail-safe addresses structural failure.

MR. BERMAN: I didn't think I was --

MR. O'NEIL: Wear is not considered a structural failure.

MR. BERMAN: I didn't think I was going back to fail-safe but was thinking about how you participated in maintenance time interval extensions,

which seemed to relate to wear or other functions like that.

MR. O'NEIL: Well, I understand that, and I hope you'll forgive me that comment, but it's bothered me for some time, that we seem to be equating fail-safety and wear, and they're not equatable.

MR. BERMAN: Do you mean to say that you considered it your responsibility as the ACO design engineer to be concerned about fail-safe properties and fatigue and structural integrity but not so much about wear?

MR. O'NEIL: The reason for that is that there is a requirement for a recommended maintenance program that is to be presented with the type certificate, and then the user of the airplane takes that recommendation and acts upon it in an appropriate manner.

MR. BERMAN: So, do I understand your answer to that question was yes?

MR. O'NEIL: Would you rephrase the question, please? Repeat the question, please.

MR. BERMAN: Do you consider it to be more of your responsibility as an ACO design engineer to be concerned about the fail-safe properties of a design of

an airplane you're looking at or -- and fatigue and other issues such as that and not so much your responsibility to be concerned about wear?

MR. O'NEIL: To a lesser degree about wear, and in this particular case, with the Acme nut, the over-design was partially in response to a concern about wear.

MR. BERMAN: Okay, sir. One more question in a slightly different area. In your work on preparing the jackscrew airworthiness directives, did the FAA change or add or delete any specific items from the maintenance manual for the DC-9, MD-80 series?

MR. O'NEIL: Did the FAA?

MR. BERMAN: Did they require it as part of the AD or did Boeing propose and enact changes in its response that was accepted by the FAA?

MR. O'NEIL: Well, again the company's recommended maintenance or the maintenance manual prepared by the company is their document and their maintenance recommendations.

MR. BERMAN: Do you know the answer to the question, though? Did the -- were there changes to the maintenance manual?

MR. O'NEIL: I believe there were, but I

don't know exactly what they were.

MR. BERMAN: Okay. Thank you very much. No more questions, Mr. Chairman.

MR. HAMMERSCHMIDT: Thank you, Mr. Berman. Are there any other questions from the NTSB personnel?

(No response)

MR. HAMMERSCHMIDT: In that case, Mr. O'Neil, I want to thank you for your participation in this public hearing, for your thoughtful answers, and I'll give you the opportunity to add anything at this time that you think we might have missed or anything you wish to clarify from your previous testimony.

MR. O'NEIL: Yes, sir, there are, and I appreciate the opportunity.

The question of wear being a quantifiable element so that one could do a safety-type analysis for structure is -- it's not feasible. The data to do such an evaluation is not available. It doesn't exist.

The concept that -- or the philosophy or the thought possibly that an MD-11 type installation with two jackscrews is more redundant than the single jackscrew and torque tube for the twin jet design is not correct.

The design requirements are essentially the

same for the structures portion, and that's two different ways to satisfy the same requirements. That's all it is. They're different, and as I mentioned earlier, the FAA does not dictate design.

I think that's all I have to say, sir.

MR. HAMMERSCHMIDT: Thank you again, Mr. O'Neil. We appreciate your follow-up comments as well, and you may stand down.

MR. O'NEIL: Thank you, sir. I appreciate the opportunity to participate in these hearings to determine the cause of the accident and hopefully be able to assist in any actions that are appropriate to rectify this situation or make any changes that may be deemed necessary to ensure continued safety.

MR. HAMMERSCHMIDT: Thank you. Your interest is noted and appreciated.

(Whereupon, the witness was excused.)

MR. HAMMERSCHMIDT: Now, we go to our next witness, Mr. Lee Koegel. Would you please come forward to the witness table, and we will begin our interview of you. Mr. Koegel is proceeding to the witness table. Whereupon,

LEE R. KOEGEL

having been first duly affirmed, was called as a

witness herein and was examined and testified as follows:

Interview of Lee R. Koegel

MR. RODRIGUEZ: Could you state your full name and address?

MR. KOEGEL: My name is Lee Koegel, 3960 Paramount Boulevard, Lakewood, California 90712.

MR. RODRIGUEZ: Turn the mike on.

MR. KOEGEL: How's that?

MR. RODRIGUEZ: Better. Repeat. No. That's okay. And what is your -- what I would like is your --

MR. BERMAN: I'm sorry, sir. Could you repeat that, please? Could you repeat that for the record? The name.

MR. KOEGEL: Lee Koegel, 3960 Paramount Boulevard, Lakewood, California 90712.

MR. HAMMERSCHMIDT: Mr. Koegel, we just needed to get that clear for the court reporter's purpose. That's why we asked you to repeat. Thank you.

MR. KOEGEL: Understand.

MR. RODRIGUEZ: As I was saying, what I was asking for was your business address, but that's okay. And what is your occupation, sir?

MR. KOEGEL: Aviation Safety Inspector. I work for an office called the Aircraft Evaluation Group, which is a division of Flight Standards, a portion of Flight Standards.

MR. RODRIGUEZ: Located?

MR. KOEGEL: We are co-located with the L.A. Aircraft Certification Office. We're one of five sections in the FAA that Flight Standards interfaces and are co-located with ACOs.

MR. RODRIGUEZ: All right, sir. And would you briefly describe your aviation background for us?

MR. KOEGEL: 1965 to '69, I was an aircraft mechanic in the Navy. From 1970 to '88, A&P mechanic for Western Airlines, maintenance foreman for Western, and mechanic for American, and I joined the FAA in 1988 as a safety inspector.

MR. RODRIGUEZ: And how long have you been affiliated with the AEG?

MR. KOEGEL: Since 1991.

MR. RODRIGUEZ: All right, sir. Mr. Guzzetti will question the witness.

MR. GUZZETTI: Thank you. Good afternoon, Mr. Koegel.

MR. KOEGEL: Hello, Mr. Guzzetti.

MR. GUZZETTI: With your position with the AEG -- well, could you briefly describe your current duties and responsibilities at the AEG?

MR. KOEGEL: My title is, as far as the MD-80 goes, I'm called the MD-80 MRB Chairman, Maintenance Review Board Chairman. It is my responsibility to ensure that we have maintenance documents for the MD-80.

MR. GUZZETTI: When you say "maintenance documents", can you be a little more specific? What types of maintenance documents?

MR. KOEGEL: We produce or actually the manufacturer does what they call an MRB Report.

MR. GUZZETTI: Are there any other reports, besides that?

MR. KOEGEL: Every new model of airplane has an MRB Report.

MR. GUZZETTI: Okay.

MR. KOEGEL: But the MRB reports are a part of something that comes before MRB reports, such as the process that we do to get the MRB report.

MR. GUZZETTI: Okay. Understood. Your -- I was just going to ask you that question. Is there a process to determine initial minimum maintenance

requirements and intervals for a particular transport category aircraft?

MR. KOEGEL: Yes. We use the procedure called -- currently on the MD-80, back in 1993, we used the procedure called "MSG, Revision 3" to determine that process or determine those intervals.

MR. GUZZETTI: Okay. MSG Revision 3. Before you get to that, did you have any specific affiliation with the MD-80 Program or do you now with the FAA?

MR. KOEGEL: I am the MD-80 MRB Chairman.

MR. GUZZETTI: Oh, okay. And the MRB is the Maintenance --

MR. KOEGEL: Review Board Document.

MR. GUZZETTI: Okay. And could you please describe how MSG Revision 3 is involved with the Maintenance Review Board Report?

MR. KOEGEL: I need to go back to MSG Rev. 1 and 2 before I can get to 3. So, it's --

MR. GUZZETTI: Okay.

MR. KOEGEL: -- a comprehensive one, if you don't mind.

MR. GUZZETTI: Fine. Let me stop you there. I really kind of asked that question out of order because I think it would be informative for me and for

others to first define what an MRB report is and what its purpose is for, and then we'll discuss how it's developed.

So, could you tell me exactly what is an MRB Report, and what its purpose is?

MR. KOEGEL: An MRB Report is a document that outlines the initial minimum schedule inspection program for a particular model of airplane. The document is derived, initiated by, the industry, meaning the operators and the manufacturer.

The AEG or Aircraft Evaluation Group or my office, the office I work in, we just support that MRB development activity with the manufacturer and with the airlines.

MR. GUZZETTI: Okay. And these requirements or intervals, are they -- do all airlines immediately adopt those exact requirements once they're promulgated by the FAA?

MR. KOEGEL: The MRB Report, like all the other aircraft maintenance manuals, are recommended in nature --

MR. GUZZETTI: All right.

MR. KOEGEL: -- to the carriers. They're not mandatory.

MR. GUZZETTI: They are not mandatory?

MR. KOEGEL: Correct.

MR. GUZZETTI: Once the -- what use does the carrier have or how does the carrier use an MRB report?

MR. KOEGEL: Again, the MRB report is just a portion of the entire maintenance inspection program for the airplane. There are other sections of the maintenance inspection program for the airplane. So, they just take the MRB report, which is -- we term it the "initial minimum schedule inspection program" for a new operator of the airplane, and they incorporate these intervals into their maintenance program. They meaning the carrier may.

MR. GUZZETTI: The carrier may incorporate these intervals into the program?

MR. KOEGEL: Yes, that's correct.

MR. GUZZETTI: Would the MRB process be involved with determining recommended minimum maintenance intervals for the lubrication and the end play check for the MD-80's jackscrew assembly?

MR. KOEGEL: That, we were involved in that process. The MRB was involved in that process, correct.

MR. GUZZETTI: Okay. And there's -- before I

actually get into what those numbers are, because I know that there's various revisions, as you indicated, let me ask you. Once a carrier adopts or reads these recommended intervals, do you know how they are incorporated in each individual airline's program?

MR. KOEGEL: No, I do not. The AEG's, the Aircraft Evaluation Group's, my job, I interface between FAA FSDOs and Aircraft Engineering. I don't get involved in how the FSDOs manage their respective carriers.

MR. GUZZETTI: What is a FSDO?

MR. KOEGEL: Sorry. Flight Standards District Office.

MR. GUZZETTI: And you say that is a different arm of the FAA?

MR. KOEGEL: For clarification, I am part of Flight Standards, which is -- I'm the one part of Flight Standards that interfaces directly with Aircraft Engineering, because we're co-located with the ACOs.

MR. GUZZETTI: And are there FSDO inspectors located throughout the country that ensure that the carriers have a maintenance program?

MR. KOEGEL: Yes.

MR. GUZZETTI: And are you involved in those

individual carriers' maintenance programs at all?

MR. KOEGEL: No, I am not.

MR. GUZZETTI: Are you involved in ensuring that the manufacturer provides acceptable minimum maintenance inspection requirements?

MR. KOEGEL: I'm involved with ensuring the manufacturer, in accordance with their type design requirements that were mentioned earlier by Mike O'Neil and Boeing, that they at least produce the documents and have them recommended available to the operators.

MR. GUZZETTI: Okay. Could you now begin to describe the evolution of this document? How does that process work from cradle to grave?

MR. KOEGEL: MSG stands for two things. It stands for a group, which is Maintenance Steering Group, and MSG also stands for the title of a document that the group -- the product. So, Maintenance Steering Group Task Force 1, and I believe in your exhibit, Mr. Guzzetti, on 11-A, --

MR. GUZZETTI: 11-Alpha. That's correct.

MR. KOEGEL: -- speaks to how the -- and I believe it's Page 11 or 12 speaks to the development of and how the process works for the MSG 1, 2 and 3.

But basically, to summarize it, MSG 1 came

about with the advent of the Boeing 747-100, where the operators of the airplane, the airlines, wanted to try and get a more effective maintenance program for the airplane.

So, the industry, the airlines and the manufacturers and the vendors, got together, and they established this MSG or Maintenance Steering Group Task Force Number 1.

The FAA was a party to it but not as a regulatory -- the FAA just kind of goes along and was apprised of the activity that was happening.

MSG 2 came along around the time of the L1011, the DC-10. MSG 2 was a further refinement on the processes that the carriers tried to establish in MSG 1.

And lastly, around in the mid-'80s, MSG 3 came along, and MSG 3 was a bigger change from 2, than what 1 and 2 were. MSG 3 brought a different analysis or a different process into the determination of a maintenance inspection program for the airplanes. It brought in a top-down approach, rather than back in MSG 2, we used like on condition and hard time and condition monitoring terms.

To remove a component from the airplane at a

set interval and reinstall it again, that was MSG 2. Under MSG 3, it was just a different philosophy, and we again took the top-down system approach and attempted to determine a reasonable inspection program.

MR. GUZZETTI: Okay. So, MSG 2, you said it actually stipulated definitions for hard timing components --

MR. KOEGEL: Correct.

MR. GUZZETTI: -- and/or determining whether a component should be inspected when it breaks, like on condition, things like that?

MR. KOEGEL: On condition is more of a functional inspection, where you look at it and see if it's still good.

MR. GUZZETTI: And is that all part of MSG 2, Maintenance Steering Group Task 2 -- Task Force 2?

MR. KOEGEL: Correct.

MR. GUZZETTI: And then, is it correct to say that Maintenance Steering Group Task Force 3 did away with that type of philosophy and definition and implemented a top-down approach?

MR. KOEGEL: Correct. More of a task-oriented maintenance program. MSG 3 was the first time that we brought lubrication into a -- we brought the

awareness of lubrication into a maintenance program.

MR. GUZZETTI: So, prior to MSG 3, there were no -- there was no verbiage or direction or anything regarding lubrication at all, whether it be the type or the interval or anything like that, is that correct?

MR. KOEGEL: Not quite, no. There was -- the manufacturer had recommended in their program lubrications. Again, we're only talking about the MSG only produced the MRB report.

MR. GUZZETTI: Okay.

MR. KOEGEL: And the MRB report's only a small portion of the entire aircraft inspection program.

MR. GUZZETTI: My next question is, how do you get from a maintenance steering group, whether it be 1, 2 or 3, how do you -- how does that drive or aid in the development of this maintenance review board report which, of course, gives you the manufacturer's recommendations?

MR. KOEGEL: The MSG 3 Group, Task Force 3, worked in conjunction with FAA Headquarters. Part of the recommendation of the MSG 3 Group was development of advisory circulars to which I work under, and the development of a process to build and do the MRB

report.

So, I have an advisory circular called 121-22A that instructs me in how to do an MRB report.

MR. GUZZETTI: Okay.

MR. KOEGEL: And it's used by industry and the FAA.

MR. GUZZETTI: When the MRB report is being developed, are there -- is that development participatory activity between FAA, airlines, manufacturer?

MR. KOEGEL: The way the MRB process initiates, and the manufacturer formally approaches the FAA, in this case the Aircraft Evaluation Group, and requests that an MRB be done, that they develop an MRB.

The manufacturer in turn gets the -- what they call -- I'll give another acronym here, ISC or Industry Steering Committee. The Industry Steering Committee is comprised of members of airlines, vendors and the manufacturer.

So, the developer of the MRB report is really the industry, along with the manufacturer. The industry meaning the airlines that participate in the process.

MR. GUZZETTI: What is the FAA's role in that

process?

MR. KOEGEL: We support the development of the MRB report, meaning I'm invited by the industry, the ISC, to attend their meetings. Should I choose -- you know, should they choose to invite me, which they always do, but I only serve as an advisor.

MR. GUZZETTI: So, -- but your title is MRB Chairman?

MR. KOEGEL: Chairman.

MR. GUZZETTI: However, you are only an advisor to that group, is that correct?

MR. KOEGEL: That's correct.

MR. GUZZETTI: All right. Does -- for the MD-80 specifically, how many times has the MRB met in meetings?

MR. KOEGEL: The MD-80 has two MRBs. It had MRB Development -- it has an MSG 2 MRB and an MSG 3 MRB. I -- the MSG 2 MRB met probably -- I don't know. It'd be a guess on my part how many times they met, but I was the last chairman of the MSG 2 MRB, and that was Rev. Q as in Quebec.

MR. GUZZETTI: What's the venue like at these meetings? Are there 10 people there? A hundred people there?

MR. KOEGEL: The purpose to revise an MRB is to update it, bring it more in line with the current operating intervals or operating -- what the member -- the airlines do, and, so, either the FAA -- I should rephrase that.

The FAA -- the MRB Chairman can call a meeting. The ISC or Industry Steering Committee can call a meeting. The purpose is to revise a document as necessary.

MR. GUZZETTI: How many people attend these meetings? Is it between -- about how many people would normally attend a meeting like this?

MR. KOEGEL: Most major air carriers send a representative or two, plus the manufacturer has representatives, plus when the manufacturer requests the FAA to form an MRB, that also means I form an MRB Board of FAA people. So, I have a board of people with me.

MR. GUZZETTI: How long do these meetings usually last? An entire week?

MR. KOEGEL: Depends upon the project. Generally, they go for -- well, it's a series of meetings, and, so, it depends upon the complexity of the model. It can go on for a year or two years,

meeting every several months or something to that effect.

MR. GUZZETTI: Okay. Would this meeting or this venue that you've just described, would that be the appropriate place for one of the participants to make a case for changing a particular maintenance interval or lengthening it or shortening it?

MR. KOEGEL: Yes.

MR. GUZZETTI: And how did they go about doing that? First of all, who normally makes that kind of request? Does it come from the FAA?

MR. KOEGEL: The manufacturer.

MR. GUZZETTI: Do the airlines ever come to the MRB meetings with a request to escalate a certain maintenance task?

MR. KOEGEL: We don't necessarily work and deal in one specific maintenance task on one specific item. We review entire packages of -- for instance, the airplane is -- has A checks and C checks. So, we kind of work in packages of inspection intervals, be it an A check interval or a C check interval.

MR. GUZZETTI: All right. Let me give a specific -- ask you a specific question about that. On Page 17 of Exhibit 11-A, it discusses the lubrication

intervals for the DC-9 or MD-80 jackscrew, the horizontal stabilizer jackscrew, both under MSG 2 and MSG 3, and there was an escalation there. MSG 2, the lubrication interval -- the recommended lubrication interval is between 600 and 900 flight hours, and in MSG 3, it jumps to 3,600 flight hours.

Can you please describe how that escalation occurred, and what data was provided to justify that escalation?

