

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C.

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 In the matter of: :
 :
 THE INVESTIGATION OF THE ACCIDENT :
 INVOLVING DELTA AIR LINES, INC., :
 FLIGHT 1288, MD-88, N927DA, : Docket No. SA-515
 PENSACOLA REGIONAL AIRPORT, : SA-515
 PENSACOLA, FLORIDA, JULY 6, 1996 : VOLUME II
 :
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Atlanta Hilton & Towers Hotel
 255 Courtland Street
 Atlanta, Georgia 30033

Thursday, March 27, 1997

The above-entitled matter came on for hearing
 pursuant to notice, at 8:00 a.m.

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 Office of Aviation Safety

Dr. Vernon Ellingstad, Director
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Thomas Haueter, Chief
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LU VERN DOKTER, FORMER FAA PMI, DELTA AIR LINES, AND CMO MAINTENANCE INSPECTOR SUPERVISOR, FAA CMO, ATLANTA, GEORGIA	
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JEFFREY STEVENS, MAINTENANCE DEVELOPMENT, PRATT & WHITNEY, EAST HARTFORD, CONNECTICUT	

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P R O C E E D I N G S

(Time Noted: 8:00 a.m.)

CHAIRMAN JOHN GOGLIA: Good morning
everybody. We're set here on day two to reconvene the
public hearing into Delta Airlines Flight 1288. And we
will start off this morning with our first witness
being Mr. Lee Clements.

(Witness testimony continues on the next
page.)

1

2 JEFFREY LEE CLEMENTS, FOREMAN-QUALITY CONTROL, NDT,
3 DELTA AIR LINES, INC., ATLANTA, GEORGIA

4 Whereupon,

5

 JEFFREY LEE CLEMENTS

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

9 MR. HAUETER: Mr. Clements, would you state
10 your name and place of employment for the safety board?

11 THE WITNESS: Yes, sir. My full name is
12 Jeffrey Lee Clements.

13 MR. HAUETER: And who do you work for, sir?

14 THE WITNESS: Delta Air Lines.

15 MR. HAUETER: And your position at Delta?

16 THE WITNESS: Quality assurance foreman in
17 the power plant area.

18 MR. HAUETER: And what is your aviation
19 background?

20 THE WITNESS: Yes, sir. I started my career
21 with Delta Air Lines July of 1976. I worked in the
22 aircraft maintenance, in the hangar, for approximately
23 eight years as a hydraulics mechanic. Moved from there
24 back to the shop area, worked in plasma spray for a

1 number of years. And from that position, November,
2 1988 was selected for an inspector position in the
3 quality assurance area for NDT.

4 MR. HAUETER: And what FAA licenses do you
5 hold?

6 THE WITNESS: A&P.

7 MR. HAUETER: Thank you, sir. Mr. Byrne?

8 MR. GATTOLIN: Good morning, Mr. Clements.

9 THE WITNESS: Good morning.

10 MR. GATTOLIN: I'd like to, if you would, get
11 into a little bit more of your NDT and FPI training
12 background and experience, please.

13 THE WITNESS: Yes, sir. After making
14 inspector on the FPI, NPI line in particular,
15 department 542, worked, my experience started there
16 again as a trainer in November of 1988. Spent
17 approximately four years on the line as an inspector
18 for FPI-NPI. For that, I was asked on setting up an
19 in-house training program. And that was in the
20 neighborhood of October of 1991, set up Delta's in-
21 house training program for NPI-FPI inspectors.

22 And proceeded from that on my own efforts,
23 worked towards studying and taking the ASNT, which
24 stands for the American Society of Non-Destructive

1 Testing as a level three in the fluorescent penetrant
2 and the mag particle methods.

3 MR. GATTOLIN: Okay. If you would, please,
4 can you give us an idea of the structure of your
5 department, i.e., how many people are you in charge of,
6 are you responsible for in the supervision? Do you
7 have, I guess you could say, assistant supervisors and
8 lead inspectors? And also, who do you report to?
9 Who's your immediate supervisor?

10 THE WITNESS: Okay. My immediate supervisor
11 is Mr. Steve Krause, who is manager of the power plant
12 quality assurance. He reports to Mr. Jim Maucere
13 director of quality assurance. I am the foreman over
14 the shop. I have no lead inspectors. And I have 22
15 individuals that I'm responsible for overseeing.

16 MR. GATTOLIN: Okay. Do you ever hold
17 meetings with your inspectors as an organized group
18 with an agenda at all, to talk about --

19 THE WITNESS: Yes.

20 MR. GATTOLIN: How often do you do this?

21 THE WITNESS: Yes, sir, I do. We have
22 quarterly shop meetings. But at any time, if there's a
23 change in our practice, I meet with the guys, if
24 there's a change in our process standard, we'll share

1 that information with them and go with a reading signed
2 type letter.