MR. KOEGEL: The MSG 3 escalation interval came about at the initiation of the MSG 3 project on the MD-80. The Industry Steering Committee, comprised of the airlines and the manufacturer and the vendors, determined that based on the airlines that participated in the project, their reliability programs and their reliability information, plus the data that the manufacturer was able to put together as far as reliability data for the different components and/or systems, was such that in the view of the Industry Steering Committee and their recommendation to the FAA AEG was that this interval is adequate.

MR. GUZZETTI: You mentioned reliability data. Exactly what type of data is that?

MR. KOEGEL: When the industry attends the

ISC meetings, the Industry Steering Committee meetings, they bring with them the data that their airlines have as far as what their reliability programs or their CAS programs, Continuing Analysis and Surveillance Programs, provide them, and, so, the participants have this information of what they currently do in their programs.

MR. GUZZETTI: Does this data include mean time between unscheduled removal data for certain components?

MR. KOEGEL: The data that I have for a lot of the components that were -- that you're asking about, yes, that data is available, and it was used.

MR. GUZZETTI: And does the FAA make the final decision as to whether that data is adequate enough to escalate a specific maintenance task or can they reject that data?

MR. KOEGEL: We can reject the data.

MR. GUZZETTI: Okay. Do you recall -- well, the -- for the end play check interval, was that ever escalated throughout the history of the DC-9 series and MD-80 series?

MR. KOEGEL: You're asking two different models.

MR. GUZZETTI: Okay. That's a fair correction. Thank you.

What was the initial end play check interval for the DC-9, original DC-9 series? Do you recall?

MR. KOEGEL: I believe it was 1-C, 1-C check interval.

MR. GUZZETTI: Okay. And then, when the MD-80 came around with MSG 2, what was the interval stipulated in that MRB report?

MR. KOEGEL: 2-C. 2-C check interval.

MR. GUZZETTI: Was there any data that you're aware of that was used to escalate from the DC-9 jackscrew 1-C to the MD-80 jackscrew 2-C of the end play check?

MR. KOEGEL: The data that's used by the manufacturer and the airlines, the operators, it's their data. It's their recommendation to the FAA. So, based on their mean time between unscheduled removal data, my assumption is that the data's there. They have it.

MR. GUZZETTI: You weren't there for the DC-9 -- for that escalation, though?

MR. KOEGEL: I was not.

MR. GUZZETTI: Okay. I'd like to put up a

chart on the visualizer. Dana, if you could put that up there. This is Exhibit 11-A, the bottom of Page 27, and -- well, I don't know whether we'll be able to -- whether it will be useful, and it doesn't appear that it is. But for those of you that have the hard copy of the exhibit, I'll just walk you through this, Mr. Koegel.

It has the MSG 2 and MSG 3 for the MD-80. The intervals for the lubrication for MSG 2 was the 600 and 900 flight hours, and then for MSG 3, it was escalated to 3,600 flight hours or 15 months, with a parenthesis that says "(whichever comes first)".

Okay. You'll notice that the last two columns of that chart, it has Alaska Airlines, their internal airline interval for lubrication, and it says eight months. That differs from the 3,600 flight hours.

Is that something that an airline under an approval from a local FSDO inspector would be allowed to do, to deviate from the recommendations of the MRB report?

MR. KOEGEL: The documents that the manufacturer and that the AEG put out are recommendations.

MR. GUZZETTI: Okay.

MR. KOEGEL: Correct.

MR. GUZZETTI: Do most of the lubrication requirements that you've seen -- well, let me ask your opinion. Do you think it's -- it enhances safety to eliminate the "whichever comes first" requirement?

Would you recommend that an airline eliminate that "whichever comes first" requirement, so they have a choice as to whether they should perform something either with flight hour requirement or a certain time interval?

MR. KOEGEL: There is usually a conversion factor or chart that the carrier would produce and provide to their local regulatory as far as being able to capture their flight hours or convert their flight hours to calendar time or vice versa, and, so, what that was, I don't know.

MR. GUZZETTI: Okay. Just a few more questions regarding MRB and MSG. The -- whenever carriers bring this data to the table to escalate an interval, is it usually the carriers only that provide this data or --

MR. KOEGEL: The carrier and the manufacturer -- I'm sorry.

MR. GUZZETTI: Skip that question. That's -- give me one moment here.

(Pause)

MR. GUZZETTI: Let me ask you this. Is wear rate of a certain component ever addressed in an MRB document? The rate of wear, is that ever -- is that -- is the MRB an appropriate venue to stipulate a wear rate for a certain component?

MR. KOEGEL: The determinations of maintenance tasks that we do as an MRB report, be it under MSG 2 or 3, the tasks are not -- I'm sorry -- the process is not a scientific process. It's just a maintenance tool, and, so, wear rates -- specifically wear rates aren't.

However, we do take into account mean time between unscheduled removals of the part in general. Of the MD-80 jackscrew, the -- when we did MSG 3 analysis on the horizontal stabilizer system as a system, the MTBUR jackscrew that I was provided by Boeing, Maintenance Engineering, was over 58,000 flight hours, MTBUR, --

MR. GUZZETTI: I see.

MR. KOEGEL: -- on that component.

MR. GUZZETTI: And was that data used as a

basis to determine the adequacy of the recommended end play check interval of 3,600 flight hours or 15 months, whichever comes first?

MR. KOEGEL: It formed a part of the MRB Board accepting the data, yes. That information, along with what the current operators of the airplane are operating the -- and doing their frequencies at, yes.

MR. GUZZETTI: Whenever a proposal was made to escalate an interval, does the -- do design engineers from Boeing and certification engineers, like Mr. O'Neil, from the FAA, are they involved in the process to provide approval?

MR. KOEGEL: Advisory Circular 121-22A, which gives me my direction on how I perform an MRB, says that part of my board will be a member from the respective Aircraft Certification Office. So, they are invited and they do attend meetings of the Industry Steering Committee when the FAA is also participants or invited to those. So, yes.

MR. GUZZETTI: Okay. As far as -- are there any airlines out there today operating DC-9s or MD-80s that do not use these intervals for the horizontal stabilizer jackscrew?

In other words, do they have a certain hard

time on their jackscrews and don't really deal with the end play?

MR. KOEGEL: I don't deal with what they do at the local FSDO level. However, I do know the answer to your question, and I do know that TransWorld Airlines on their DC-9 model, not the MD-80 but the DC-9, they hard time their jackscrew at, I believe, 15,500 flight hours.

However, -- and I know this by talking to the PMI of TransWorld, but they also have chosen the hard time because they don't do an end play check.

MR. GUZZETTI: So, TWA Airlines does not perform an end play check on their DC-9 airplanes --

MR. KOEGEL: Only, only DC-9.

MR. GUZZETTI: Only the DC-9. So, what happens after they reach their 15,500 flight hours?

MR. KOEGEL: They pull it out and overhaul it.

MR. GUZZETTI: Do you know if the U.S. Air Force or the U.S. Navy also follows that type of flight limit?

MR. KOEGEL: I do not know.

MR. GUZZETTI: Okay. Where does -- is there any guidance that stipulates this 15,500 flight hours

from the FAA?

MR. KOEGEL: Again, we have -- it's guidance. It's recommendations, and it comes in the form of another advisory circular.

MR. GUZZETTI: What is the number of that advisory circular?

MR. KOEGEL: 121-1A.

MR. GUZZETTI: 121-1A.

MR. KOEGEL: This was a document that was produced and published back in the early '70s, and it again was an attempt to establish some sort of industry-wide standard recommendations for intervals, for maintenance intervals.

MR. GUZZETTI: Do you happen to have a copy of that advisory circular?

MR. KOEGEL: No, I don't. I have -- no, I don't. I have pages just dealing with the DC-9. I have two pages of the advisory circular that deal with the jackscrew for the DC-9.

MR. GUZZETTI: Okay. Mr. Chairman, I'd like to enter an exhibit. I'd like to enter that advisory circular as an exhibit to this hearing, if I may.

MR. HAMMERSCHMIDT: That sounds reasonable. Mr. Rodriguez, would you -- do you see any difficulty

with that, as the hearing officer?

MR. RODRIGUEZ: For the record, there would be no problem with it. We'll put it as 9-Z.

MR. HAMMERSCHMIDT: Okay.

MR. RODRIGUEZ: Unless we're going to use double letters, you can't have any more exhibits, Jeff. It's Advisory Circular 121-1A, be 9-Z.

(The document referred to was marked for identification as Exhibit Number 9-Z and was received in evidence.)

MR. HAMMERSCHMIDT: And if -- you may be about to say, Mr. Guzzetti, if the FAA would please provide that to us, then we will get that photocopied and to all the parties as efficiently as we are able to.

MR. GUZZETTI: Yes, Mr. Chairman, I'll ensure that the FAA will provide that to us. I've got kind of a marked-up copy here, but I would rather -- Mr. Koegel, I would rather receive that copy from the FAA, if that's doable.

MR. KOEGEL: Oh, yes, it's doable. I'll take the action to do that.

MR. GUZZETTI: And, Mr. Chairman, I'll ensure

that that's adequately processed as an exhibit today.

MR. HAMMERSCHMIDT: Thank you.

MR. KOEGEL: Mr. Guzzetti, I'd like to add, though, that the 121-1A was again an advisory circular, advisory in nature, and the interval on the jackscrew, the 121-1A, is 14,000 flight hours removal.

Remember, TransWorld chose to remove theirs at 15.5.

MR. GUZZETTI: Okay.

MR. KOEGEL: But the AC, the advisory circular, speaks -- addressed it at 14,000.

MR. GUZZETTI: But in the advisory -- in this advisory circular, it specifically stipulates -- it goes into actual aircraft models and actual -- and the components of those models and stipulates a hard time?

MR. KOEGEL: A recommended hard time.

MR. GUZZETTI: A recommended hard time.

MR. KOEGEL: Please keep in mind, these are not engineering-derived recommended intervals.

MR. CLARK: Let me ask real quick. You said that TransWorld chose to use 15,500 hours, 15,000 hours, but the issue is that TransWorld chose that number.

Can they choose any number they want or what

kind of oversight do you provide when they choose a number, and do you agree with it or do you disagree or do you approve it?

MR. KOEGEL: On TransWorld's DC -- I'm sorry. On TransWorld's MD-80 fleet, they chose to do the end play checks at every 2-C and the lubrication of their MD-80s at every 1-C. So, they've chosen to maintain their different fleets --

MR. CLARK: I understand that, but on the DC-9, how did they choose -- they chose 15,000 hours. Where's the FAA in all of this? Did they just choose any number they want?

MR. KOEGEL: It's a function of the operator under FAR Part 121. The onus is on the operator, and, so, the local -- I can't speak to what the local FAA regulatory has over TransWorld.

MR. CLARK: So, it's -- for all of these operators out all over the country, they -- any operator can choose a number they want, if they can get the local PMI to approve it, they're home free?

MR. KOEGEL: I wouldn't say home free, sir.

MR. CLARK: Well, maybe not home free, but they can do it?

MR. KOEGEL: It --

MR. CLARK: If they choose wrong, they're not home free, but if they choose a number, and they can get the PMI to agree to that, then they can live with that number?

MR. KOEGEL: I don't deal in the national policy realm, but I do understand that under 121, FAR Part 121, the onus is on the air carrier to maintain the highest levels of safety.

MR. CLARK: Who's the -- do you know the process then that the PMI goes through or what he does to approve that number or does the FAA approve that number then or is that an approved number?

MR. KOEGEL: I don't deal in that level.

MR. CLARK: So, the fact that they're using 15,000 hours, the number they chose, you don't know whether that's an approved -- it is approved by the FAA or not?

MR. KOEGEL: That's correct. I do not know.

MR. CLARK: Okay. Thank you.

MR. GUZZETTI: Just one more question about the MRB, and then I would like to go into another topic.

Have you -- is it possible, during this MRB process, that data is -- that a maintenance interval

can actually be decreased where data could be provided to indicate a higher failure rate, such that the minimum manufacturer's recommendations could be decreased? Have you ever -- are you -- has that ever happened before in the MRB processes that you've participated in?

MR. KOEGEL: Yes.

MR. GUZZETTI: Okay. So, it goes both ways then?

MR. KOEGEL: That's correct. It does.

MR. GUZZETTI: Okay. Were you ever aware of any data that was provided for lubrication interval or end play check interval reasons that supported decreasing those intervals, i.e. having those end play checks and lubrication intervals performed much more frequently? Has any data ever come to your -- across your desk to indicate that?

MR. KOEGEL: Not from the manufacturer, no, or the airlines or the ISC, no.

MR. GUZZETTI: Okay. So, no, the answer is no for everything? You've never seen data submitted through the MRB process to make those -- make the lube and the end play more frequent, is that correct?

MR. KOEGEL: That's correct.

MR. GUZZETTI: Okay. We talked a lot about the MRB. I'd like to probe you on your knowledge regarding maintenance -- the maintenance program.

Mr. O'Neil testified that there's -- that the type design of an airplane assumes that a maintenance program goes along with that type design. Do you know where that is stipulated?

MR. KOEGEL: The function of the Aircraft Evaluation Group and the reason we're co-located with Aircraft Certification Offices is that we are chartered with determining the operational suitability of FAA design approvals. So, we give them a -- we provide an operational evaluation of what they approve.

So, with that in mind, under FAR Part 25.1529 is an article entitled "Instructions for Continued Airworthiness", and it is under this FAR that we have an interface between the Aircraft Certification Service and Flight Standards.

So, I -- we ensure that the manufacturer provides the instructions for continued airworthiness for the products that they sell.

MR. GUZZETTI: And what was that regulation number again?

MR. KOEGEL: FAR 25 -- FAR Part 25.1529.

MR. GUZZETTI: Was there an equivalent regulation back in -- when the DC-9 was -- back -- equivalent regulation for the CARs?

MR. KOEGEL: I do not know.

MR. GUZZETTI: Okay. Could you provide a little more description of FAR 25.1529 as it relates to how it achieves its purpose of attaching a maintenance program and maintenance requirements with a type design? Could you describe that a little bit more for us?

MR. KOEGEL: It just simply says that there must be. The applicant for a TC -- sorry -- for a type certificate or a supplemental type certificate needs to provide the instructions to go along with their design.

MR. GUZZETTI: Does the FAA have to approve those instructions and closely evaluate them before they're attached to the airplane?

MR. KOEGEL: I do not approve FAR Part 25.1529 items.

MR. GUZZETTI: Who does approve them, within the FAA organization?

MR. KOEGEL: They are accepted, --

MR. GUZZETTI: They are accepted --

MR. KOEGEL: -- as all maintenance manuals

are accepted.

MR. GUZZETTI: Okay.

MR. KOEGEL: But again, 1529 -- sorry. FAR Part 25.1529 items aren't -- they aren't the engineering design fault analyses-type items. They're just simply maintenance instructions. The Illustrated Parts Catalog, for instance. Wiring diagrams. These sort of things are part of the Instructions for Continued Airworthiness that I ensure are at least available to be sent out, you know, when the new model airplane goes out the door.

MR. GUZZETTI: Are minimum or defined wear rates for specific components defined in -- via FAR 25.1529?

MR. KOEGEL: No.

MR. GUZZETTI: They are not?

MR. KOEGEL: No.

MR. GUZZETTI: Okay. Mr. Koegel, have you ever served as a principal maintenance inspector?

MR. KOEGEL: No, I have not.

MR. GUZZETTI: Okay. Do you get involved with accepting the aircraft maintenance manual through FAR 25.1529?

MR. KOEGEL: I ensure that the manufacturer

has it to provide.

MR. GUZZETTI: But you do not accept the manual per se?

MR. KOEGEL: Correct. I do not accept the manual per se. I only accept the MRB portion of it if we're talking about a whole new model or large model airplane.

MR. GUZZETTI: And that MRB portion that you accept, does it -- is that the document that stipulates the intervals for maintenance -- specific maintenance tasks?

MR. KOEGEL: It stipulates the initial minimum schedule inspection program, yes.

MR. GUZZETTI: Okay. But through FAR 25.1529 and/or through the MRB process, there is still no hard requirements promulgated that all airlines must follow, is that correct?

MR. KOEGEL: That's correct.

MR. GUZZETTI: Okay. Mr. Chairman, I'd like to turn the questioning over to Mr. McGill, if that's okay.

MR. HAMMERSCHMIDT: That's okay. Mr. McGill, we look forward to your questions. Please proceed.

MR. McGILL: Thank you very much. Good

afternoon, Mr. Koegel.

MR. KOEGEL: Hi, Mr. McGill.

MR. McGILL: Just a couple questions here. We'll kind of clear up here. From your -- from an engineering and safety standpoint, should these intervals on the heavy checks be based on flight hours or calendar months or time?

MR. KOEGEL: I'm an aviation safety inspector, and I'm an air frame and power plant mechanic, not an engineer, and, so, I really can't -- I don't feel qualified to answer your question.

MR. McGILL: Okay. Let's take the MRB that you have for both MSG 2, MSG 3. You have put both calendar time and hours on to the check intervals and the lubrication intervals. For instance, 3,600 flight hours or 15 months, whichever comes first.

So, at that -- when you were approving the MRB report, you had both of those on that document, is that correct?

MR. KOEGEL: I accepted the MRB report, not specifically approved it. But, yes, both of those items were on there. There is flight hours or 15 months, whichever comes first, correct.

MR. McGILL: By the time it -- in -- when the

OAMP of the MSG 2 was created, it also included the flight hours and time, is that correct, sir?

MR. KOEGEL: That's correct.

MR. McGILL: By the time we get to MSG 3, however, we lost one of those. Could you please explain why one of those were no longer part of the OAMP?

MR. KOEGEL: The --

MR. McGILL: MSG 3 OAMP intervals. At this time, for instance, on the MD-80, C-1 check, 3,600 flight hours. However, the 15 months was not on there, and the same way down with the lubrication.

MR. KOEGEL: The MSG 3 MRB interval should be the overriding interval. It should override the MSG 3 OAMP. The OAMP is just -- is the on-aircraft maintenance program. So, I'm assuming it was a typo or left out because the tasks that are in the MRB are carried directly over and put in the OAMP. Should have been.

MR. McGILL: So, we think maybe a typo is why the OAMP does not include the calendar time?

MR. KOEGEL: The requirements in the MRB is the overriding. I -- and I don't know what happens internally with the Boeing Company in the development

of their on-aircraft maintenance program.

MR. McGILL: Another question, Mr. Koegel. Would an established air carrier operating MD-80 aircraft, would they be operating under MSG 2 or 3 or does it matter which one that they choose?

MR. KOEGEL: It is the carrier's choice. The operator's choice.

MR. McGILL: Do you know, are you familiar with established carriers, some of the others, would they be also operating under MSG 3 or would they still be using MSG 2, like Alaska?

MR. KOEGEL: I am unaware of which air carriers are using either program.

MR. McGILL: Can a carrier intermix the two MSG types, 2 or 3?

MR. KOEGEL: In the program rules of the most recent MSG 3 MRB, we have a paragraph that speaks to initial operators of the MD-80, which means an operator that chooses to operate the MD-80 for the first time, may not mix the two.

However, we go on to say that existing operators of the MD-80 may intermix the two, between -- tasks between the two programs.

MR. McGILL: Earlier, you spoke very quickly,

but would you just reiterate the difference of MSG 2 and MSG 3?

MR. KOEGEL: MSG 2 is again an industry-recommended analytical tool that was developed back in the early '70s, and this tool came up with processes called "hard time or on condition". It was basically the program took a process and took a component view of maintaining airplanes, where -- so, they would say a component should be removed at X number of hours for whatever reason.

MSG 3, again industry-recommended program, produced by the airlines and the manufacturer, of which the FAA is only supporting or the AEG just supports, is a task-oriented program, whereas we take a system from a top-down approach viewpoint of it and inquire about the consequence of failure of different systems or components and assign a task to it rather than a process. Task can be a lubrication task or an inspection task.

MR. McGILL: Since you're on the cutting edge, is there an MSG 4 coming along?

MR. KOEGEL: The industry develops those, sir. I have no idea.

MR. McGILL: Mr. Chairman, I have no further

questions.

MR. HAMMERSCHMIDT: Thank you, Mr. McGill. Are there other questions from the Technical Panel at this point?

(No response)

MR. HAMMERSCHMIDT: Seeing no signals, we will proceed directly to the Parties to the public hearing for their questions, and again we will begin with the Air Line Pilots Association.

CAPTAIN WOLF: Thank you, Mr. Chairman. Mr. Koegel, just a few quick questions here, and what we're looking at here was when these C check intervals were escalated, should each of these inspection tasks, for example, the stabilizer jackscrew inspection itself, be reviewed to see what effect extending the intervals would have on each of these individual inspections, and would some of this information be passed along at the Maintenance Review Boards?

MR. KOEGEL: Could you please be more specific in which intervals you're referring to? Is it -- are you referring to the chart on Page 27?

CAPTAIN WOLF: Yes. For instance, at the C checks, and when you decide to escalate them up from either 7,200 hours, up to the 9,550 hours, alls I'm

wondering is, are -- this particular task or any other tasks, are these things reviewed during the -- your meetings, and getting information from the various carriers to see if they've had any problems or whatever? It's just not a decision that's made. It's something that you review, you all review together and say okay, we haven't had a problem. So, we're going to go ahead and extend that schedule.

MR. KOEGEL: The C check interval goes out as basically one package. So that, everything that's packaged by maintenance -- schedule and maintenance planning in a C check package goes and is escalated or de-escalated, whichever the case may be.

The data brought in is data brought in by the airlines and the manufacturer, and they review it, and they present it to the FAA AEG as a recommendation, and we in the AEG in turn, and myself and my Board, review them and find them acceptable.

CAPTAIN WOLF: Okay. Would you expect an air carrier to obtain and analyze tear-down reports for rotable parts overhaul, such as the jackscrew, as a part of the basis for escalating an inspection interval?

MR. KOEGEL: Again, you're asking me about an

airline-specific question, and I don't deal in airline-specific.

CAPTAIN WOLF: But overall, industry basis. I mean, would this be something that would be good to have done or would you perhaps advise the carriers, say this might be a proactive thing to do?

MR. KOEGEL: I would certainly think it would be proactive to gather all the data you can before you escalate anything.

CAPTAIN WOLF: Okay. I know you've been with the FAA since 1991, and just real -- maybe a short clarification on explaining the role of the Aircraft Evaluation Group, and is it your particular office that is responsible for it?

MR. KOEGEL: I'm a Flight Standards inspector assigned to the Flight Standards Service. The Aircraft Evaluation Group is the only section of Flight Standards Service that directly interfaces with Aircraft Certification Service or the Engineering side of the FAA.

There are five AEGs throughout the country, one in Seattle, one down in Long Beach, and one in Dallas-Fort Worth for rotorcraft, and one in Kansas City and one in Boston. But we are essentially Flight

Standards inspectors.

CAPTAIN WOLF: How much contact, monthly, quarterly, yearly, as far as contact, do you have with FAA inspectors in the Aircraft Evaluation Group?

MR. KOEGEL: It is my function to interface between FAA inspectors in the field and Aircraft Engineering, when there's questions on design approvals and things like that. So, I have a lot of interaction with the Flight Standards inspectors in the field.

CAPTAIN WOLF: All right. And directed towards yourself but perhaps also involved in the MRB Group is, what criteria you use to approve and deny a change, and then, is this criteria documented any place? Is it just in notes or is this something that you keep and then distribute out to other people?

MR. KOEGEL: When you say "approve a change", I don't quite know what you mean because, Number 1, we don't approve. We just --

CAPTAIN WOLF: Or accept a change.

MR. KOEGEL: -- find acceptable. But are you referring to specific individual maintenance tasks or entire packages?

CAPTAIN WOLF: Both of them.

MR. KOEGEL: I don't deal with individual

task escalations like you would think an FOEB or MMEL Board does, no.

CAPTAIN WOLF: Just one last question. There must have been several other carriers who were lubricating their jackscrews at 3,600 hours. In other words, when you went ahead and changed the lubrication on the MSG, 600 flight hours up to the 3,600-hour flight hours in the MSG 3, what kind of information did you get?

Were there carriers that were already at that extended interval that were able to give you positive feedback in regards to your Board making the evaluation that it would be okay to extend it out to 3,600 hours?

MR. KOEGEL: The MD-80 MSG 3 MRB was the second MSG 3 product put out by the Boeing Corporation or Douglas at that time. They did the MD-90 first. So, they did MSG 3 on the MD-90 of which Delta has numerous MD-90s. So, out the door with Delta, they took the MSG 3 interval of 1 C or 12 months, and that was back in -- the MD-80 was certified back in '93.

So, then along came the MD-80. We did MSG 3 on that. That was actually the second airplane, and, so, we have data that when TransWorld bought their MD-80s, they initially went out of the factory at MSG 3

intervals of 1 C for the lube, just like the MD-90s and just like the 717s.

CAPTAIN WOLF: Okay. And on these maintenance review boards, is attendance mandatory by the carriers or is it voluntary?

MR. KOEGEL: The document is generously called an MRB document, but the Board that actually puts it together is the Industry Steering Committee, the ISC, in conjunction with vendors and the manufacturer.

Participants to the -- and members of the Industry Steering Committee, their participation is valued. We couldn't do an MRB document without the industry and without the manufacturer.

CAPTAIN WOLF: So, you end up pretty much getting a total cooperation from all the carriers? All the carriers do send somebody to these meetings?

MR. KOEGEL: That's correct.

CAPTAIN WOLF: Okay.

MR. KOEGEL: Well, not all the carriers. I can't -- let me qualify that. But those who are participants or choose to participate, yes.

CAPTAIN WOLF: All right. Okay, sir. Thank you very much. That's all the questions we have.

MR. HAMMERSCHMIDT: Thank you, Captain Wolf. Any questions from the Aircraft Mechanics Fraternal Association?

MR. PATRICK: Yes, Mr. Chairman. Thank you. Mr. Koegel, under FAR 25.1529, you stated that IPCs, maintenance manuals and so on, are accepted, not approved.

Does this acceptance include a review of special tooling to be used to accomplish certain tasks?

MR. KOEGEL: No.

MR. PATRICK: Thank you. Okay. If the MSG MRB recommends the flight hour and/or calendar month interval for an inspection or check using accumulated engineering and statistical data, why is it that the PMI for a particular airline can exclude that data or drop one of the requirements, such as flight hours versus calendar months? Why don't they take this information to a group and then deviate from that particular program?

MR. KOEGEL: I don't know why they would deviate, other than the -- each carrier has different utilization rates of airplanes and different operating environments. So, based on their environment, it could differ dramatically. An airline in Hawaii versus one

in --

MR. PATRICK: In Alaska.

MR. KOEGEL: -- Alaska.

MR. PATRICK: Okay. Thank you. I just have one more question. Did Boeing recommend the current MSG 3 MRB lube interval of 3,600 flight hours or 15 months, whichever comes first? Do you know the answer to that one?

MR. KOEGEL: The Industry Steering Committee --

MR. PATRICK: Right.

MR. KOEGEL: -- did.

MR. PATRICK: Okay.

MR. KOEGEL: And Boeing and the industry was part of that group. They made that recommendation to the MRB.

MR. PATRICK: Okay. Back to the special tooling question. Is there a program to certify or review tooling in effect that you know of?

MR. KOEGEL: I am not aware of any program to certify or review tooling.

MR. PATRICK: Okay. Thank you very much. That's all the questions I have for this witness.

MR. HAMMERSCHMIDT: Thank you, Mr. Patrick.

Mr. Clark, you have a follow-up question?

MR. CLARK: Just along that line. On the approval, on the Industry Steering Committee, is a group of what, manufacturers and airlines?

MR. KOEGEL: And vendors. Yes, sir.

MR. CLARK: And vendors, and to say that this time of what, 3,600 hours, was approved, the fact that the ISC approved that, how is that done? Is it done by a majority or is it done by -- is there some sort of consensus or is it the lowest common denominator of what everybody will agree to?

MR. KOEGEL: The ISC generally meets, and the manufacturer usually hosts the ISC meetings, and they are attended by representatives of the various airlines that choose to participate and vendors, and they bring their -- each particular airline's reliability and continuing analysis data with them, and they discuss intervals, what's good, what's bad. Is this a good task or bad task? Is it an efficient program or not or not efficient?

MR. HAMMERSCHMIDT: Very good. We go next to the Boeing Commercial Airplane Group for questions.

MR. HINDERBERGER: Thank you, Mr. Chairman. We have no questions at this time.

MR. HAMMERSCHMIDT: Thank you, Mr. Hinderberger. Alaska Airlines?

CAPTAIN FINAN: Thank you, Mr. Chairman. Good afternoon, Mr. Koegel.

MR. KOEGEL: Hi.

CAPTAIN FINAN: Isn't it accurate that the intervals for C checks vary from the MRB recommendations as a matter of routine among DC-9 operators or MD-80 operators?

MR. KOEGEL: You mean with the individual carriers, they vary from the document?

CAPTAIN FINAN: That's right.

MR. KOEGEL: Yes, that's correct.

CAPTAIN FINAN: Are you familiar with Exhibit 11-W, which is the Boeing Airline Maintenance Inspection Interval Listing for Operators published in January of 2000?

MR. KOEGEL: I don't believe I have 11-W here.

CAPTAIN FINAN: Well, as Chairman of the MD-80 MRB, would you find it surprising that of the 46 operators listed in that report that use time limits alone for C checks, there are 11 different time limits, and for those that use calendar alone, there are four

different calendar intervals?

MR. KOEGEL: Could you step me back, please? I just now got 11-W.

MR. HAMMERSCHMIDT: Excuse me, gentlemen. I might mention for the record that I don't believe this witness was expected to be briefed on that exhibit.

CAPTAIN FINAN: Actually, I'm just asking the question. As the chairman of that committee, he would find those numbers surprising.

MR. HAMMERSCHMIDT: I just wanted to make it clear that this was --

CAPTAIN FINAN: Sure.

MR. HAMMERSCHMIDT: -- an area that he probably is not prepared on. So, give him a chance to review that, if he wishes to answer it.

MR. KOEGEL: Thank you. Which page would you like me to look at?

CAPTAIN FINAN: I believe it starts on Page 107, I think, for MD-80 operators.

MR. KOEGEL: Let me find that.

CAPTAIN FINAN: And actually, the question's more general, but I think if you want to review that, that'd be fine.

MR. KOEGEL: Would you please go ahead and

repeat the question?

CAPTAIN FINAN: Yeah. Just that if you would find it surprising that of 46 operators listed, 11 use different time intervals, and four use different -- that only use calendar intervals. Of the four that only do that -- four that only use calendar intervals, that they are -- that there are four different ones?

MR. KOEGEL: No, I would not find it surprising. Other models and carriers with other models of fleets do the same thing.

CAPTAIN FINAN: Thank you. No further questions.

MR. HAMMERSCHMIDT: Thank you, Captain Finan. Federal Aviation Administration, any questions?

MR. DONNER: Yes, sir. Just one question for Mr. Koegel, and forgive me for how I have to phrase this, please.

You were talking about 25.1529, and my question for you, sir, is, is there any portion of 1529, the "Instructions for Continued Airworthiness", that requires FAA approval that you know of, such as perhaps the Airworthiness Limitation Section?

MR. KOEGEL: Yes, that's correct. The Airworthiness Limitation Section, which is an

engineering section, does require FAA approval. I'm not familiar with that. I don't review them.

MR. DONNER: Okay. Thank you. I just wanted to clarify the record on the acceptance versus approval portion of that. Thank you.

MR. HAMMERSCHMIDT: Thank you, Mr. Donner. Now, we go to the Board of Inquiry for questions. Mr. Berman?

MR. BERMAN: Thank you, Mr. Chairman. Hello, Mr. Koegel.

MR. KOEGEL: Hello, Mr. Berman.

MR. BERMAN: Did Boeing's design engineers participate in your MRB process or is it just the Boeing Maintenance Service Engineering folks?

MR. KOEGEL: I'm not -- I don't know who in the Boeing Company participates in their portion of the ISC. I do not know.

MR. BERMAN: I'm a little surprised that you don't know who they are. Do you attend the meetings?

MR. KOEGEL: Yes.

MR. BERMAN: Okay.

MR. KOEGEL: I don't know the difference between a Maintainability engineer and a Design engineer. They don't -- the Boeing Company brings

engineers to their meetings, but what discipline they are, I don't know.

MR. BERMAN: I see. So, as far as you're concerned, do you have any way for you to ensure that the design people are adequately involved in your process?

MR. KOEGEL: It's my expectation that the Boeing Maintainability folks who make these recommendations are interfacing with their people.

MR. BERMAN: Okay. Let me turn to something that the last witness, Mr. O'Neil, mentioned. He made reference to properly-trained and equipped mechanics being needed to keep the program moving and detect excessive wear and lubricate things properly.

As a part of the Flight Standards Service, what does that mean? Does that mean that mechanics should be specifically trained to their tasks?

MR. KOEGEL: The training of mechanics is basically within -- under the purview of the individual air carrier and how they choose to train their people.

MR. BERMAN: Do you feel as a member of the Flight Standards Service and an aviation safety inspector in Maintenance, that it's okay for a mechanic who's never accomplished a task previously to just

follow the maintenance and task documents and launch into a task that way?

MR. KOEGEL: As a certificated A&P mechanic and as an employee of several -- two airlines, it has not been my experience that's ever happened. They always -- both carriers assign a more senior mechanic to accompany a more junior one on the first OJT, if you will, type function.

MR. BERMAN: And is that a necessary process for an air carrier to do?

MR. KOEGEL: Necessary is defined by the air carrier themselves. I would believe it's prudent.

MR. BERMAN: Prudent. Okay. Thank you, sir. You mentioned a top-down systems approach was the integral part of the MSG 3 process. What is that?

MR. KOEGEL: They -- we view the system and the functional failures that could happen in the system rather than take a component view and just hard time a component change.

We would expect that with proper lubrication or periodic servicing, that the unit would last a long time.

MR. BERMAN: So, are you saying that was the conclusion of your processes, the MRB processes work on

the jackscrew assembly of this airplane?

MR. KOEGEL: The conclusion of the Industry Steering Committee, which was the carriers and the manufacturer, concluded that, and the MRB Board concurred with that, based on the analysis that they presented us at the Industry Steering Committee meetings, yes.

MR. BERMAN: Mr. McGill or Mr. Guzzetti, do we have records of the minutes of those meetings where those were discussed? Do we have copies of the analysis that Mr. Koegel's referring to?

MR. McGILL: No, I don't have any.

MR. BERMAN: Okay. I'd like to request that the FAA provide that to us, please. Thanks.

MR. KOEGEL: Could you be more specific as far as the analyses you're requesting?

MR. BERMAN: Specific analysis related to the jackscrew assembly of the MD-80 and DC-9 series that resulted in a finding, as you've just stated, that if it was maintained properly, it would last a long time, as you put it, or whatever was the outcome of the ISC in that process.

MR. KOEGEL: I'll take the action. I can provide what we call a "MSI" analysis of the horizontal

stabilizer system. An MSI is a term called -- an acronym for Maintenance Significant Item, and in the MSG 3 process on the MD-80, we took the horizontal stabilizer as a single MSI and analyzed it using the MSG 3 tool, but again it's an analytical tool but not scientific tool.

MR. BERMAN: What was the result of your analysis? Now you're looking at the whole horizontal stabilizer. What was the result of your analysis regarding the jackscrew assembly? Was that part considered to be a maintenance significant item?

MR. KOEGEL: Not the individual component itself, no. The horizontal stabilizer was considered a maintenance significant item.

MR. BERMAN: Did your process look at all the individual parts?

MR. KOEGEL: Yes, it did. It had the mean time between unscheduled removal of all the parts in the horizontal stabilizer trim system.

MR. BERMAN: So, maintenance significant item isn't -- is that something that -- let me start again.

If you had a part that if it wears out, the tail comes off the airplane, would that make it a maintenance significant item, if it's not fail-safe

through the FAA certification process?

MR. KOEGEL: You're combining two different functions of engineering design safety analyses versus maintenance task development tools. So, the MSG 3 process was just a maintenance task analysis tool. It uses a whole different set of criteria. So, it would not -- no, we would not, because it's not considered such.

MR. BERMAN: But you said that your process relates to the safety or the criticality of the item?