3 MR. GATTOLIN: Okay. How often do you have
4 an opportunity to meet with your supervisor on a, I
5 guess you could say a formal setting, where you have an
6 agenda that you would care to cover, and also, how
7 often do you go in and say, hey, we have a problem
8 here, how can we solve this?

9 THE WITNESS: Okay. Daily. Daily
10 interaction with my immediate supervisor.

11 MR. GATTOLIN: Daily interaction. All right.
12 Within your department, do you have any type of
13 program where you would take suggestions from the
14 floor?

15 THE WITNESS: Yes, sir, we do. Of course, I
16 interact with my people on a daily basis. Any
17 problems, any needs that arise, we're able to deal with
18 that at that time. We also have, which is supported by
19 our upper management at Delta Air Lines, a process
20 called CIT teams, which is continuous improvement
21 teams. And I worked on setting mine up approximately a
22 year, year and a half ago.

23 And in that, we have inspectors and our
24 processors meet and come up with a plan, an action of

1 items that they feel is important. They decide as a
2 group, in order to benefit the shop. And then we take
3 those suggestions, they present them to management, and
4 it's been quite successful.

5 MR. GATTOLIN: And how long has CIT been in
6 effect?

7 THE WITNESS: In my department, it's been I
8 think probably a year, maybe a year and a half. I
9 think it's probably a year.

10 MR. GATTOLIN: Okay. And what happened
11 before, say in 1995, 1994, so on and so forth?

12 THE WITNESS: At that time it was daily
13 interaction with the people, them sharing with me
14 opinions or problems, things like that.

15 MR. GATTOLIN: With this CIT program, does it
16 allow the inspectors to perhaps bypass you and go to
17 Mr. Krause?

18 THE WITNESS: Yes, sir. They do go through
19 me, but they are able to present their ideas to upper
20 management in a controlled format. So I mean they can
21 go above and share the plan to upper management, which
22 they have.

23 MR. GATTOLIN: When you say controlled
24 format, would you explain for folks who don't

1 understand?

2 THE WITNESS: Well, what I mean by that is a
3 setting. They have parameters, they have structure
4 within their team. They have a leader in their
5 organization, or like a six or seven man involvement,
6 who's the spokesman. They all are involved in the
7 process. They come up with a strategy game plan. And
8 then the one person, sometimes it's more than one, will
9 present it. But they'll all be there for the
10 presentation.

11 MR. GATTOLIN: Okay. Now if I could, when
12 you took over as foreman, that was in 1994, you said?

13 THE WITNESS: Yes, sir, February of 1994.

14 MR. GATTOLIN: And how many inspectors were
15 in your department at that time?

16 THE WITNESS: At that time we have 11
17 inspectors.

18 MR. GATTOLIN: In 1994?

19 THE WITNESS: Yes, sir.

20 MR. GATTOLIN: And how many do you have now?

21 THE WITNESS: Today we have 13.

22 MR. GATTOLIN: And before you took over, it
23 sounds like the department has grown, is that correct?

24 THE WITNESS: Yes, sir.

1 MR. GATTOLIN: It has. How many were in the
2 department during 1994 and 1995?

3 THE WITNESS: Around the, again, May area of
4 1994, we had approximately 11 inspectors.

5 MR. GATTOLIN: Okay. And how many shifts did
6 they work?

7 THE WITNESS: At that time, I had a partial
8 second shift.

9 MR. GATTOLIN: One and a half shifts. Okay.
10 When you have an employee come to you with a problem
11 with regard to the process or to the operation itself,
12 that they perceive as a problem, and you say, well,
13 it's not really that much of a problem, say that
14 they're talking of the rollers have residue on it, the
15 fluorescence residue on it, and they come back and they
16 will say it to you a second time, how do you resolve
17 this if it's a continuous type complaint where your
18 first response was, well, it's not really that
19 important. Or if you were to do that. I'm just using
20 the fluorescence.

21 THE WITNESS: Yes. I don't respond that way.

22 If someone comes to me and they're insistent that it's
23 an issue, I work with them to address that issue. I
24 will ask them for ideas, what's your ideas on how we

1 can correct this, and consider that. And a lot of
2 times, the men have the solutions to the problems.

3 MR. GATTOLIN: All right, well, you've been
4 there. In 1989, and in 1995, your department was
5 reviewed once by GE in 1989 and also by the FAA after
6 the accident. And going through those reports, there
7 were some things that were similar, such as the
8 improper use of the solvent for diagnosing the cracks
9 where they're flooding it, the tam panel cleaning of
10 that.