MR. KOEGEL: The process is strictly a method to determine the optimum or most efficient maintenance inspection program for that MSI or that maintenance significant item, which is the horizontal stabilizer.

MR. BERMAN: Okay. I'm not sure that we got to the bottom of that one, but we'll move on for now.

DR. ELLINGSTAD: Excuse me, Ben. Could I --

MR. CLARK: Yes, sir.

MR. CLARK: With respect to this process, you talked about it as being analytic but not scientific. What did you mean by that?

MR. KOEGEL: It uses a question of function of failure or what would happen if this happened? What if you don't do this? What if you don't do that? What

happens to the particular MSI?

DR. ELLINGSTAD: Are you doing some kind of a formal risk analysis?

MR. KOEGEL: No.

DR. ELLINGSTAD: A quantitative analysis of any kind?

MR. KOEGEL: No, not at all. It's not a scientific tool or a quantitative tool.

DR. ELLINGSTAD: Yet you're applying some kind of data. Apparently you talked a minute ago about bringing together some quantitative data about, you know, mean time between replacement or whatever.

Is there any formal kind of an operation of this process, whether the one that you're talking about applied to the horizontal stabilizer or any other system that you're applying this kind of a methodology to?

MR. KOEGEL: When we analyzed the MD-80 aircraft under the concepts of MSG 3, the manufacturer provides the ISC with what they term "a list of MSIs" or maintenance significant items on the airplane.

In the case of the MD-80, there's probably a hundred of them that we termed "MSIs", and every MSI is subject to this analysis, but it's just a fault tree

analysis. It's not a scientific engineering-type analytical scientific process, no.

It's a consequence of failure questions that we ask the part. For instance, is it detectable by folks on the ground or people on the flight crew?

DR. ELLINGSTAD: Would you put this in the category that Mr. Kovacik talked about as a qualitative analysis?

MR. KOEGEL: No.

DR. ELLINGSTAD: So, there's something more than that indicated?

MR. KOEGEL: Could you define "qualitative" for me?

DR. ELLINGSTAD: Well, I think the -- he was using that to distinguish it from a more formal quantitative methodology, and you're basically saying that this is not a formal quantitative methodology?

MR. KOEGEL: That's correct. It's less than that.

DR. ELLINGSTAD: Okay.

MR. KOEGEL: It's an attempt to determine the optimal, most efficient inspection frequency for this particular MSI, and it's accomplished by maintenance personnel mostly.

DR. ELLINGSTAD: And the result of this is some kind of a narrative assessment? Some --

MR. KOEGEL: Every MSI that is reviewed by the Industry Steering Committee, and it is concurred with by the FAA MRB, is a packet of data that is reviewable.

DR. ELLINGSTAD: Fine. Thank you. Sorry, Ben.

MR. BERMAN: No problem. Mr. Koegel, let's talk for a moment now about the escalation of C check limits. You told me that that was viewed under MSG 3 as a package, top-down, with the entire C check escalated together.

In approving a process or accepting a change like that in your MSG, was every inspection item analyzed separately, every inspection item within that C check package analyzed separately?

MR. KOEGEL: C check packages are packaged separately by each individual air carrier, and each individual air carrier may choose to put things in his C check package that aren't in the MRB report.

So, to answer, no, not each and every individual C check thing was analyzed, just MSIs were analyzed.

MR. BERMAN: Okay. And this brings us back to the MSI. Just to clarify what I was asking for a little earlier and to follow up on Dr. Ellingstad, I don't want to analyze things right here today, but you have an item, the Acme nut, that is a known wear item. It's designed with that philosophy in mind. Therefore, it's dependent on inspection and maintenance to stay safe, and we've heard time and again today and yesterday about that story.

I have trouble understanding how that part, which holds the tail on of the airplane, could be classified as not an MSI. So, that's what I'm looking for you and for the paperwork to back up.

MR. KOEGEL: The stabilizer jackscrew in the MSG 3 analysis of the MSI that encompassed the horizontal stabilizer, the data presented to the industry, and they in turn recommended to the FAA, was that the mean time between unscheduled removals of the jackscrew is over 58,000 flight hours. Average utilization of the -- of an MD-80 is 3,600 flight hours per year.

So, to get to 58,000 is quite a long time out there from the point of view of looking at the data presented to us.

MR. BERMAN: Well, that's a very interesting analysis because if you look at an average or mean time between replacement, and it's 58,000 hours, you could have three airplanes, which I think we've had in the past, that have a much faster need for replacement, whether it's from high wear rate or poorly-manufactured surface finish or whatever. You could have three airplanes that would be way, way faster than that, and that wouldn't affect the average figure much at all.

Do you think it's appropriate for the FAA to base this requirement on the mean or average and ignore the three or more outliers given that if you had three accidents from this, I don't think that you'd be sticking with the same intervals?

MR. KOEGEL: I don't believe we've relied on the other three. We've relied on the end play checks that are done every 2 C or subject to 200 flight hours to check the progression of wear.

MR. BERMAN: But you escalated both over time, the end play check interval and the lubrication interval?

MR. KOEGEL: The end play check on the MD-80, MD-90 has always been at 2 C. Just the interval itself has progressed. The 2-C interval has gone from -- and

I don't know what the lower end of it was on the MD-80, but it's gone up to where it is currently now at 3,600 flight hours or 15 months, whichever comes first.

MR. BERMAN: Exactly. So, riding along with the rest of the C check packages, which vary from carrier to carrier, this particular item got escalated as C check intervals increased, and then it got -- and then the flight hour requirement got dropped out.

So, with a top-down approach, this got escalated, and it looks like it was never looked at specifically, is that correct?

MR. KOEGEL: No. We looked at the jackscrew.

MR. BERMAN: Yeah.

MR. KOEGEL: We looked at the jackscrew. It was specifically part of the MSI package.

MR. BERMAN: Because the horizontal stabilizer was an MSI, you're saying it was looked at?

MR. KOEGEL: Yes, that's correct.

MR. BERMAN: And then, the decisions were made based on the mean time between replacements?

MR. KOEGEL: And operator input, operator data to the manufacturer.

MR. BERMAN: How did the FAA deal with the information coming out of Douglas at the time or

McDonnell-Douglas in the '80s and '90s, where they were concerned about premature replacements? They were reiterating the need to lubricate the assembly every 600 hours in all operator letters. Was that information addressed by the MRB?

MR. KOEGEL: I wasn't at the AEG during the time that those AOLs went out, but I believe as testified to yesterday, the AOLs are just informational in nature and normally routinely not routed by the FAA.

MR. BERMAN: Well, it doesn't sound like too great an idea to ignore information like that because those are the cases that are violating the averages, and they're the ones that are closest to being accidents. Would you agree with that?

MR. KOEGEL: I can't disagree with you.

MR. BERMAN: Okay. Have you been involved in MEL, Master MEL work in your career?

MR. KOEGEL: As an MRB Chairman, I sit on the FOEB of the MD-80, the Flight Operation Evaluation Board, as a maintenance advisor to the pilots on the Board.

MR. BERMAN: Okay. So, you're familiar with Master MEL concept, and why is it, do you think, thinking back on the philosophies of the FAA in this

area, that an air carrier can never make its own minimum equipment list more permissive than the master minimum equipment list, yet in the maintenance intervals, the MRB is not controlling, and an air carrier can be more permissive?

MR. KOEGEL: Correct.

MR. BERMAN: That wasn't a yes or no question. How does that work within FAA philosophy?

MR. KOEGEL: I don't feel I can comment on how the MMEL philosophy and FAA national policy is or exists. I don't deal with other than as an advisor on the FOEB Boards.

MR. BERMAN: Okay.

MR. KOEGEL: I don't have an opinion.

MR. BERMAN: If you can't answer it, --

MR. KOEGEL: I really can't.

MR. BERMAN: -- do you have an opinion to offer?

MR. KOEGEL: Pardon me?

MR. BERMAN: Do you have an opinion to offer?

MR. KOEGEL: No, I don't.

MR. BERMAN: Okay. Going back to the AOLs, you said they're not routinely routed. Can you describe why they're not routed?

MR. KOEGEL: No, I cannot.

MR. BERMAN: Okay. I think you said they're purely informational, which I think is what we're talking about here, is information.

Were you involved in the expansion of the lubrication limits for this assembly? I know you said you weren't involved in the end play check intervals, but were you involved in the lubrication limits?

MR. KOEGEL: On the MD-80, when it went from 3,600 flight hours to 1 C?

MR. BERMAN: Yes.

MR. KOEGEL: Yes.

MR. BERMAN: Can you describe the nature of the discussion that ensued at your -- in your process? How that happened?

MR. KOEGEL: The lube interval itself as a specific task was not discussed, specifically as we're going to take this one task out to X number of flight hours. The whole check package or again the lubrication is part of the MSI or the analysis of the maintenance significant item included is lubrication a good thing to do, and when is a good time to do it?

MR. BERMAN: So, what was the analysis?

MR. KOEGEL: 1 C. The analysis drove us --

drove the -- to a 1 C recommendation.

MR. BERMAN: Based on what?

MR. KOEGEL: Based on that this was the second MSG 3 MRB follow-on behind the MD-90 which had a 1 C in-service history of no problems with the MD-90 and also no problems with the MD-80.

MR. BERMAN: Okay. Were you on the MD-90 MRB activity?

MR. KOEGEL: No, I was not.

MR. BERMAN: Okay. Do you ever see the all operator letters that McDonnell-Douglas, now Boeing, produces?

MR. KOEGEL: Yes, I do.

MR. BERMAN: Oh. Do you have to ask for them or are they given to you routinely?

MR. KOEGEL: It's a function that generally happens between the manufacturer and the Aircraft Certification Office, and, so, it's -- by the time it's routed to our small branch of the LACO, they're not new.

MR. BERMAN: Does your office have a file of them? For instance, if you've got an all operator letter about a slat, would you put in a slat file to watch for the next time you escalate a slat inspection

interval?

MR. KOEGEL: I have a personal folder that I -- on the models of airplanes that I am the MRB Chairman of, that when information comes around, that I get in this fashion, I stick it in the folder for my upcoming revision.

MR. BERMAN: Okay. Thank you. No further questions, sir.

MR. HAMMERSCHMIDT: Thank you, Mr. Berman. We've gone on here for about an hour and 45 minutes, and Mr. Clark indicates that he has just a few questions to ask, and therefore I would like to try to finish up with this witness before we take our break.

So, Mr. Clark?

MR. CLARK: Thank you. When you were talking about an MSI, I think you indicated that that's what, primarily maintenance personnel? Somebody that performs an MSI or works on an MSI item?

MR. KOEGEL: The MSI is the term for a maintenance significant item that is -- yes. It is reviewed by or the people on my MRB are maintenance people.

MR. CLARK: Okay. When they look at this, do they understand the significance of that gimbal nut or

that brass jackscrew, that if it fails, we'll lose an airplane? Do they understand that when they're evaluating this?

MR. KOEGEL: Not to the level that you're asking me, and that we've heard testimony on the last two days, no. It's a different type of analysis that we look at it from.

MR. CLARK: Okay. And then, in the -- that follows in that you said that you kind of go through an analysis that says what happens if. So, that would not be a part of that scenario?

MR. KOEGEL: That's correct. That's correct. You're correct.

MR. CLARK: What kind of a what happens scenario would be applied or question would be applied to the jackscrew and the gimbal nut, Acme nut?

MR. KOEGEL: In the process you're asking about, it's -- we ask ourselves, we, the maintenance people who are reviewing this, -- also, I need to add it's not -- the MSI is reviewed by members of the airlines and members of the manufacturer, and their qualifications are necessarily -- are not necessarily just as maintenance folks. They could be engineering personnel also that do these analysis on their part.

But the MRB I was referring to is mostly just maintenance folks, and we don't deal on the level of anything more than what if. So, for instance, we ask ourselves, if the jackscrew or if the stabilizer stops moving, will the pilot know?

So, rather than go back there and do checks or inspection intervals that are non-productive or inefficient, if indeed there's a problem with the horizontal stabilizer or anything on the airplane or flaps or slats, the first person to know about it would be the flight crew.

So, in our look at the system, we say, okay, well, if they're going to know about it first, then indeed why should maintenance go there and do this?

MR. CLARK: If it's simply going to quit operating, they know they can handle it? They're trained to handle that. So, --

MR. KOEGEL: That's the general way that we do MSG 3, yes.

MR. CLARK: Okay.

MR. KOEGEL: But again, it's just from the maintenance perspective.

MR. CLARK: Okay. But in the process of doing that and expanding these intervals, in the -- it

seems that the lube interval has gone from 900 hours to 2,500 hours or you would permit 3,600 hours. The inspection intervals on the end play go from 7,000 to 9,000 hours, and all of that's based on an MTBF of 58,000 hours, is that right or is that a part of it?

MR. KOEGEL: Your numbers are basically not right.

MR. CLARK: Okay.

MR. KOEGEL: In the MRB document, it goes from 3,600 to 7.2. I don't know where the 90 whatever came from.

MR. CLARK: Well, then the -- early in the history of the DC-9s, I understood that the lubrication interval was -- there's a document that says 1985 was 450 hours, that there's between 600 and 900 hours was an accepted lubrication interval, and then at one point, there's a 2,550 hour number out there for lubrication interval.

So, those are the numbers I'm using, and then it's grown to 3,600 hours as an acceptable lubrication interval, and I thought that was in one of the MRBs.

MR. KOEGEL: The 3,600 hour interval is in the MRB that I --

MR. CLARK: Okay. But for some -- from

somewhere, for when they originally came into service in less than a thousand hours, we're now up to a permissible area of 3,600 hours, according to your document.

MR. KOEGEL: But that was based on operator input, manufacturer input, and it was based on -- in addition to what you don't see there is on the 1 C check, there's also an operational check that we do to perform on the jackscrew. So, besides lubing it, we ops check it. So, it's operated at that 1 C. So, every 1 C, something's done to it.

MR. CLARK: Okay. And then, in part of the process here, the end play check moved from either 6 or 7,000 hours up into the 9,000 hour range.

MR. KOEGEL: Not in the document.

MR. CLARK: That's not in your document, but it's permissible out there?

MR. KOEGEL: Correct.

MR. CLARK: Okay. All right. Now, with all of that going on, you talked about mean time between failure, and you talk about this 58,000 hours, and, so, if we started expanding these service intervals or these end check intervals, and all of a sudden, that mean time between failures started down, what would you

do about that? Would you become aware of that?

MR. KOEGEL: The MRB is usually convened annually, and the topic of discussion is to relook at the intervals we have. So, if an operator is having difficulty or if it goes up, if the MTBUR goes up, it'll be a subject of discussion and assume bring it back down.

MR. CLARK: Okay. Now, part of this mean time between failure, MTBF, -- what type of failures are we looking at there? This 58,000 hours MTBF, what's the typical failure that causes that jackscrew to get pulled off?

MR. KOEGEL: I don't know. It's data I rely on the manufacturer to collate and maintain.

MR. CLARK: Okay.

MR. KOEGEL: And the operator.

MR. CLARK: Could be faulty motor, could be a leaky seal, could -- I mean, those are the types of things. It could be something like that?

MR. KOEGEL: It could be a number of items. However, it's probably not the motor because when we have the data in our -- again, I hate to refer back to it, but the MSI package, we list each component in that primary MSI or horizontal stabilizer system as an

individual component and an individual MTBUR.

MR. CLARK: Okay.

MR. KOEGEL: So, we have the MTBUR of the motors.

MR. CLARK: But what we're looking at here is we're looking at failures that cause it not to operate or the pilot to become aware of it, things like that, where it has to be taken off, fixed and put back on. So, it's that type of failure.

MR. KOEGEL: That is tracked by --

MR. CLARK: Okay. But the failure that's critical here is the catastrophic failure, that the threads let go, and we have a catastrophic failure. That number really never folds into this 58,000 MTBF number, does it?

MR. KOEGEL: I would agree with you.

MR. CLARK: Okay. So, as we're expanding out from hundreds of hours to 3,600 hours or 7,000 or 9,000 hours, we're expanding based on all of these in-operation type failures, and with all of this going on, there's nothing in here that would give you a clue to how close you're getting to a catastrophic failure, is there?

MR. KOEGEL: Other than the end play checks.

The end play check's done every 7,200 flight hours or 2 C, and the end play checks are based on data that we already know, and when the jackscrews are pulled off, they're sent back to the manufacturer.

MR. CLARK: Okay. Do you know what they do with them at the manufacturer?

MR. KOEGEL: Overhaul them.

MR. CLARK: Yeah. They don't find out why they wore so fast, they just fix them and send them back, is that -- do you know that?

MR. KOEGEL: No, I do not.

MR. CLARK: Okay. Okay. Part of -- earlier, you talked about the term, it's accepted, the maintenance program is accepted by the FAA, rather than approved.

MR. KOEGEL: Yes.

MR. CLARK: What's the difference between the two? Why do one versus the other? If you were to approve it, what would that mean? What does that mean differently to something that you accept?

MR. KOEGEL: Not being a lawyer, I don't feel qualified to comment between the main differences between approved and accepted. I do know the differences, and the differences are to me as a lowly

inspector, is that the approved documents are approved per each page roughly, generally, or FAA approved each page, whereas accepted is we don't approve each page specifically. Other than that, I don't feel qualified to comment much more than that.

MR. CLARK: Okay. But if you accept it, that gets you more off the hook than if you approve it for whatever you may be on the hook for? Is that what's going on? Is it a liability issue or do you know?

MR. KOEGEL: I don't know.

MR. CLARK: Okay.

MR. KOEGEL: I don't think so, though.

MR. CLARK: Okay. All right. The -- if you accept the maintenance manual, then who is really responsible for the maintenance program to assure that things are done, that the levels are set correctly, that the -- that we aren't going to have failures out there?

MR. KOEGEL: Under FAR Part 121, the operator is responsible.

MR. CLARK: Okay. But you require or the FAA requires the manufacturer to provide a guideline?

MR. KOEGEL: Under FAR Part 25, they need to produce them, and we need -- and I ensure that they are

part of a big package that goes.

MR. CLARK: But whatever is done out there rests solely on the shoulders of the operator in your -- from your viewpoint?

MR. KOEGEL: Yes.

MR. CLARK: They are the ones responsible for that maintenance program and the validity of the maintenance program?

MR. KOEGEL: The operator is responsible for their own maintenance program, correct.

MR. CLARK: Okay. And would it be certainly in the interests of an operator to expand maintenance schedules out as far as they can to save money? Is that one reason?

MR. KOEGEL: Operator utilization could be another reason, besides just saving money, and their environment.

MR. CLARK: Okay. What -- but the -- in the -- does the FAA provide oversight over that to make sure they don't push too far?

MR. KOEGEL: That question deals with how the individual or the local regulatory deals with their certificate, and I'm not qualified to comment on how they do it.

MR. CLARK: When you accept a maintenance package, what does that mean? What do you do with that? What happens? You just sign a piece of paper that you accept it? Is it --

MR. KOEGEL: What I accept is the MRB report.

MR. CLARK: Oh, yeah, that's right. You're on that.

MR. KOEGEL: The document produced by the ISC and the manufacturer.

MR. CLARK: Okay. All right. Okay. Thank you.

MR. HAMMERSCHMIDT: Thank you, Mr. Clark. Any other questions from the NTSB?

MR. RODRIGUEZ: No, sir.

MR. HAMMERSCHMIDT: Thank you. Dr. Ellingstad has no questions.

Mr. Koegel, we appreciate your participation in this public hearing, and we thank you for being a responsive witness to our questions, and you may stand down.

MR. KOEGEL: Thank you for the opportunity to provide them.

MR. HAMMERSCHMIDT: Thank you, sir.

(Whereupon, the witness was excused.)

MR. HAMMERSCHMIDT: At this point, we will take a break. We are about an hour and 58 minutes from our lunch break, when we returned. Let's take about a 15-minute break.

The next witness is Mr. Dennis Jerome. If he could be at the witness table in about 15 minutes, we would appreciate it, and I might mention that the intention this evening, and I emphasize "intention", is to adjourn at about 7 p.m. So, thank you.

(Whereupon, a recess was taken.)

MR. HAMMERSCHMIDT: Let me ask the hearing officer, Mr. Richard Rodriguez, if there might be a change in the witness line-up that was engineered during the last break.

MR. RODRIGUEZ: Yes, sir, Mr. Chairman. In order to accommodate a witness, we are replacing Mr. Jerome at this time or postponing his appearance until we have interviewed Mr. Maloney, Mr. Jay Maloney, Former Director of Engineering for Alaska Airlines, and Mr. Maloney will be the next witness, and Mr. Jerome will follow him in order to accommodate some personal needs.

MR. HAMMERSCHMIDT: Thank you, Mr. Rodriguez. It looks as though Mr. Jerome will be tomorrow, along

with the other witness to testify on Grease.

MR. RODRIGUEZ: Yes, Mr. Moore.

MR. HAMMERSCHMIDT: So, this may work out fine from our vantage point.

MR. RODRIGUEZ: Yes, sir.

MR. HAMMERSCHMIDT: All right. Mr. Maloney, please come to the witness table, and we welcome you, sir.

Whereupon,

JAY MALONEY

having been first duly affirmed, was called as a witness herein and was examined and testified as follows:

MR. RODRIGUEZ: Please be seated, sir.

Interview of Jay Maloney

MR. RODRIGUEZ: And would you state your full name and address, please?

MR. MALONEY: Full name is Jay P. Maloney. Address is Seattle, Washington. I currently work for the Boeing Company.

MR. RODRIGUEZ: And is that in the Commercial Aircraft Group?

MR. MALONEY: Commercial Aircraft Group. Yes, sir.

MR. RODRIGUEZ: And would you briefly describe your aviation background for us?

MR. MALONEY: I have, since July of this year, worked for the Boeing Company. Prior to that, I worked for Alaska Airlines, from 1992 to July of this year, and prior to that, I worked at Continental Airlines in Houston, Texas, and prior to that, I graduated college, from Parks College in Kohoke, Illinois.

MR. RODRIGUEZ: And as a matter of interest, was your experience with Continental in the maintenance area as well?

MR. MALONEY: Sir, it started out in the Pilot Training Group, and then it moved into the Maintenance area, yes, and then into the Engineering area.

MR. RODRIGUEZ: Okay. Thank you very much. Mr. McGill will question the witness.

MR. McGILL: Good evening, Mr. Maloney.

MR. MALONEY: Evening.

MR. McGILL: Let's start real quickly here and explain the positions you have held since you were working for Alaska Airlines.

MR. MALONEY: Okay. The positions at my

employment while at Alaska Airlines?

MR. McGILL: Yes, sir.

MR. MALONEY: Got hired in '92 at Alaska as a service engineer, and then I believe in '93 or '94, moved into Maintenance Programs, where I was the Manager of Maintenance Programs and Technical Publications, and then in October '97, moved into the Director of Engineering position, where I, at that point in July, I moved over to the Boeing Commercial Aircraft Group.

MR. McGILL: Okay. So, July, you went to Boeing. Was that by your own choice? Was this an advancement in your career?

MR. MALONEY: It was an advancement in my career. The Boeing Aircraft Commercial Group had made me a job offer into a new division that they have started. So, I took that opportunity.

MR. McGILL: Thank you. I want to go back initially to 1997. That was when -- and I wanted you to briefly go through -- if you'll look at Exhibit 11-G, where we have the MEO1 for the Technical Change Request that moved AeroShell 33 Grease on the task cards from Mobil 28.

From that time in 1997, state your position

again at that time when this task card again was written.

MR. MALONEY: Okay. At that time, my position was Manager of Maintenance Programs and Technical Publications.

MR. McGILL: Okay. So, in starting with this MEO1, it's got your signature on there, could you just kind of generally -- let's not talk about this one maybe right now. Let's just talk generally how a technical change request would be made or be sent to you from someone in the company, and then we'll take this one right here, and if you could, then kind of take us through this process, please.

MR. MALONEY: Yes, sir. Technical change requests, such as this one, would come into my department on a regular basis. We would have basically an in box, if you will, where the technical changes would come in. We would get several a week. They would be logged in by an assistant -- someone within the Technical Publications Group would log these in.

Once they get logged in, I would, on a weekly basis, I believe, take these and review them, look at them as far as which type of routing they would go through. There's three choices here, looking at this

form, there's MRB and RAP and Routine.

They would be reviewed and then signed by me and sent on for further consideration for a change, and, so, the process was something that the originator filled it out, put it in the in box, and then I would pick it up and review it for the type of routing that was required, and then it would go out for consideration by the various departments that are indicated on the form. That was the initial incoming process.

MR. McGILL: You said there were three special actions, an MRB required, the RAP Control Board action required or Routine. Do you remember what each one of those -- what drove which one of those that might be?

MR. MALONEY: Well, it's been awhile since I've processed one. The MRB and the RAP were committees; that is, every other week, there would be a review board, and the review board would review these change requests, and I think in general, if it was a program change, it was considered a RAP, and if it was a GMM change, it was considered MRB, from what I can recall.

So, we would meet every other week and review

these change requests, and there would be two agendas basically, a RAP and an MRB agenda.

MR. McGILL: Let's just take this one right here that we have as an exhibit, and can you explain the requested change to us, please?

MR. MALONEY: On this particular one here?

MR. McGILL: Yes, sir.

MR. MALONEY: In looking at this one, it's a request to revise the lube task cards to use AeroShell 33 DMS 3-33 Grease for Flight Controls, Doors, Landing Gear, except Wheel Bearings, on MD-80s. This grease will replace Mobil 28.

MR. McGILL: Prior to this time, were you involved in any of the processes that made this type of change? Were you on any of the committees? Were you part of the groups that studied to make that change?

MR. MALONEY: Groups or committees?

MR. McGILL: Well, just anything that -- from the company. Were you involved at all on the change of the lubricant for the MD-80?

MR. MALONEY: Prior to this submittal, no, sir, not that I can recall.

MR. McGILL: Take us through the person that made that request. Who is the person who made the

request for here? For this change?

MR. MALONEY: The person who made the request?

MR. McGILL: Yes.

MR. MALONEY: Anyone who's making a change request using this form is at the top of the form, it's got a K. Matsuzawa. That would be -- from looking at this form, that would be in my view the person initiating the request.

MR. McGILL: Do you know anything about that request? Any information that -- were you around when they -- when Mr. Matsuzawa made this request?

MR. MALONEY: Well, I was in the Maintenance Programs Group, and I received this from Mr. Matsuzawa via this form.

MR. McGILL: But the decision to make this request, were you part of that group?

MR. MALONEY: Not that I can recall, sir, no.

MR. McGILL: Okay. So, the request comes in to change lubricants in 1997. Continue right on through supervisory approval. Whose signature is that?

MR. MALONEY: Looking at that, it's hard to read. But it looks like John Hoover's. That is, I know John Hoover was the Manager of the Systems Group

at that time. So, I would assume that's his signature as supervisor.

MR. McGILL: Now, as Manager of the Maintenance Program and Publications Group, is it your responsibility now to send this request to other people?

MR. MALONEY: In '97, when we get these change requests, yeah. They would come in to me, and I would be responsible for routing those to the other departments for consideration, and this one came to me, and it looks like I dated it on 9/17/97 for routing.

MR. McGILL: When they come in from routing, when are these -- right above that, the special action required for the MRB or the RAP action required, would that have been checked at this point?

MR. MALONEY: It should have been, yes.

MR. McGILL: But it wasn't?

MR. MALONEY: No, it wasn't.

MR. McGILL: Did you try to figure out why?

MR. MALONEY: Yeah. In my own mind, I tried to figure out why. I normally would check those based upon the requirements stated in the GMM, General Maintenance Manual.

MR. McGILL: But they're not checked. So,

why would they -- why would you -- if you -- why isn't there no signature -- no checkmark in one of those three?

MR. MALONEY: I don't know that, sir. I normally would check these, but for this one, I either forgot to or missed it. I don't know.

MR. McGILL: If you had done it, would there be a particular category that you would have put it in?

MR. MALONEY: If I had done it, I'd -- to be honest with you, I would probably review the GMM one more time to see just what category I should put that in, but I'm not a hundred percent sure at this point if it would be a RAP or a Routine. I'm fairly confident I wouldn't mark it MRB because that was for GMM changes.

MR. McGILL: Okay. And you routed it to -- who is the next person that you routed it to?

MR. MALONEY: Well, sir, if -- again, I can give you the scenario here. If I had marked it RAP on that box, I would have given it -- as I recall, I would have given it to our Technical Publications Group. I had an individual who put the agendas together for the biweekly meetings, and there was an in box there where it would have gone for inclusion on the agenda.

If it was marked Routine and went out

Routine, there was a -- I called it a routing box. It was a set-up that we had back in the Publications Group where each department had their label on the in box, and it would go in there for review; that is, the way this normally worked, if there was a change request to be considered for incorporation, each department, whether it be Maintenance, Base or Line, QC or Reliability, would go back, look at their box.

If there was a change request in the box, they'd pull it out, review it, consider it, whether or not they had any questions or wanted to make any changes or wanted to disapprove it at the time or possibly approve it, and that would then go into the next box.

It wasn't high-tech, but it kept the forms in one location, so we could keep track of them.

MR. McGILL: Once you sent it out the first time, did you get it back?

MR. MALONEY: I don't recall getting this one back, sir.

MR. McGILL: Did you -- are you the one that initialed through the Base Maintenance and Maintenance Planning?

MR. MALONEY: Yes, sir. Those are my

initials.

MR. McGILL: How -- why would you not initial through, say, Line Maintenance?

MR. MALONEY: Well, on these types of changes that we would get, part of what I would do on the review process is I would look at what was written here, which I read to everybody, and then, based on what was written on the change request, I would look at which department would be most affected by the change and then include and make sure that department was included for the review process.

So, we did most of our lubes on the line. So, I included Line Maintenance, it looks like, on this one.

MR. McGILL: But, of course, you also do lube checks and that would have been Base Maintenance?

MR. MALONEY: Yes.

MR. McGILL: If you don't know at the time whether that was -- should have been a RAP Control Board action or a Routine, do you recall why you didn't go back and look that up to find out which one of these people you would have sent -- because I believe -- would Quality Control have needed to be approved, if that had been a RAP Control Board-required item?

MR. MALONEY: Yes, sir. Quality Control would have been included, if it was a RAP.

MR. McGILL: So, at this point, you didn't know that perhaps Quality Control should be on here? Is that why you didn't scratch through that?

MR. MALONEY: Well, again I'd have to refresh my memory on the GMM, but I know that I processed a lot of these, and Quality Control, along with some of these other departments, were required, I believe, per the GMM, on any change request. It didn't matter which one or what type, that is.

MR. McGILL: When you get one of these forms, do you also get the justification package that went with it?

MR. MALONEY: Usually there is an attachment with most of these requests. That's something I would look for before I would send it on, that there would be something relevant to the change request.

MR. McGILL: Was there an attachment with this one?

MR. MALONEY: I'm going to make an assumption here, sir, that there was, and that I -- part of what I would review these changes for is some type of relevant attachment to be considered. If I sent just the form

on, there wouldn't be anything to look at for the review process. Usually there is, yes.

MR. McGILL: At the time, would that have been considered a significant request to change the MIL Spec of a lubricant?

MR. MALONEY: Well, in whose opinion? Mine or --

MR. McGILL: Your opinion.

MR. MALONEY: My opinion. Well, at the time, a change to -- this is my opinion, to a lubricant, I didn't see that as a major significant change. I saw it as basically in my opinion a routine change.

MR. McGILL: Is there any guidance in the GMM that one would -- could use to determine whether that's a change request like this is significant, that requires Board action or Routine?

MR. MALONEY: Again, there's some guidance in the GMM that I recall that identified the type of consideration for MRB, RAP or Routine, I believe, but I'd have to review it again.

MR. McGILL: Do you remember reviewing that at this particular time?

MR. MALONEY: No, sir.

MR. McGILL: The signature for the

Engineering Director is -- who is this?

MR. MALONEY: Under the Engineering block?

MR. McGILL: Yes, sir.

MR. MALONEY: Well, it looks like Jim Davey, at least the last name I can make out is D-A-V-E-Y.

MR. HAMMERSCHMIDT: Mr. McGill? Up here.

MR. McGILL: Yes, sir.

MR. HAMMERSCHMIDT: Is this a form that we can put up on the screen?

MR. McGILL: Well, I thought we were going to, and Dana said that she didn't think it would show up, and, so, --

MR. HAMMERSCHMIDT: Okay.

MR. McGILL: -- we can try again, though, and see --

MR. HAMMERSCHMIDT: Okay.

MR. McGILL: Dana, it's 11-G, and there it is. It's -- I guess that's better than nothing right there. So, that's good. Thank you, sir.

So, Mr. Davey is the Director of Engineering, that's correct?

MR. MALONEY: Well, he was -- in '97, I believe his title was Staff Vice President of Engineering, but --

MR. McGILL: Okay. Staff Vice President of Engineering. Now, from what you see right here, it just looks like this form is incomplete to somebody like me. Would you say that this is incomplete or is this a completed form?

MR. MALONEY: If we're referring to the lack of signatures here or the fact that it's not completely signed by the departments indicated, I'd say it's incomplete.

MR. McGILL: And right at the bottom, there's a place there for the Maintenance Program Publication Request -- there's a signature at the end, too.

MR. MALONEY: Yes, sir. At the very bottom?

MR. McGILL: Yes.

MR. MALONEY: Yeah.

MR. McGILL: And that hasn't been signed either?

MR. MALONEY: That's correct. It has no writing on it.

MR. McGILL: So, I'm just trying to better understand if a document comes in, and you have sent it out for these -- how does it -- how did it get to the situation where it was actually implemented?

MR. MALONEY: Well, if you like, I can take

you through what would happen --

MR. McGILL: Yes, sir. Please do that.

MR. MALONEY: Okay. Well, after I would send these type of documents out for review, they would come back to the Maintenance Programs Department, to my group, and at that time, there were basically two processes here.

So, if this was an MRB or a RAP item, where we meet every other week, at the conclusion of the meeting, I would take the approved or disapproved change requests back with me to my department, and at that point, I would assign the change request to a programmer.

If it was disapproved, I would send it back to the originator, and what I generally like to do is if it was disapproved, there would be an explanation from the department that disapproved it written on there.

If it was approved, I would assign it to a programmer. They would incorporate the change into the Maintenance Program, and at the bottom, you mentioned here on the form, it would be the programmer's responsibility to write that he signed his signature there; that is, that he's completed the task, the

request.

If this did not come through the biweekly meetings, there was another in box back in my department that these completed forms went into; that is, after they'd been routed and signed, they'd go into an approved box or a completed box, and I would check that every week or so, and then bring it back and assign it to a programmer.

MR. McGILL: Well, I keep looking at this, and it's nothing -- it doesn't appear to be signed off. I'm trying to understand how you can -- how it was advanced further if we don't have people looking at the various justifications that were attached to this document.

How did it progress to where we do know that it changed the task card, and it changed the lubrication? So, is there anything that you can explain how it got to that point?

MR. MALONEY: Well, again I don't have an explanation on how it got to that point. The fact that I'm looking at my signature on this form, and the fact that these forms take that route for review, this form would -- this change request wouldn't be incorporated until it came back signed, and I have not an

explanation how it would have gotten into the Maintenance Program without it being signed. I would not have assigned it to a programmer without the signatures.

MR. McGILL: Because right now, it's just two signatures, yours and Mr. Davey, --

MR. MALONEY: That's correct.

MR. McGILL: -- and somehow or another, you're saying it moved into an approved slot and continued on with the process.

MR. MALONEY: Well, again that approved slot that I mentioned as far as after it's been routed, once it goes into the slot where you have completed forms, whether it's been approved or disapproved, I would take paper out of that and then assign it to a programmer.

This one, by looking at it, it's not completed. So, therefore, I can't answer how this would have gotten assigned to a programmer. I don't know.

MR. McGILL: Okay. Do you recall any more about the attachments that would have been with this? The justification for this lubrication change?

MR. MALONEY: In all honesty, I can't, sir. These came in weekly, and I basically was looking for

attachments, signatures, and then I would process them on. It would be difficult. I don't know if I could tell any more on this one from any other change request that came through.

MR. McGILL: So, you can't really tell us anything about why the lubrication was changed rather than just what you're looking at right here?