11 What controls are supposed to be in place that
12 appeared to fail? How did this happen? It's maybe too
13 general of a question, but it seems like there are some
14 consistencies from 1989 through 1995, the same things
15 were occurring. What in your opinion caused this?

16 THE WITNESS: The GE report, I believe it was
17 1990. And at that time, we did not have an in-house
18 training program. Our personnel were sent outside for
19 training. And which, my experience with the outside
20 training was that they didn't cover these areas as
21 thoroughly as maybe should have been.

22 It was always an understanding, I was an
23 inspector on the line at the time, the importance of a
24 clean solvent. It was just passed down through the on

1 the job training and experience. When we went and set
2 up the in-house training program, we provide that
3 information in our class, in our course.

4 I believe that technique, it's taught and
5 understood, the importance of a solvent. So we teach
6 in those areas, we train in those areas.

7 MR. GATTOLIN: How do you check an
8 inspector's on the job performance, let's say, on a
9 daily basis? What techniques do you folks use?

10 THE WITNESS: Generally, I go out there on
11 the line on a daily basis, interact with my people, a
12 lot of times it's involvement with the issues that they
13 have, or concerns they have. I will occasionally enter
14 into the tent, observe an inspection, monitor it.

15 And just as a general practice, we also now
16 have a trainer, Mr. Jim McMillan, who also is a level
17 three, come down and go through the line and visit and
18 see what's going on. And he and I will interact with
19 one another and discuss the issues or problems, and
20 decided whether to include it in our recurrent problem
21 or we need to deal with it directly at that time.

22 MR. GATTOLIN: If you find an inspector is
23 not performing up to the standards that you folks have
24 established, what is the procedure you follow from that

1 point on?

2 THE WITNESS: Once I observe or someone else,
3 whether it's a QA or Mr. McMillan, again, we see that
4 there's a problem in that area, we will get with that
5 gentleman and talk with him and decide whether to send
6 him back through the complete course again. And if the
7 individual does not improve, which we have done, he
8 will be taken out of the area. Can be.

9 MR. GATTOLIN: Can be terminated or just put
10 in another area?

11 THE WITNESS: No, not terminated, just taken
12 out of the inspection area.

13 MR. GATTOLIN: Has there been, since you've
14 been there, it sounds like there, has there been a
15 turnover in your department?

16 THE WITNESS: Yes, sir, there has.

17 MR. GATTOLIN: What percent, and how does it
18 work? How does that happen?

19 THE WITNESS: Well, in the 1994 era, as many
20 of you know, the airlines had the tough years there.
21 And we offered, Delta offered a retirement program.
22 And several of our people that had been on the line for
23 many years had retired and were replaced. So from the
24 1994 era to today, you might say we've had a 75

1 percent, 80 percent turnover, and that's an
2 approximation.

3 MR. GATTOLIN: Okay. What's the average
4 experience level now with your inspectors?

5 THE WITNESS: Today, many of them have one
6 that's, he's got probably eight years' experience on
7 the line. And the rest of them, say probably three
8 years. And two recent ones with a year experience.

9 MR. GATTOLIN: Okay. Back in 1995, you had
10 basically one and one half shifts, let's say, one full
11 shift and a partial shift, and that's what you still
12 have at this time. Is that correct?

13 THE WITNESS: Today, I've brought these, the
14 gentlemen that I had on the second shift, it was a
15 decision by me to, based on a recommendation, I might
16 add, from the men, of a plan how to improve, I brought
17 them up and put them on the weekend coverage partial
18 weekend coverage.

19 MR. GATTOLIN: So basically it's still one
20 and a half plus a weekend?

21 THE WITNESS: Yes, sir, it's no second shift
22 at this time.

23 MR. GATTOLIN: Okay. Now, we've got through
24 the administrative aspects so far. Could you describe

1 the FPI process? Let's start out with just your
2 general knowledge on cleaning, and then we'll go into
3 the FPI process. Let's orient it toward the 219 hub,
4 if you would. Just give us kind of a thumbnail sketch
5 of what the cleaning is, because I know that's not your
6 specific area, as you've expressed. What understanding
7 do you have of the cleaning?

8 THE WITNESS: Cleaning is an important part
9 of the process. We ensure that the part is first
10 cleaned by the OEM guidelines. Once that's
11 accomplished, when it enters our shop, we do the
12 visual, as Mr. Hilerio stated, the white glove, q-tip
13 type thing in the tight radiuses, fir tree areas.

14 If it meets our acceptance at that point we
15 will then place the part on the one. In particular the
16 219 hub, it will then be dipped in the penetrant. It
17 goes for a -- and each one of these processes have
18 parameters that they must function in.

19 Once it meets the dwell time it is then moved
20 over to the mechanical remover of the surface
21 penetrant, which is the pre-rinse station, then to the
22 emulsification process, which is controlled. Then the
23 post-rinse from there into the dryer ovens. And once
24 it's dry, by visual, it's then taken out and the

1 developer is applied. And it remains there for a
2 specified time and then taken into the inspection booth
3 for readout.

4 MR. GATTOLIN: How long could the hub have to
5 dwell in the penetrant itself? Is there a specific
6 time period also within the emulsifier?

7 THE WITNESS: Yes, sir. The dwell time is a
8 minimum of 30 minutes.

9 MR. GATTOLIN: Thirty minutes?

10 THE WITNESS: Yes, sir.

11 MR. GATTOLIN: Okay. And how about the
12 emulsifier?

13 THE WITNESS: The emulsifier, emulsification
14 process parameters are 30 to 90 seconds, not to exceed
15 the 90 seconds.

16 MR. GATTOLIN: What would occur if you went
17 beyond the 90 seconds?

18 THE WITNESS: What possibly could happen was
19 you would allow the emulsifier, the emulsifier acts as
20 a, it breaks down the surface penetrant. What could
21 happen if you left it in too long, it could actually
22 work its way into the defect or crack, if you will, and
23 break down the penetrant in that crack and render it
24 water washable and you could wash it away.

1 MR. GATTOLIN: And how do you, how do the
2 inspectors in the process position, how do they time
3 the stay in the emulsifier?

4 THE WITNESS: We have timers in place. And
5 of course, with that process being as critical as it
6 is, they stay right there at the emulsification tank
7 and monitor it while they're there. But the timer is
8 in place.

9 MR. GATTOLIN: And that was in place back in
10 1995, 1994?

11 THE WITNESS: Yes, sir.

12 MR. GATTOLIN: What qualities would, I'm just
13 going to kind of digress for a moment, what qualities
14 in your mind must an inspector candidate have? What
15 type personal qualities, abilities, what should this
16 individual have in general terms?

17 THE WITNESS: Well, obviously he's someone we
18 would regard as a person with a high character, lot of
19 mechanical experience, background, one who understands
20 the mechanics in engines and parts. And someone who
21 you hold in high esteem.

22 MR. GATTOLIN: Okay. What factors can
23 prevent a successful FPI on a hub? Give me some good
24 factors.

1 THE WITNESS: As I mentioned earlier,
2 cleaning is a very important part of the process.
3 Basically, if you don't have a clean part, you can
4 reduce your potential for finding a flaw. On the FPI
5 line in itself, the emulsification process is very
6 critical.

7 MR. GATTOLIN: Okay. What about the
8 condition of the line from a drying oven on to where
9 the inspector's working? What areas in there could
10 create a problem for the individual?

11 THE WITNESS: I guess the only one in between
12 those two stations would be your developer application
13 process.

14 MR. GATTOLIN: Tell us about that, if you
15 would please.

16 THE WITNESS: Okay. You have times, a
17 minimum of 10 minutes during the application of the
18 developer, and that's a minimum. And you have a two
19 hour max. You control that process, and as long as
20 you've got that in control.

21 MR. GATTOLIN: How about the physical
22 properties of the area that the individual is working
23 in, the conditions?

24 THE WITNESS: The inspection environment, the

1 booth?

2 MR. GATTOLIN: Yes.

3 THE WITNESS: Well, he's provided with all
4 the tools necessary to perform the task. As long as he
5 has a darkened area with a black light, the aids to
6 support the inspection and a hoist of some sort to help
7 him in maneuverability of the part. You could have
8 contamination in the booth type thing.

9 MR. GATTOLIN: What do you mean by
10 contamination?

11 THE WITNESS: Penetrant, excess penetrant
12 maybe.

13 MR. GATTOLIN: Where would the excess
14 penetrant be?

15 THE WITNESS: In the area, in the general
16 area.

17 MR. GATTOLIN: Can you be a little more
18 specific?

19 THE WITNESS: Just in areas where it would
20 cause a background.

21 MR. GATTOLIN: A background to reflect on
22 him?

23 THE WITNESS: Yes, sir.

24 MR. GATTOLIN: Okay. How does this 219 hub

1 move from the drying oven and developer to where the
2 inspector is? What type of environment?