MR. MALONEY: Yeah. That, and my own opinion or assumption.

MR. McGILL: And what is that?

MR. MALONEY: That it might have been an improved grease. I mean, at the time, I would have made -- most likely made that assumption, that it was an improved -- an improved grease.

MR. McGILL: Would you think it needed also in the justification some sort of an engineering analysis or any kind of study or anything like that or test program, sampling program?

MR. MALONEY: Well, that would have been just -- that would be pure opinion on my part. I wasn't in a position, sir, to make a decision like that at the time.

MR. McGILL: Okay. After -- and we do know that somehow or another, it got approved. From that

point, --

MR. CLARK: Excuse me. At that time, who was in the position to make that type of decision?

MR. MALONEY: Well, as far as a change request, such as this one or any one that went through, and I get them from various departments, they go through these individual departments identified here, and those departments would review it and the attachments for whether or not this was an acceptable change, whether this made sense to use, whether this was indeed an improvement.

So, you've got Reliability Engineering, Quality and Line Maintenance on this one.

MR. CLARK: Okay. Thanks.

MR. McGILL: Are you familiar with the Exhibit 11-H, which was the 199- -- the -- I believe this was the No Technical Objection Letter that Boeing had sent, dated 26 September 1997.

MR. MALONEY: I've reviewed this document.

MR. McGILL: But the request came in, you signed off on the 17th of September. This letter is the 26th of September. Was there some other -- that you know of, some other reason why that request to make the lubrication change, other than the letter, No

Technical Objection Letter, that was sent by Boeing?

MR. MALONEY: No, sir. Again, this particular telex, I've reviewed it here recently, and I -- you know, as far as how it relates, I can read this now and see that there's information here relevant to this particular change request, but I became aware of this document earlier this year.

MR. McGILL: The application was actually in July. So, that's even two months prior to the letter. I was just curious if you knew anything about that --

MR. MALONEY: No, sir, I don't.

MR. McGILL: -- or remember anything about that.

MR. MALONEY: Not that I can recall.

MR. McGILL: In Exhibit 11-I, December of 1997, there's like six pages of task card changes that was sent to the FAA, and on the fifth page of those six was the Task Card 281331.2000, which made the grease change.

Is this normal, that you would send four or six pages of requests to the FAA like this?

MR. MALONEY: Yes, sir. This is a -- if you want a little background on this, I --

MR. McGILL: Yes, sir, please.

MR. MALONEY: Okay. This is a typical monthly report that the FAA would receive from the Maintenance Programs Group. Any change, no matter how minor or how major, made to the Maintenance Program is captured by the computer system, and a report prints out every month.

I worked fairly closely with our local Flight Standards District Office, and we supplied them this on a monthly basis, so they were aware of the changes that we made on any given month.

So, it was kind of a tool to be used, so that for the activity that the program might have seen on any given month, what changed, what didn't, you could go to this report, look at the card number, and pull the card up and review the card, if you wanted to.

MR. McGILL: Would this have been the only notification that the FAA received about this request change or this material change?

MR. MALONEY: As far as I know, this report covers any change we made to the program. So, to my knowledge, this report would be the only report I know of that the FAA would get related to a program change.

MR. McGILL: So, if I happened to be the principal maintenance inspector, and I received six

pages sent to me periodically, I would be reviewing every one of these card changes, task card changes, if I really wanted to understand what was actually done?

MR. MALONEY: Yes, sir. Not only would you be reviewing this report, but we would also be sending you every single card on the report.

Our principal kept copies of our program, I believe, I'm almost sure of this, in their office, Hard copies, and every month, much like revising a manual, we would send them the changes, and then they would incorporate the changes in their books.

MR. McGILL: Would you know that, you know, -- not only this, would you also send any kind of a justification for this change? Would that be included with/attached to this card?

MR. MALONEY: Well, if you look at the report, what -- at least when I was managing the group, I would ask the programmers to do, that any change on this report reference the document that authorized the change. So, you wouldn't have to send all of the supporting documents because you could reference whatever it was that changed the program, whatever drove the change.

MR. McGILL: And once that change was sent

over to the FAA, it has a revision date, and you send that revision also to the FAA, is that what you said, of the task card?

MR. MALONEY: The -- a copy of the card --

MR. McGILL: Yes.

MR. MALONEY: -- would also be sent.

MR. McGILL: So, that's a thick stack of papers, in other words?

MR. MALONEY: Some months, it could be, yes.

MR. McGILL: When you send something to the FAA like that, is that accepted data that they are receiving or must that be FAA-approved before you could implement that change?

MR. MALONEY: When we would send these reports and changes to the FAA, it would be considered accepted data; that is, the fact that -- at least this is my view of it, that we were informing them of changes made to the program on a monthly basis.

We always knew they could come back at us and say we have a question regarding a particular change, and at that point, part of my job was to work with them and address any questions or concerns they had with anything in the maintenance program.

MR. McGILL: Other than Mr. Matsuzawa, would

you know who had wanted to implement this change or originated it inside the company?

MR. MALONEY: No, sir. I'd have to ask Mr. Matsuzawa as to what originated or what was really driving this change.

MR. McGILL: After you make a change like that, is there any follow-up or tracking from an engineering perspective of any of these changes?

MR. MALONEY: Not that I recall or I don't recall of any follow-up or tracking of changes made for things of this nature.

MR. McGILL: The 11-J attachment was a letter about -- that was sent by Boeing that referenced a problem that Alaska had with an aircraft or several aircraft up around Fairbanks.

Have you looked at this document that was sent on 11-J, the 17th of December?

MR. MALONEY: 17th of December 1999?

MR. McGILL: Yes.

MR. MALONEY: Yes. Yeah. I've reviewed this document.

MR. McGILL: Can you tell me anything about that, what might have led up to this circumstance?

MR. MALONEY: Yes, sir. We had -- from what

I recall, we had two aircraft in Fairbanks where, during the take-off roll, the aircraft was slow to rotate. So, what I mean by that is, the crew, using the control column, pulling back at rotation speed, did not get the normal response from the airplane, and that was reported or made -- I was made aware of that situation by the Director of Flight Safety within the Alaska Airlines Group, and we were working with Flight Operations to determine why we had this particular problem with the nose not responding properly to a control column input on take-off.

There were --

MR. McGILL: Did -- go ahead.

MR. MALONEY: I was going to say, we had one of our Systems engineers working this with Flight Operations.

MR. McGILL: Did you have any responsibilities in helping determine whatever the nature of the cause of this rotation problem?

MR. MALONEY: Yes, sir. I was Director of Engineering at that time.

MR. McGILL: Oh. So, you were right there then?

MR. MALONEY: Yes, sir.

MR. McGILL: And how did you evaluate it, and what did you do?

MR. MALONEY: Well, from what I recall at the time, we were made aware of an aircraft in Fairbanks that did not respond properly to a control column input at rotation. The nose didn't come up as it should have.

Once we were made aware of that situation, we started looking at the flight data recorder and various pieces of information from the airplane. We also assigned a Systems engineer to get involved with it, with our Director of Flight Safety. They worked together on this in trying to determine what would cause this.

So, in that process, they were working with Long Beach Engineering and also the NTSB. This is not my area of expertise, but I believe this was reported, and I'm not sure if that's a normal thing to do, but nevertheless we were working with the NTSB and Long Beach Engineering to try to determine what might cause this type of problem.

What I recall that was unique was the temperature at Fairbanks on the ground was extremely cold. That's what got everyone's attention, I think,

as to what might have been unusual about this particular take-off, as to why the nose wouldn't come up when it normally would have on the input.

MR. McGILL: Is this what brought about the request here to look at the AeroShell 33 grease?

MR. MALONEY: Looking at this, it was -- the way this is worded, I would assume that it was a factor, knowing that it was extremely cold, if we might have some kind of problem with freezing, and whether that would have been moisture, although at those temperatures, moisture isn't a real issue, but maybe there might have been deicing fluid or moisture retained in the grease that could have froze.

Timing on this, I'm not real sure when this went in as it related to the data that we were getting from the airplane. We were working extremely hard, again that's my opinion, to try to figure out what happened here.

We got quite a bit more information from the flight data recorders off the aircraft, and I'd have to look at this to see what airplane we're talking about.

MR. McGILL: Well, I don't think it shows an airplane, does it? What do you just basically remember about the flight data information?

MR. MALONEY: What I basically recall is, the pertinent information that came off of it is what speed the aircraft rotated, at what speed it lifted off. We actually had some information that showed us the position of the elevators as far as whether they were fare with the stabilizer or if they were in a down or up position, and the information that I recall is that we had an elevator, that both elevators, the left and the right, were in a down position, not fared with the stabilizer at a 150 knots, that that's not normal.

MR. McGILL: Yeah. That's not normal, but could that be something other than -- this letter confers a lot about grease, but did you look into --

MR. MALONEY: Oh, yeah.

MR. McGILL: -- something else? Actuators? Hydraulics?

MR. MALONEY: Absolutely. At that air speed, the amount of force it would take to keep an elevator down in the slip stream wouldn't have been, again this is my opinion, a grease problem. There were hydraulic boost cylinders up in that tail that were used to drive the elevator down for stall recovery, and those systems are operated by the crews prior to take-off. Each take-off, control columns push forward. The hydraulics

of the system would push the elevators down.

What we were doing here in trying to determine why these elevators didn't fare, we were looking at the hydraulics that operated the boost cylinders. We were looking at the rigging on the control cables. We were looking at the dampers that are up there. If they were not working, that could have caused it.

We were looking at everything from the control column back from a mechanical standpoint, to a hydraulic standpoint, to even possibly a grease issue, but it wasn't anything that was determined conclusively what might cause that.

So, this telex is to me, as I read it, it's just the tip of the iceberg of what we were trying to recognize as what might cause this type of problem.

MR. McGILL: I noticed that the next telex was sent back by Boeing. It was J.K. 11-K.

MR. MALONEY: 11-K?

MR. McGILL: Hm-hmm. They talked about the cold weather on -- with the testing of AeroShell 33. I was just wondering, it seems like that these letters that -- of course, they're generated by Boeing, by their tech rep. Everything is talking about

lubrication, and is that how you recall the situation?

MR. MALONEY: I don't have an 11-K, sir.

MR. McGILL: Okay.

MR. MALONEY: And I have an --

MR. McGILL: Okay. We'll get you one here.

MR. MALONEY: I have an 11-Q.

MR. McGILL: Yeah.

MR. HAMMERSCHMIDT: I would just note that 11-K was not part of this witness's --

MR. McGILL: Oh, was that not --

MR. HAMMERSCHMIDT: -- exhibits to be prepared on for this testimony.

MR. McGILL: Okay. Maybe that's why he didn't get it.

MR. HAMMERSCHMIDT: But if he has time to look at it and shed some light on the subject, well, we'll proceed.

MR. MALONEY: I haven't seen this one here. I only saw -- I'm not that familiar with it.

MR. McGILL: Okay. Well, that's okay. Can you tell me what kind of knowledge you have about AeroShell 33?

MR. MALONEY: As it stands today?

MR. McGILL: At the time. No. At the time.

I'm sorry. At 1997, here at this particular time, what did you know about it? Had you been to any meetings and talked about AeroShell 33 at that time?

MR. MALONEY: At which time, sir?

MR. McGILL: 1997.

MR. MALONEY: Any meetings? I don't recall meetings and talking about AeroShell 33.

MR. McGILL: Okay. When this event -- these two airplanes had a problem, in the first letter, it was brought up about -- in Exhibit 11-J, there were some points about the lubrication.

Did you have any meetings about AeroShell 33 at that time?

MR. MALONEY: Not that I recall, that talked about AeroShell 33. We talked about what might cause this problem, and we were looking at all possibilities. To be honest with you, we certainly looked at grease or lubrication on the hinge points, but I do not recall if we talked specifically about AeroShell 33.

MR. McGILL: Okay. By 1999, had you been into discussions involving AeroShell 33?

MR. MALONEY: Well, that's what I was just -- I was speaking to -- you're talking about the Fairbanks aircraft?

MR. McGILL: Well, I initially started in '97, and then I moved it to when they first made the change over from Mobil 28, and then I -- anywhere along there, have you all had any kind of -- did you have company briefings on the performance of AeroShell 33?

MR. MALONEY: Again, in 1999, we had discussions on whether grease and lube intervals were something that -- as related again to these Fairbanks aircraft, if that's something we might want to consider, and the discussions on that were related to primarily lube intervals, and information we had obtained from SAS on what they were lubing their tails at, their tabs, the elevator tabs.

So, what I can't --

MR. McGILL: Where did that come from? The interval changes?

MR. MALONEY: Well, again as it relates to grease or lube, --

MR. McGILL: Yes.

MR. MALONEY: -- you're asking me if I recall discussions in that area.

MR. McGILL: Yes.

MR. MALONEY: What I do recall is we were looking at a lube interval for the tail, and the reason

we were looking at that is in our discussions with the Long Beach Engineering Group and with the NTSB and with basically trying to get input as to if anyone else had experienced this problem, SAS had an elevator lube interval that was something we were maybe going to consider to implement, just as a precaution.

It wasn't anything that again we could conclusively determine what would cause an elevator to be in a down position at a 150 knots. Again, that would take a lot of force of some kind to hold that elevator in that position.

MR. McGILL: Now, at that time, you were lubricating every eight months?

MR. MALONEY: I don't recall, sir. I'd have to go back and check the program. I don't recall what the lube interval was. I know we were looking at lowering it.

MR. McGILL: Just one second here. When you -- do you recall when you made the change from Mobil 28 to AeroShell 33, was there any procedure that was written down that might have flushed out, purged out, Mobil 28 before the other grease got in? Was there any procedures set forth in this change?

MR. MALONEY: Well, again I -- in looking at

again the change request, --

MR. McGILL: Yes.

MR. MALONEY: -- I -- in looking at this, I don't see anything that refers to that.

MR. McGILL: Would that have been in a form of an attachment or would it have been on that request sheet, do you think?

MR. MALONEY: I couldn't tell you if it was in the form of an attachment, and if it was something that -- again, this is speculation on my part. If it was required, it might have been written on this sheet, but that's speculation.

MR. McGILL: Okay. Mr. Chairman, I have no more further questions at this time.

MR. HAMMERSCHMIDT: Thank you, Mr. McGill. Mr. Rodriguez, do you have some questions?

MR. RODRIGUEZ: Yes, sir. Mr. Maloney, let me go back here and see if I can -- if you can help me understand some of this material.

With respect to the MEO1, the initial request from Mr. Matsuzawa specifies "This grease will replace Mobil 28 grease listed in the Maintenance Manual". That's why I take MM to mean, Maintenance Manual.

The request for the change itself identifies

from Mr. Matsuzawa that this change will affect the maintenance manual, is that correct or do I misunderstand?

MR. MALONEY: Well, as I read this, the request is revising it to change the lube to AeroShell 33 on the task cards. Revise applicable lube task cards to use AeroShell 33. That's how I read it.

MR. RODRIGUEZ: Is there any policy about trying to keep the task cards and the maintenance manual in sync?

MR. MALONEY: We would look at various cards that were in the program and either keep them in sync or we would have as a, if you will, priority -- I don't know what the right word might be used, but the card itself would take precedence over the maintenance manual, and that we had lube cards that we used to do the lube, and that was the standard practice to use, would be the cards.

MR. RODRIGUEZ: Is there somewhere in writing that says for the mechanic to only use lube cards for reference as opposed to the maintenance manual?

MR. MALONEY: I don't know. I don't know if there is in writing or not. I'd have to go back and review the GMM and look in the various documents.

MR. RODRIGUEZ: Would a conflict between the maintenance manual and work task card with respect to grease, would a discrepancy in those two documents, would that bother you?

MR. MALONEY: Would it bother me? It --

MR. RODRIGUEZ: Yes, sir. Personally. You're the Director of Engineering. Is that --

MR. MALONEY: Well, again, sir, when this came through, I was not Director of Engineering. I was the Manager. So, I have to go upon what's on this request, and we would make the change, based upon what was written here, and the lube cards themselves were the priority document, if you will, for accomplishing that task.

MR. RODRIGUEZ: Hmm. I wonder if you could tell us, when did you become Director of Engineering?

MR. MALONEY: I became Director of Engineering in October.

MR. RODRIGUEZ: Of what?

MR. MALONEY: '97.

MR. RODRIGUEZ: Did you replace Mr. Davey? Did you backfill his position or is that different Director of Engineering?

MR. MALONEY: Well, we didn't have a Director

of Engineering prior to that.

MR. RODRIGUEZ: Was a vacancy?

MR. MALONEY: Was a vacancy.

MR. RODRIGUEZ: So, Mr. Davey is signing the form as Director of Engineering, although he was technically the Assistant Vice President of Engineering, is that correct?

MR. MALONEY: Yes, sir.

MR. RODRIGUEZ: And what you're indicating to me today is that this would have been a routine special action required, a routine classification, as a change in lubrication because it was only changing work cards? Is that the idea?

MR. MALONEY: Yes, sir. I would describe looking at this form, that this was a -- basically a typical change request that came through the department, requesting in this case a lubrication change to the cards.

We received various change requests not only to the program but to the maintenance manuals and IPCs and various other documents that might need to be revised.

MR. RODRIGUEZ: Would there have been a separate MEO1 to change the maintenance manual to

reflect this selection of a different grease?

MR. MALONEY: Well, yeah. Again, this is my opinion. There -- if there was a need to change another document, because that's what we're talking about now, generally there would be a separate change request for that document.

Again, the reason for that is these change requests came in quite numerously, and to keep track of what was being changed and why it was being changed, this was about the only way that we had to do it.

So, as a rule, and this is just a rule of thumb, sir, we tried not to change several documents on the same change request.

MR. RODRIGUEZ: What I wrote down was that you got several a week.

MR. MALONEY: Yes, sir.

MR. RODRIGUEZ: What is "several"?

MR. MALONEY: Well, in this time frame?

MR. RODRIGUEZ: As an average. Yes, sir.

MR. MALONEY: If I had to guess, anywhere from -- we would process anywhere from 10 to 15 a week.

MR. RODRIGUEZ: My several was two or three. That's my understanding.

MR. MALONEY: Oh.

MR. RODRIGUEZ: Okay. And as you would assign this, I guess you'd call them, programmer to process it, is that right?