3 THE WITNESS: A roller system, which the
4 parts are placed on a ring-shaped plastic part to aid
5 in transport.

6 MR. GATTOLIN: Okay. Can those rollers and
7 have those rollers been contaminated in the past?

8 THE WITNESS: Yes, sir, it can.

9 MR. GATTOLIN: How often does this area get
10 cleaned?

11 THE WITNESS: It gets cleaned on a daily
12 basis, as needed.

13 MR. GATTOLIN: As needed?

14 THE WITNESS: Yes, sir.

15 MR. GATTOLIN: Who makes that decision?

16 THE WITNESS: The inspector.

17 MR. GATTOLIN: The inspector makes that
18 decision?

19 THE WITNESS: Yes, sir.

20 MR. GATTOLIN: Does anyone check to see if
21 the inspector is making that decision?

22 THE WITNESS: Yes, sir.

23 MR. GATTOLIN: Would that be you?

24 THE WITNESS: That would be me.

1 MR. GATTOLIN: Okay. All right. Your
2 processors, what type of training do the processors
3 get, what are their qualifications?

4 THE WITNESS: The processors get the same
5 training as the inspector. In fact, when I set up the
6 in-house training program back in 1991, the first
7 classes I taught were in the first part of 1992. And I
8 felt it was very important that the processors at that
9 time be the first ones in the classroom to get that
10 training.

11 So they get the same training as the
12 inspector.

13 MR. GATTOLIN: Okay. In other words, that
14 would be with the, how to inspect the part itself, also
15 the dwell times and the use of the materials, the
16 spraying?

17 THE WITNESS: The full course they receive,
18 which covers the history, the theory, the different
19 type penetrant methods that's out there, the importance
20 of each step of the process, the importance of
21 cleaning. They get the full course.

22 MR. GATTOLIN: Okay, now, with the FPI
23 process, how large a crack can be missed on that? And
24 also, what flaws are below its ability to pick up?

1 THE WITNESS: It is my experience and belief
2 that anything 100, 150,000ths range should be 90
3 percent probability of detection based on industry
4 guidelines.

5 MR. GATTOLIN: Okay. If the penetrant and
6 the emulsifier and the dye have not worked, why would
7 that happen? What would cause it not to work? Let's
8 say the crack exists, but it's not seen. What would
9 cause the inspector not to see that crack? Give some
10 basic areas, please.

11 THE WITNESS: Okay. Basic areas would be
12 cleaning.0

13 MR. GATTOLIN: When you say cleaning, what do
14 you mean?

15 THE WITNESS: Well, it could cover just
16 general cleaning of a part. Any kind of a contaminant
17 that could bridge or entrap an indication or a flaw.

18 MR. GATTOLIN: Okay, cleaning and what else?
19 Go ahead.

20 THE WITNESS: The other areas could be the
21 emulsification process, dwells, you know, penetrants.

22 MR. GATTOLIN: All right, good. What about
23 the inspector? What could an inspector do that would
24 obliterate any evidence of a crack?

1 THE WITNESS: It's important in his bleedback
2 techniques and application developers.

3 MR. GATTOLIN: Would you explain to all of us
4 what bleedback technique is?

5 THE WITNESS: Yes, sir. It's a process by
6 which, if you will, it like brings a picture, if you
7 looked at a picture and it's out of focus, it will give
8 you a sharper image, bring it into focus. So you see
9 an indication, you take the solvent and bleed this
10 indication. And it will give you a sharp, clear image
11 of a flaw.

12 MR. GATTOLIN: How often does a solvent apply
13 to the, say on the 219 hub, as an example, how often
14 would that be applied?

15 THE WITNESS: That part is relatively free of
16 a lot of indications. It's hard to say. It's on a
17 piece by piece situation.

18 MR. GATTOLIN: Okay. The process standard
19 that they have, that's been developed for it, does that
20 specify the number of times that a solvent's been
21 applied and the time it should sit there before --

22 THE WITNESS: Are you talking about the
23 bleedback technique?

24 MR. GATTOLIN: Yes, sir.

1 THE WITNESS: No, sir, what it does is give
2 you descriptive on the bleedback. If you bleedback an
3 indication and it does not immediately reappear, you
4 could then use the non-aqueous developer, the solvent
5 developer, and you would wait a period of time, five
6 minutes.

7 MR. GATTOLIN: Okay. On the examination
8 area, or the tent, as it's referred to, where the
9 inspector is, what equipment should be in that tent for
10 the inspector to use and also for his protection?

11 THE WITNESS: The inspector should have,
12 obviously a darkened area with a black light,
13 ultraviolet light, white light, magnifying glass, those
14 are the basic tools. The access are in the area, the
15 non-aqueous developer, for areas of interest or concern
16 to him.

17 MR. GATTOLIN: What type of physiological
18 problems can take place with an inspector's working and
19 using a black light? Is there anything that would
20 affect his eyes or his vision?

21 THE WITNESS: White light, coming in and out
22 of a lit area into a darkened area, you have to wait
23 for a period of time for your eyes to adjust.

24 MR. GATTOLIN: Any goggles or anything to

1 protect the eyes?

2 THE WITNESS: Yes, sir. They have access to
3 the UV light protectant goggles.

4 MR. GATTOLIN: What does the UV light do to
5 the eye itself, from what your understanding is?

6 THE WITNESS: If you have unfiltered
7 ultraviolet light, it can be a hazard, if exposed to it
8 with the increase of possibility of cataracts, as I
9 understand it. But the light is filtered, and they
10 also have, again, access to the UV filtered goggles.

11 MR. GATTOLIN: Okay, by having access, that
12 means it's their option whether they want to use it or
13 not?

14 THE WITNESS: It's their option.

15 MR. GATTOLIN: Okay.

16 THE WITNESS: But the light as it is filtered
17 does not pose that problem.

18 MR. GATTOLIN: How long does the individual
19 have to allow his eyes to become accustomed to the
20 environment before beginning the inspection?

21 THE WITNESS: The requirement is a minimum of
22 one minute to three minutes. And if he comes in from
23 outside, say a brightly lit area of sunlight, directly
24 into a tent, it could go up to five minutes.

1 MR. GATTOLIN: Up to five minutes. Okay.
2 Getting back to the FPI process in that, is there
3 anything that you're aware of, or, let me rephrase
4 that. What can contaminate the FPI solutions, the
5 penetrant dye, the emulsifier, what are the things that
6 can be contaminated that to where it will cause it to not
7 perform as it should?

8 THE WITNESS: Okay. Well, on the water wash
9 end, you can have water introduced into it. It could
10 be any number of things. If you had contaminants,
11 alkalines or anything like that introduced to it.

12 MR. GATTOLIN: How would that get introduced
13 to it?

14 THE WITNESS: It would have to come in
15 directly as a, someone actually just placing it in the
16 area, or possibly through part transfer from the
17 cleaning. But other than that, it's not likely. We do
18 perform tests, weekly tests, we have our daily tests,
19 our weekly tests to ensure the performance of the
20 process, and the individuals performing the process, as
21 well as we have quarterly brightness tests to ensure
22 that our penetrants are meeting the specs, as well as
23 weekly local brightness tests.

24 MR. GATTOLIN: Would you describe the tests

1 that you'd use for the penetrant dye and also to check
2 the emulsifier?

3 THE WITNESS: Yes, sir. The penetrant dye
4 again we check the line daily with the use of our
5 panels to ensure that the process is functioning. We
6 also do a weekly brightness test. And by that, we take
7 a white paper towel, apply some of the in-use penetrant
8 to a sample of new, unused penetrant, and look for a
9 visual.

10 Then we have the quarterly brightness tes
11 which is sent to Turco, the supplier of our product, to
12 their Chicago facility or the facility up north, and
13 they perform the brightness test, which gives us a
14 numeric value.

15 MR. GATTOLIN: Okay. The panels, what are
16 these panels that you're talking about?

17 THE WITNESS: They are called, the Magnaflux
18 product, the tam panel, Sherwin is the PSM panel, and
19 these are panels that have a chrome side portion to
20 them that has five starburst type cracks located in
21 them. And you process those panels each morning first
22 thing, just as you would a part. Then when the
23 inspector checks it in the booth, he should on the
24 ultra high sensitive, pick up four indications, five

1 indications. And on the high sensitivity, four,
2 minimum of four.

3 MR. GATTOLIN: The 1990 GE report and the
4 1995 FAA report indicated the tam panels weren't
5 cleaned to perform their duty properly. Now, that was
6 on two specific reviews. It seems as though there
7 might be something taking place there also. What is
8 the methodology that's used to clean tam panels? How
9 do you clean these, and how reliable would you consider
10 that cleaning to be?

11 THE WITNESS: In the time frame of 1995, in
12 that era and back, we were trained in our process, we
13 went by our process standard, it was our approved
14 procedure, that stated that we would clean the panels.

15 And that was the process, what we had did, went by.

16 At that time, it was inspectors knowledge and
17 experience to take the panel, look under the light to
18 ensure that it was in fact clean. We did that.

19 Today, we've added some changes to that to be
20 a little more specific. We use an ultrasonic cleaning
21 and an acid tone or alcohol. And it's check again
22 before it's placed in the storage container.

23 MR. GATTOLIN: What would cause these panels
24 to show up during these inspections to be dirty? Why

1 would that be? What would in your mind cause it?
2 Let's say in 1995, I know you weren't there in 1990,
3 but in 1995, why did they find them in the condition
4 that they did?