MR. MALONEY: Well, we call them program specialists.

MR. RODRIGUEZ: Program specialists. I didn't quite understand how the differences occurred in the dates. The thing was initiated in July. Mr. Davey, the Assistant Vice President of Engineering, signed off on it July 25th, two days after it was initiated.

Can you tell me -- it would appear to me -- and the Manager of Maintenance Programs and Technical Publications, which is you, didn't sign off on it until September 17th. Is there -- can you explain to me why Mr. Davey would see it in two days, and you wouldn't sign off on it until three months later?

MR. MALONEY: Well, looking at this, it's hard to tell. I'm not really sure. The -- these would come in, and on a -- like I said earlier, a weekly basis or so. They'd get logged in, and then I would -- after they're logged in, I would get it and review it.

So, I'm not real sure why this one is dated the date it is. I don't recall why I would have had

this date on there.

MR. RODRIGUEZ: Well, it went --

MR. MALONEY: Other than --

MR. RODRIGUEZ: Excuse me, sir.

MR. MALONEY: Other than that was the date I saw it, and I signed it and dated it the day, on the 9th -- 9/17/97. I don't know why the delay.

MR. RODRIGUEZ: There's nothing to indicate when you first saw it, is there? To give it to a program specialist?

MR. MALONEY: When I first saw it?

MR. RODRIGUEZ: Hm-hmm.

MR. MALONEY: Well, there again, these get logged in. So, -- and I don't -- I'd have --

MR. RODRIGUEZ: There's nothing on the form to indicate when you first saw it?

MR. MALONEY: No, sir. No, sir.

MR. RODRIGUEZ: Would you have seen it when it first came in and was logged? Can it be logged without your knowing it?

MR. MALONEY: Yes, sir. Yes, sir.

MR. RODRIGUEZ: Do you know how long those records are kept?

MR. MALONEY: I'm sorry. Which records?

MR. RODRIGUEZ: The logging-in of MEO1s.

MR. MALONEY: I -- forever, I guess. I'm not sure.

MR. RODRIGUEZ: Mr. Chairman, could we find out from Alaska Airlines the date that this MEO1 was logged in?

MR. HAMMERSCHMIDT: We can ask. Is that information that's available currently?

CAPTAIN FINAN: If we can determine it, we'll provide it, Mr. Chairman. If we can determine when it was logged in, and we'll try to do that.

MR. HAMMERSCHMIDT: Very good. Mr. Rodriguez, how quickly do you need this information?

MR. RODRIGUEZ: We will wait. We'll ask the question of higher authority and make sure what the exact procedures are for --

MR. HAMMERSCHMIDT: Well, we request that information from Alaska Airlines, please. Thank you.

MR. RODRIGUEZ: And I -- I guess what I was saying is, what it appears to me is it went -- it was initiated, passed through Mr. Hoover and Mr. Davey in the space of two days, and then apparently behind all of that, you scratched off the Director of Base Maintenance, the Manager of Maintenance Control, the

Director of Maintenance Planning and Production Control, and ignored the Manager of Reliability and the Director of Line Maintenance. That's what I see on this, based on the scratch-outs.

Is that something that -- I know this has been asked before, but I don't understand it. Is that something that you would routinely do or is that something that might have been directed by Mr. Davey?

MR. MALONEY: No. That's something I would routinely do, depending on the request.

MR. RODRIGUEZ: Why didn't you line out the Director of Line Maintenance?

MR. MALONEY: Again, based on what I was reading with this request, I'm assuming I made a decision here that we're talking lube cards, and most of our lubes, from what I can recall, a lot of them were done on the line. So, --

MR. RODRIGUEZ: So, don't you think he would be interested?

MR. MALONEY: Line Maintenance?

MR. RODRIGUEZ: Yeah.

MR. MALONEY: Yes, sir. He's included.

MR. RODRIGUEZ: But he didn't sign it?

MR. MALONEY: No. There's no signature

there.

MR. RODRIGUEZ: Why is that?

MR. MALONEY: I don't know. Again, it goes out for his review.

MR. RODRIGUEZ: As a Manager of Programs and Technical Publications, did you attend what I believe are either daily or weekly morning telecons with Line Maintenance and other outlying stations and that sort of thing within the Maintenance Department?

MR. MALONEY: I attended quite a few of those.

MR. RODRIGUEZ: Are you a regular member of that teleconference?

MR. MALONEY: At the time -- I'm trying to recall. I believe I was. I'm trying to remember, because there was a period of time, I don't believe I was a regular member.

MR. RODRIGUEZ: What period of time was that?

MR. MALONEY: It might have been when I first started the job, which was back in '94.

MR. RODRIGUEZ: '94?

MR. MALONEY: Right.

MR. RODRIGUEZ: And when would you have become a regular member? Ball park figure.

MR. MALONEY: Again, this -- there wasn't any requirement to attend the meetings. I would generally attend as I had time to. They were at 8 in the morning, and I would try to make it a point to attend.

MR. RODRIGUEZ: In '97, would you have been making it a point to attend regularly?

MR. MALONEY: I would have tried, yes.

MR. RODRIGUEZ: And you said that you don't recall any conversations amongst the people taking part in that telecon with respect to change in grease?

MR. MALONEY: I'm sorry, sir. Which telecon now are we --

MR. RODRIGUEZ: Any telecons in and around the time frame of July to September of '97, with respect to the change-over from Mobil 28 to AeroShell 33.

MR. MALONEY: I don't recall any conversations as far as change-over goes.

MR. RODRIGUEZ: And you're not aware of any documentation that would involve any kind of an engineering analysis or study of the effects of switching the grease and that sort of thing?

MR. MALONEY: I personally was not, no. Again, at the time, the -- my role would not normally

have lended me to that type of analysis or review of a technical data such as that.

MR. RODRIGUEZ: And similarly, based on your review of this document, you don't believe there was any documentation to justify the switch --

MR. MALONEY: No. Well, --

MR. RODRIGUEZ: -- attached to it?

MR. MALONEY: No. I believe -- in my earlier statement, when these come in, as any change request would, there would generally be attachments with this. So, -- but the exact attachments, I couldn't tell you.

MR. RODRIGUEZ: Hm-hmm.

MR. MALONEY: So, -- well, then let me see if I can put it in context. This document recommending a change in grease could come into your area of responsibility, be handled by a program specialist underneath you, and sent to Mr. Davey, the Assistant Vice President of Engineering, without you knowing that they were going to change the grease, is that correct?

MR. MALONEY: Well, not exactly. These come in to my department, and they do get logged in by an individual who receives these, and then once they're logged in, I would process it through for further consideration.

I would take it, as I did here, sign my name and date it and process it on for review by other departments.

MR. RODRIGUEZ: Yes, sir. But that was in September that you signed it off?

MR. MALONEY: Yes, sir.

MR. RODRIGUEZ: And by that time, it had been up to the Assistant Vice President of Engineering and back?

MR. MALONEY: Yes, based on the dates here.

MR. RODRIGUEZ: Well, other than the dates here, do you have any recollection whatsoever of this particular MEO1 circulating through your area of responsibility?

MR. MALONEY: No, sir. By looking at this document here, it doesn't stand out to me as any -- I don't have any particular recollection of this document in my department, other than any other document that came in and how I would process them through. It doesn't jump out at me.

MR. RODRIGUEZ: And no documentation and no engineering analysis or in no conversations on telecons within the Maintenance Department, were you aware of any Douglas-recommended study if you do make the

switch, is that correct?

MR. MALONEY: I personally was not aware of any.

MR. RODRIGUEZ: In the eight years or so -- I may be -- the figures may be off. I was thinking you were the Manager the whole time, but in the time that you were the Manager of the Maintenance Programs and Technical Publications, did you ever issue or process any other changes of grease that you recall?

MR. MALONEY: Not that I recall. I'd have to go back, and again we have the reports that print monthly, and I'd have to review the reports and see what would be on the change for each month.

MR. RODRIGUEZ: And tell me again now, why is the Director of Quality Control left blank and not crossed out?

MR. MALONEY: Again, there's a requirement for any change request to receive Quality Control approval. It didn't matter what type of change it was. It would go through QC.

MR. RODRIGUEZ: But this didn't?

MR. MALONEY: From the looks of this, no, it did not.

MR. RODRIGUEZ: If there had been attachments

to this MEO1, where would they be stored?

MR. MALONEY: They would -- generally, any change request that came through, and most of them would have attachments from what I can recall, after the maintenance programmer incorporated the change, the change request got filed in a file cabinet that was in the department.

MR. RODRIGUEZ: Do you know how long those were kept?

MR. MALONEY: I don't know if there was any type of limit set on how long to keep change requests.

MR. RODRIGUEZ: Mr. Chairman, I would like to make an official request at this time for a search for any documentation that may have been attached to MEO1-002974 from Alaska Airlines.

MR. HAMMERSCHMIDT: Does Alaska Airlines understand this request?

CAPTAIN FINAN: Yes, sir, Mr. Chairman. I believe that request has previously been made, and those documents have been produced.

MR. RODRIGUEZ: Okay. Thank you.

MR. HAMMERSCHMIDT: Just for clarification, while we're waiting for Mr. Rodriguez's next question, does Alaska Airlines fully understand what the previous

request was in terms of the logging of this MEO1 form?

CAPTAIN FINAN: Yes, sir.

MR. HAMMERSCHMIDT: You understood what Mr. Rodriguez is looking for?

CAPTAIN FINAN: Yes, sir.

MR. HAMMERSCHMIDT: I just wanted to be sure. Thank you.

MR. RODRIGUEZ: Yes, sir. With respect to this change in lubrication, are you aware of any written guidance that the company might have with respect to changes in the lubrication of any components?

MR. MALONEY: No, sir.

MR. RODRIGUEZ: Do you remember any discussions or guidance or comments being made after the change to AeroShell 33, either as the Manager of Maintenance Programs and Technical Publications or as the Director of Engineering?

MR. MALONEY: What I clearly remember as far as AeroShell 33 is concerned is shortly after the accident, our local FAA came and made me aware of our use of the AeroShell 33, and at that point, I started getting pretty much involved with AeroShell 33. That was earlier this year.

MR. RODRIGUEZ: Was that in March? Was that Mr. Bennett?

MR. MALONEY: Pardon?

MR. RODRIGUEZ: Was that when Mr. Bennett sent you the letter?

MR. MALONEY: Yes. It was Mr. Bennett, yes.

MR. RODRIGUEZ: And the lack of a signature at the bottom of the page, what kind of breach of company procedures or whatever would that represent, to go ahead and process a change in grease without that being completed, if anything?

MR. MALONEY: I would have to refer to the GMM. I believe there's some guidance in there as far as, you know, use of this change request form. So, --

MR. RODRIGUEZ: Well, help me understand. Here's an engineer who said let's change to Mobil -- I'm sorry -- to AeroShell 33, and here's an incomplete document, as I understand it.

Who actually authorized this change? Where does the buck stop?

MR. MALONEY: The buck stops with the completion of the form. It's just my opinion.

MR. RODRIGUEZ: Well, what is the company's procedure, as you remember it? Who would have been the

individual that really pulled the trigger on this action?

MR. MALONEY: I'm not sure how to answer that. It's --

MR. RODRIGUEZ: Would it be Mr. Davey?

MR. MALONEY: Mr. Davey was the one that was initiating or requesting the change here. So, --

MR. RODRIGUEZ: He's the highest signature on the form, is he not?

MR. MALONEY: As the form stands now, yes.

MR. RODRIGUEZ: Now, I've asked about the engineering analysis prior to the purchase. Did you participate in any discussions in your position with respect to the acquisition of AeroShell 33?

MR. MALONEY: Acquisition? You mean the actual --

MR. RODRIGUEZ: Buying.

MR. MALONEY: -- buying? No, sir.

MR. RODRIGUEZ: Well, when you signed off September 17th, '97, what would you anticipate then occurring within the company as a function of that?

MR. MALONEY: As a function of that, I would anticipate this going out for review by the departments indicated on the form, and then at some point after the

departments have reviewed this request, I would anticipate it coming back to the Maintenance Programs Department for incorporation or possibly denial.

I mean, it just depends on what comes back after all the departments have reviewed the request, as with any request.

MR. RODRIGUEZ: So, what you're saying is that -- what I understood you to say is that after September 17th, this form would go out and be filled out by other departments or reviewed by other departments, you said?

MR. MALONEY: As -- I'm going to -- as I look at the form, it would go to Reliability as I'm looking at it, Line Maintenance and Quality Control, for review, and then, when they were completed with their review, the normal process, the form would come back to the Maintenance Programs Group.

At that time, it would be -- if I were in a position as Manager of Maintenance Programs, I would receive that form, verify that it has all the signatures, and at that time, I would approve it and assign it to a programmer.

DR. ELLINGSTAD: Excuse me, Mr. Rodriguez. Could I just ask a clarifying question?

In exercising your responsibility with this form, does your signature there represent your exercise of any substantive review or decision with respect to this change or are you merely collecting the signatures of other people who are approving it?

MR. MALONEY: In this capacity, sir, my signature's indicating basically an administrative-type. I'm verifying I've got the required signatures, and that it has all of the signed-off requirements. So, it's not of the substance per se, it's the actual processing of the change request, and then its eventual incorporation into the program.

DR. ELLINGSTAD: Thank you.

MR. RODRIGUEZ: In your time as the Director of Engineering, are you aware of any engineering analyses that were attempted on AeroShell 33 by the company?

MR. MALONEY: I personally was not. No, sir.

MR. RODRIGUEZ: Would you have been?

MR. MALONEY: Not necessarily, no. I don't --

MR. RODRIGUEZ: Who would have done that?

MR. MALONEY: At what point, sir?

MR. RODRIGUEZ: I'm talking about during,

let's say, the Summer of '99 through the Fall of '99, etc. If the company wanted to do some kind of an analysis or some testing in-service program evaluation, who would have been in charge of that?

MR. MALONEY: Well, in that time frame, I can give you an example, if you like. We were -- this is not related to grease, but we were looking at engine oils, changing engine oils.

So, that would be the Power Plant Group that would look at and work with the manufacturer on changing from one oil to the other. So, it would be Engineering.

MR. RODRIGUEZ: Would be in Engineering?

MR. MALONEY: It would be in Engineering to look at that and evaluate a change of an engine oil, and again I'm relating to what I dealt with.

MR. RODRIGUEZ: Yes, sir. Would that -- in your case, would that be -- for grease, let's say, would that be perhaps Scott Patterson, Manager, Air Frame Engineering? Certainly wouldn't be Power Plant Engineering?

MR. MALONEY: Right. We're talking grease now.

MR. RODRIGUEZ: Yes, sir.

MR. MALONEY: Scott was Structures. So, Air Frame referred to structures-type engineering.

MR. RODRIGUEZ: Well, as I'm looking at the organizational chart, I see Power Plants, Systems and Air Frame Engineering available to evaluate if there was going to be something done.

MR. MALONEY: Yes, sir. There were those three groups, yeah.

MR. RODRIGUEZ: Which group would you put the grease in?

MR. MALONEY: Systems.

MR. RODRIGUEZ: Systems? Okay. Mr. Hoover? Do you know if Mr. Hoover did any of that or did you talk with him about that? Discuss it with him or any of your supervisors?

MR. MALONEY: Again, with Mr. Hoover, I had discussions, quite a few discussions here earlier this year related to this grease issue, but back in '97, I --

MR. RODRIGUEZ: No. '99, sir.

MR. MALONEY: Oh, '99.

MR. RODRIGUEZ: Summer and Fall, Winter of '99, before the accident, pre-accident.

MR. MALONEY: No, sir. I didn't have any --

I don't recall any discussions with Mr. Hoover on evaluating --

MR. RODRIGUEZ: Nor with any of your supervisors up the chain in the Engineering area?

MR. MALONEY: Right.

MR. RODRIGUEZ: Help me out with this. I'm always lost. I'm a dumb pilot. Aren't -- isn't your maintenance program approved by the FAA?

MR. MALONEY: Yes, sir. It's approved through our Ops Specs.

MR. RODRIGUEZ: If you change the maintenance program, do you have to get their approval?

MR. MALONEY: It depends on what the nature of the change is.

MR. RODRIGUEZ: If you change the grease, that doesn't require approval?

MR. MALONEY: No, sir, it does not. At least to my recollection, it doesn't. It requires acceptance, and that's -- again, we talked about the report we would send every month.

MR. RODRIGUEZ: That's all the questions I have at this time, Mr. Chairman. Thank you.

MR. HAMMERSCHMIDT: Thank you, Mr. Rodriguez. Any other questions from the Technical Panel?

(No response)

MR. HAMMERSCHMIDT: Seeing none, we will go to the Parties to the public hearing for questions, and let's begin with the Aircraft Mechanics Fraternal Association, and we will go clockwise from there. So, Mr. Patrick?

MR. PATRICK: Thank you, Mr. Chairman. Just a moment, please.

(Pause)

MR. PATRICK: Mr. Maloney, first question I have is, in the MRB or RAP meetings, would all parties sign MEO1 then or would the MEO1 be routed from department to department for signatures?

MR. MALONEY: In the MRB and RAP meetings, they would either -- they'd all be signed at that point, either as approved or disapproved.

MR. PATRICK: You made some mention earlier about not all parties being present at all those meetings, is that correct?

MR. MALONEY: Well, no, I don't believe I made reference to that. The RAP meetings required at least somebody to represent the various departments.

MR. PATRICK: And the MRB meetings, same thing?

MR. MALONEY: Yes, sir.

MR. PATRICK: Okay. As Manager of Maintenance Programs and Technical Publications, would the completed MEO1 form be returned to you and to your attention before being assigned to a technical writer?

MR. MALONEY: Yes, sir. As Manager in that capacity, I would take those back from that type of meeting with me, as I recall. Yeah.

MR. PATRICK: If the technical writer makes written changes to the maintenance program, would he then sign the bottom of the MEO1 form?

MR. MALONEY: That was the standard procedure, yeah.

MR. PATRICK: Okay. Would the technical writer sign his name or initial on any other form, other than the MEO1 form, when he made a change to a maintenance program?

MR. MALONEY: As far as I know, this is the only form that he would sign off on.

MR. PATRICK: Okay. No other log -- that would be it for -- his signature would just be recorded on the MEO1. Okay.

You stated that you took the Director of Engineering position in October of 1997. You signed

the MEO1 form in question in September of 1997, one month later.

MR. MALONEY: Yes, sir.

MR. PATRICK: As Manager of Maintenance Programs and Technical Publications, did you see this form again after you signed it or --

MR. MALONEY: No, sir, I did not.

MR. PATRICK: Who took the position of Manager of Maintenance Programs and Technical Publications after you left in October of '97?

MR. MALONEY: I don't recall. There were -- we had three or four programmers. So, I imagine any one of those could have backfilled the position.

MR. PATRICK: Do you think that any one of those would have seen this MEO1 form and brought it to your attention as --

MR. MALONEY: That, I don't know. I don't recall seeing it after I signed it.

MR. PATRICK: How would the mechanics themselves know of any changes that were implemented, like such as the maintenance information letter?

MR. MALONEY: I'm sorry. You're asking how would they know if there was a maintenance information letter or how would they know if a change took place?

MR. PATRICK: Well, how would they know that there were any changes implemented on the MEO1? When would they first realize there was a change made to a program?

MR. MALONEY: Okay. That could happen a couple ways. I got many of these change requests from mechanics, and we would, after incorporating the change, send the originator back a copy of the signed form, of the signed MEO1.

If there was a requirement from any of the departments for a maintenance information letter, that would be published by our group and sent out or the report that I referred to earlier, that the FAA gets, we also had a report that went down to Production Control to notify them of changes, and the ultimate would be when he picks the card up and looks at the card, he would see that there'd be a change on the card.

MR. HAMMERSCHMIDT: Excuse me, Mr. Patrick. When the mechanic sees the change on the card, would there have been any special instructions that would have accompanied that change?

MR. MALONEY: No, sir.

MR. HAMMERSCHMIDT: Okay. Thank you.

MR. PATRICK: Could you explain how that information was obtained by the mechanics on the work card? Were they ever aware of any changes before they received a new program or new card to do a task or --

MR. MALONEY: The mechanics -- generally what we would -- we did with -- and again, I'm trying to recall back then. There was -- I recall the Production Control Group requesting a report, if you will, the monthly report, which was a way of notifying.

Now, a mechanic, you're asking directly about a mechanic, I don't know if I can answer that.

MR. PATRICK: I was just --

MR. MALONEY: Other than actually seeing the card and realizing there's a change on the card.

MR. PATRICK: I was just curious as this occurred during the change -- this MEO1 on the grease change -- one moment.

MR. MALONEY: Okay.

(Pause)

MR. PATRICK: Okay. No further questions. Thank you very much. Thank you, Mr. Chairman.

MR. HAMMERSCHMIDT: Thank you, Mr. Patrick. Captain Wolf with the Air Line Pilots Association.

CAPTAIN WOLF: Thank you, Mr. Chairman. Mr.

Maloney, just a few quick questions. Just to follow up on Mr. Patrick's question concerning the RAP meetings, and if all the representatives that would normally go to these meetings, if they were not there, did the representatives who did go to that meeting have signature authority and approval?

MR. MALONEY: The -- I don't know. To answer to your question, yes; that is, an individual who would sit in for a member at those biweekly meetings should be coming prepared to either approve or disapprove the subjects, you know, the change requests that were on the agenda.

CAPTAIN WOLF: Okay. So, he would have signature authority and approval?

MR. MALONEY: As I understood it. As I understood it. Yes, sir.

CAPTAIN WOLF: Okay. Thank you. This is just a general question on the General Maintenance Manual. If I understand it correctly, a change to the General Maintenance Manual as a result of a change to a task card would require a separate MEO1.

What is the process to change the General Maintenance Manual after the MEO1 is received, and would there be any FAA involvement in that?

MR. MALONEY: Okay. A change to the General Maintenance Manual is initiated by the change request from the MEO1. It would require the signatures from the departments that are on the form, and then that change would go to the FAA; that is, I'm trying to recall here, there was -- the GMM was held by our local FAA; that is, they had a copy of it, very much like the maintenance program.

When we made a change to the GMM, a revision was sent out to the FAA and to any copy-holder of the GMM, which was their notification of the change. It served as -- I guess you could say it served as the notification of the change.

CAPTAIN WOLF: So, would the PMI be involved with this?

MR. MALONEY: The PMI would be not involved with the review or the approval of the change. He would be involved with the notification of the change. So, if he didn't object to any changes to the GMM, it would be considered approval, at least that's how I took it.

CAPTAIN WOLF: Okay. But the FAA would be involved in the approval process?

MR. MALONEY: In that respect, yes.

CAPTAIN WOLF: Okay. Thank you. Just two questions on the grease, and perhaps it's already been stated or -- but perhaps I might have lost it in the translation here.

What was the basis for changing the grease, to begin with, going to AeroShell from Mobil? What was the -- what initiated this task card here? Why would we change the grease?

MR. MALONEY: Again, looking at the change request, this is an assumption on my part, that it was an improved grease.

CAPTAIN WOLF: It was an approved grease?

MR. MALONEY: Improved.

CAPTAIN WOLF: Oh, an improved grease?

MR. MALONEY: Improved grease.

CAPTAIN WOLF: Okay. On that basis, do you know, through your office or any of the other Maintenance and Engineering Offices at Alaska, what they have done some comparisons with some other airlines and asked them if they were using AeroShell back there in the tail section or perhaps in discussions when -- as far as with other cold weather operators that run similar routes that we do?

MR. MALONEY: I'm not able to answer that. I

don't know.

CAPTAIN WOLF: Okay. Thank you. This is my last question. When you -- we got this letter, this NTO letter from Boeing, and it basically talks about the responsibility of Alaska Airlines to monitor the areas where AeroShell 33 would be used, was there any monitoring carried out, and if there was, how was this monitoring done?

MR. MALONEY: I'm sorry. Which letter are we referring to?

CAPTAIN WOLF: I believe that's Exhibit 11-H, and that's the NTO letter from Boeing of September 26th, '97.

MR. MALONEY: Well, I don't recall having any kind of monitoring or evaluation.

CAPTAIN WOLF: Would you feel it would be a good idea to do that or something that might be a good follow-up to use in a new grease in that particular area?

MR. MALONEY: Again, it would be hard for me to answer that. I could certainly give you my opinion as I'm sitting here today, but I don't -- I'm not -- not being familiar with everything that was surrounding the use of this grease, it's hard to answer that

question.

CAPTAIN WOLF: Okay. Just a moment, please.

(Pause)

MR. HAMMERSCHMIDT: While we're waiting a moment, I'll make a housekeeping announcement. When I'd indicated before the last break that we would be concluding this session at 7 p.m., that was based on having Mr. Jerome as a witness, but we decided to insert Mr. Maloney today because he cannot be here tomorrow.

Therefore, we will be going until we finish the questioning of Mr. Maloney. Therefore, if you had based any dinner reservations on that announcement, that we would be out of here at 7, please make the proper adjustments.

But after Mr. Maloney, we will be recessing until tomorrow.

CAPTAIN WOLF: Mr. Chairman, that's all the further questions I have.

MR. HAMMERSCHMIDT: Okay. We thank the Air Line Pilots Association, and moving next to the FAA.

MR. DONNER: No questions, Mr. Chairman.

MR. HAMMERSCHMIDT: Okay. Alaska Airlines?

CAPTAIN FINAN: No questions, Mr. Chairman.

MR. HAMMERSCHMIDT: Thank you. Boeing?

MR. HINDERBERGER: No questions, Mr. Chairman.

MR. HAMMERSCHMIDT: Thank you. Mr. Berman?

MR. BERMAN: Mr. Maloney, could you please recall for me the discussions that you mentioned about possibly changing the lubrication intervals of some parts of the tail of the airplane at the time of the Fairbanks incidents?

MR. MALONEY: I'm sorry. What would you like to know?

MR. BERMAN: What do you recall about them? Please describe them to me.

MR. MALONEY: Changing the lube intervals?

MR. BERMAN: Yes.

MR. MALONEY: From what I can recall, that the elevators, in trying to look at rigging and hydraulics and dampers, and I believe we had quite a list from Long Beach Engineering as to what we should be investigating that might cause this problem, and we checked and looked at all possible reasons for the elevator to stay down.

The -- kind of a last resort, if you will, or a last effort that we figured it couldn't hurt, is

maybe look at the lube intervals, and we again did that only because we had some input from SAS, through our discussions with Long Beach Engineering, as to what might cause this problem.

No one ever determined that I can recall this being a problem that grease could cause. It was simply precautionary, if you will, but it certainly wasn't determined that this would for sure fix a problem, particularly an elevator that stays down at a 150 knots. It's hard -- I don't think anybody was convinced -- again, this is my opinion, that grease would cause that kind of a problem.

MR. BERMAN: So, where did the discussion of grease end at that point?

MR. MALONEY: I believe it ended with lowering the lube interval.

MR. BERMAN: At that time?

MR. MALONEY: At which time now?

MR. BERMAN: The time of the Fairbanks flights.

MR. MALONEY: I'd have to look back. It was around that time. Yeah. I mean, it was somewhere after we had exhausted all other avenues to look at lowering the lube interval, which was after the

Fairbanks incidents.

MR. BERMAN: Okay. Just -- I'm sorry. I'm getting near the end of the day here, I hope. When was the Fairbanks incident?

MR. MALONEY: I'd have to look at the telexes. I'm not sure what the exact date was.

MR. CLARK: February of '99. Is that the -- there were two of them.

MR. BERMAN: Okay. Thanks. So, you said a decision was taken to change the lube intervals at that time.

MR. MALONEY: Well, it was a recommendation from -- that we heard from SAS. So, we would have put a motion forward, if you will, to lower the lube interval.

MR. BERMAN: Did your department initiate an MEO1 on that?

MR. MALONEY: I don't recall if it was my department or somebody else. I don't recall.

MR. BERMAN: But you do recall an MEO1?

MR. MALONEY: I recall discussions on lowering the lube interval, and it was in one of those biweekly meetings, from what I can recall.

MR. BERMAN: One of those RAP meetings or

MRB?

MR. MALONEY: Yeah. Generally, there's a change request that goes into those type of meetings.

MR. BERMAN: Hm-hmm. And what was the result of the meeting?

MR. MALONEY: I believe there was agreement to do it, from what I can recall. I just --

MR. BERMAN: Do you know if it ever happened?

MR. MALONEY: I don't know.

MR. BERMAN: Okay. Here's another subject to switch to. In maintenance, is there ever a need to lubricate something on an airplane that's a non-routine maintenance action?

MR. MALONEY: Yes, yes.

MR. BERMAN: Where would a mechanic look for how to do that lubrication, such as which grease to use, if he was going to do a non-routine action? He's going to make a non-routine work card or something.

MR. MALONEY: It would just be my opinion, but he'd look either in the Maintenance Program for a lube card. From what I can recall, I know we tried to give them good graphic pictures of where the lube points were, and they were generally in my opinion better than what you could find in the maintenance

manual. So, I guess -- not being in that position, I'm guessing he would look there first.

MR. BERMAN: So, if he was going to go to a lube card, would he have to find that within a C check package or some other package or how would he -- how would that be cross-referenced for his use?

MR. MALONEY: Well, we had -- our cards were set up with scheduled maintenance, as you're referring to, and there's also a separate set of cards that were outside of a check package, like a C check, and those were accessible through a separate book. They were in kind of their own stand-alone book, and I'd have to go back and look at the books to know exactly what lube cards were in those books, but they were accessible.

MR. BERMAN: Could he possibly have looked in the maintenance manual?

MR. MALONEY: Sure.

MR. BERMAN: If -- I think you mentioned that you didn't see the need to back change the maintenance manual or you don't know if the maintenance manual was ever changed to show the use of AeroShell 33, is that right?

MR. MALONEY: Yeah. I don't -- again, looking at the form, I didn't see a request here to

change the maintenance manual.

MR. BERMAN: I see. Are you aware of what the maintenance manual said about what type of grease to use after '97?

MR. MALONEY: After --

MR. BERMAN: After September of '97, a change in the MEO1.

MR. MALONEY: Well, I can answer the question. At the time, I wouldn't have been aware of what the maintenance manual stated, other than what's on the form. It says replace Mobil 28-generated grease kit in maintenance manuals. So, by reading that, I would probably make an assumption that there was some reference in the maintenance manual to Mobil 28.

MR. BERMAN: Okay. Thank you. I'm going to assume we have the copies of the maintenance manual from that era. Of course we do. Thank you very much, gentlemen. Thank you. No more questions.

MR. HAMMERSCHMIDT: Thank you, Mr. Berman. Mr. Clark?

MR. CLARK: Just a quick few. In your position in this maintenance -- Manager of Maintenance and Tech Programs or Tech Publications, and then from that, you moved into Manager of -- Director of

Engineering, is that correct?

MR. MALONEY: That's correct.

MR. CLARK: Okay. In all of that, had you received any training or any knowledge about greases or issues that may involve grease?

MR. MALONEY: In my capacity as Director of Engineering?

MR. CLARK: Either one.

MR. MALONEY: Not that I can recall, although I did get fairly familiar with the subject again earlier this year.

MR. CLARK: Yeah. In -- yeah. But at that time, did you have any concerns about changing greases from one brand to another, from one type to another?

MR. MALONEY: No, sir. I personally did not.

MR. CLARK: Who -- if you didn't, who on this list should have had those concerns?

MR. MALONEY: As far as changing -- concerns with changing the grease?

MR. CLARK: Yeah. Changing from one MIL Spec to another or changing greases within one MIL Spec. Who should be the person that should have studied that and researched that to know that that would be an appropriate thing to do?

MR. MALONEY: Well, I guess that goes back to the earlier question. Again, most likely be Engineering as far as looking at that type of area.

MR. CLARK: But you were the -- you'd be the Director of Engineering then. Would that be your responsibility to assign somebody to research that?

MR. MALONEY: Yeah. If I was looking at changing -- similar to the engine oils that I was dealing with as Director of Engineering, I would assign it to an appropriate engineer to look at.

MR. CLARK: Okay. But if you didn't know things about compatibility of greases or various issues or some greases may produce corrosion or things like that, would you know enough to assign somebody to check into that?

MR. MALONEY: Certainly.

MR. CLARK: How would you know it to know -- if you weren't aware of those issues, how would you know to assign somebody to look into those issues?

MR. MALONEY: Well, I mean, as, I guess, in a normal capacity, as a director, I would look at anything that I wasn't considered an expert on, and there were many things I was not an expert on.

MR. CLARK: Okay.

MR. MALONEY: And I would look at the disciplines that I had at my disposal to investigate or look at various issues, subjects, systems, anything of that nature.

MR. CLARK: Okay. And you talked about work cards that would have been developed out of this. The work card would have been to change from one grease to another, is that correct? I mean, is that --

MR. MALONEY: The work card itself would have been changed to call out the grease that was requested here.

MR. CLARK: Okay. So, when a mechanic got a new work card, and the grease changed, would there be anything to -- instructions to -- other than just to grab the new type of grease and grease the airplane? Would there be other instructions that would go with that card or that should have gone with that card?

MR. MALONEY: Well, the card itself would show the change on the materials.

MR. CLARK: Hm-hmm.

MR. MALONEY: We had -- I'm trying to remember. I don't recall if there were Rev bars, you know, or revision bar. That's a black bar that goes along the side of the change on a document, but I don't

know if we had that with these cards.

MR. CLARK: What would that mean, if there were black bars?

MR. MALONEY: That would mean that this particular area of the document's been changed. That's common practice.

MR. CLARK: And what would a mechanic do if he saw that black bar?

MR. MALONEY: He would compare it, the revised document to the old document. It would kind of be a flag, if you will, but I don't think we had that type of change bars.

MR. CLARK: What kind of document are we talking about? We're not talking about the card. We're talking about a document.

MR. MALONEY: Well, we have our cards, and that's where the grease was used, on a lube card, and then standard practice was some other documents, like the maintenance manual, would have change bars on it.

MR. CLARK: If those change bars existed, would those -- would you get into it enough to -- for the first lube with that grease to tell somebody to purge the system of the old grease, to put the new grease in? Would that be a part of that document?

MR. MALONEY: Well, the best way to answer that, I think, is that the lube card didn't have provisions to make that kind of requirement.

MR. CLARK: Okay.

MR. MALONEY: It didn't exist there.

MR. CLARK: So, if it didn't have the black bars, the mechanic would not know to purge the old grease and use the new grease, if the card did not have a black bar?

MR. MALONEY: Yeah. And now that I've thought about it, I'm almost sure we didn't have those kind of bars on the cards.

MR. CLARK: Okay. And if it had, he would have to go to a document, and then that document would have -- somebody would have had to have planned into that document to tell him to purge the grease, if that was determined to be appropriate to do?

MR. MALONEY: If that was determined to be appropriate, yes.

MR. CLARK: But you don't believe that was the case. Okay. Thank you.

MR. HAMMERSCHMIDT: Thank you, Mr. Clark. Let's see. Mr. Berman, do you have another question?

MR. BERMAN: Mr. Maloney, when you're talking

about the decision that was made to change the lubrication interval as a result of the February '99 events at Fairbanks, you were concerned about the tail of the MD-80. Would that have included changing the lubrication interval of the jackscrew?

MR. MALONEY: Not to my knowledge. No, sir. We were looking at the elevator and the elevator tabs.

MR. BERMAN: Okay. Thank you.

MR. HAMMERSCHMIDT: Thank you, Mr. Berman, and we have no further questions from the Board of Inquiry.

Therefore, let me thank you, Mr. Maloney, for your participation in this public hearing, for being a very responsive witness and sharing your knowledge with us.

(Whereupon, the witness was excused.)

MR. HAMMERSCHMIDT: Let me also thank the people in the audience for their attention throughout the day, and the Parties to the Investigation for their cooperation and their good questions, excellent questions, and, of course, I want to acknowledge the thoroughness of the NTSB questioning.

At this point, we will just stand in recess until tomorrow morning at 11 a.m., at which time, we

will have our first witness, Mr. Dennis Jerome.

We're in recess until 11 in the morning.

(Whereupon, at 7:17 p.m., the public hearing was adjourned, to reconvene tomorrow morning, Friday, December 15th, 2000, at 11:00 a.m.)