5 THE WITNESS: Well, we were asked to check
6 these panels out of a process that we were not normally
7 accustomed to and was not called out by spraying a non-
8 aqueous developer on the panel. When we did that, this
9 was in the August of 1996 FAA inspection, we observed
10 some penetrant at the very corners of the cracks,
11 starburst. We recleaned them and went through the
12 process several times.

13 MR. GATTOLIN: You went through it several
14 times and finally got it clean?

15 THE WITNESS: One particular panel, we
16 continually ran into problems after a period of time.
17 And we got another panel and worked with that, and we
18 managed to get it to that cleaning guideline.

19 MR. GATTOLIN: Okay. If you could, what type
20 of, again, this may be a little redundant, but describe
21 the type of quality control systems that were in place
22 during 1994 and 1995 that would assure the quality of
23 the solutions and the processes and the inspector's
24 performance.

1 THE WITNESS: Again, the inspector
2 performance was based on initially, he went through the
3 training course, his OJT, he worked with another
4 inspector. And once the inspector felt that he was
5 comfortable and the level two OJT inspector felt he was
6 comfortable, we would then sign him off. Again, the
7 observations were based on my interaction with the
8 people, daily and weekly basis. Kind of just a general
9 practice, not as a program.

10 MR. GATTOLIN: Okay. When would an FPI,
11 inspector in the FPI line, take over the duties of a
12 processor? When does this happen, and how often does
13 it happen in your department?

14 THE WITNESS: When would an inspector take
15 over the function of processor?

16 MR. GATTOLIN: Yes. In other words, when
17 would he have a dual role, processor and inspector?

18 THE WITNESS: It happens from time to time, I
19 wouldn't say frequently or infrequently, just usually
20 it's in a case where you have a situation where a
21 processor is on vacation or out sick, and another one's
22 out sick. You could have that situation where the
23 inspector processed. But he's trained and certified to
24 perform that just as a processor is.

1 MR. GATTOLIN: Okay. How many parts would he
2 process, and how many parts could an individual inspect
3 on the average, if he's doing a dual role, if he's
4 performing that role?

5 THE WITNESS: It depends on what parts we're
6 talking about, the size, a lot of variations there.
7 You could give a general range of say, on individual
8 large parts or medium size rotating parts anywhere from
9 four to eight a day, depending, maybe a little more.

10 MR. GATTOLIN: All right. And how long has
11 this been a practice at Delta, to your knowledge?

12 THE WITNESS: A practice?

13 MR. GATTOLIN: A practice where you have the
14 inspector doing also the processor's function?

15 THE WITNESS: It's always been there.

16 MR. GATTOLIN: It's always been that way?

17 THE WITNESS: Yes, sir.

18 MR. GATTOLIN: Has it increased since you've
19 been there, or has it decreased?

20 THE WITNESS: I would have to say it's
21 decreased, due to the addition of personnel.

22 MR. GATTOLIN: Okay. And I think this was
23 asked yesterday of Mr. Hilerio, but how many 200 series
24 hubs have passed through your shop, let's say in the

1 last two, three years, to your knowledge? Any guess at
2 all?

3 THE WITNESS: No, sir, it would be tough. It
4 would be a general three a week type thing that he gave
5 you. But I couldn't tell you.

6 MR. GATTOLIN: Okay. And you say the, going
7 into, I'd like to go into some of those things, Exhibit
8 8E, if you could.

9 Page 16 is just some questions that I have, I
10 want to know why it's bad, shall we use that word, or
11 why it's inappropriate, or incorrect. On this
12 observation F2 where they found the fluorescence
13 material on the solvent that was on the production
14 floor, contaminated with fluorescent material, why
15 would this be considered inappropriate? What problems
16 could be associated with that, Mr. Clements?

17 THE WITNESS: If you had excessive amounts of
18 fluorescence in the acetone, it could give you somewhat
19 of a possible masking effect, depending on how much.

20 MR. GATTOLIN: How do they apply the acetone
21 to the area that's going to be the bleedthrough?

22 THE WITNESS: The inspector has the use of a
23 soft bristle camel hair brush and/or a q-tip. And he
24 would dip it in the solvent. In the case of using the

1 camel hair brush, shake out the excess solvent, and
2 bleed the area of concern.

3 MR. GATTOLIN: When they do that, that picks
4 up some of the fluorescent material onto the bristles
5 of the brush or to the cotton of the q-tip, is that
6 correct?

7 THE WITNESS: Yes, sir.

8 MR. GATTOLIN: What does the inspector do,
9 once he's applied the solvent to the area? What's he
10 do with that q-tip and/or brush?

11 THE WITNESS: Okay, the q-tip is disposed of.
12 The brush is placed in a second container in the area
13 that we use to clean the brush before we re-introduce
14 it to the actual acetone that we use for bleedback.

15 MR. GATTOLIN: Are they cleaned in acetone
16 also?

17 THE WITNESS: Yes, sir.

18 MR. GATTOLIN: How often do they change the
19 cleaning material for that brush?

20 THE WITNESS: Daily or sooner, as necessary.

21 MR. GATTOLIN: And the inspector is the one
22 that makes that judgment?

23 THE WITNESS: Inspector's decision.

24 MR. GATTOLIN: Okay. Going down to

1 observation F3, you may have explained this, but my
2 memory is short with age. In here it says inspector
3 working production line on the afternoon of the 13th
4 was using solvent as a cleaning aid to remove excess
5 fluorescing, repeatedly flooding the inspection area
6 with brushfuls of solvent in order to remove the
7 fluorescence material.

8 Your process standard specifies what, guess
9 you could say it's Exhibit 11N, what does that call
10 for? If you would refer to 11N, please.

11 THE WITNESS: Yes. Do you have the specific
12 page?

13 MR. GATTOLIN: Yes. Either 9 or 11.

14 THE WITNESS: I'm sorry, what page?

15 MR. GATTOLIN: Right here. Here you go.
16 Right here where it's the indications, applying the
17 material. On page 9. The solvent, cotton swab or fine
18 hair brush. How many times should they do this, and
19 how long do they have to wait?

20 THE WITNESS: Are you talking about 15A?

21 MR. GATTOLIN: Yes, sir.

22 THE WITNESS: Okay, it says wipe area once
23 with a solvent, using a cotton swab or fine hair brush.

24 It is the inspectors who have all competency in

1 decision. When he bleeds that indication back and he
2 applies, say, the developer again and nod, he's still
3 not sure, he has the ability to rebleed that
4 indication.

5 MR. GATTOLIN: Okay, it comes just basically
6 with training?

7 THE WITNESS: With training and experience.

8 MR. GATTOLIN: Okay. On page 17, observation
9 F5, we talked about this before. Do you have any --
10 it's observation F5 on 17 in the 8E, flipping back to
11 that.

12 THE WITNESS: Page 17 of the process
13 standard?

14 MR. GATTOLIN: No, of 8E, it's the FAA's
15 August 1996 report. Exhibit 8E.

16 THE WITNESS: Okay. Observation F5?

17 MR. GATTOLIN: Yes, sir. It's page 17.

18 THE WITNESS: Okay.

19 MR. GATTOLIN: And visible trash and debris,
20 could you kind of talk a little bit about this, what it
21 would cause, why it's there, if it's a daily thing
22 going on with cleaning?

23 THE WITNESS: Yes, sir. As many of you know
24 an FPI line facility is something that requires

1 continual monitoring, which we do. We have since this
2 observation and recommendation, have heightened a bit
3 to require a daily and weekly check-off of the areas.
4 Daily checks in the inspection booth, and it is a
5 signoff item now.

6 MR. GATTOLIN: Okay, that's now. Before
7 then, it was not something that --

8 THE WITNESS: It was at the discretion of the
9 inspector, not the discretion, but it was the
10 responsibility of the inspector and myself to monitor
11 this.

12 MR. GATTOLIN: Speaking of this area, how
13 much time do you spend with administrative duties,
14 percentage on a daily basis? In other words, where
15 you're holed up in that office of yours. Or meeting
16 with your superiors.

17 THE WITNESS: Okay. Couple hours a day,
18 three, two or three hours a day.

19 MR. GATTOLIN: Twenty-five, 30 percent? Is
20 that what you're saying?

21 THE WITNESS: Thirty percent.

22 MR. GATTOLIN: Okay. The rest of the time
23 you're doing?

24 THE WITNESS: In the area, interacting with

1 other departments, engineering.

2 MR. GATTOLIN: Okay. How much time would you
3 spend on a daily basis, would you say, just average, on
4 the floor where the inspectors are, looking at the
5 shop, condition of the shop, things of this nature?

6 THE WITNESS: It would vary.

7 MR. GATTOLIN: Give me an average.

8 THE WITNESS: An hour, hour and a half,
9 something like that.

10 MR. GATTOLIN: On a daily basis. Okay. All
11 right, let's see. That's it for our exhibit.

12 Then go over here. The, when we were, when
13 our group was down looking at your shop back in July of
14 1996, we observed the table beneath the rollers in the
15 inspector's tent that had a lot of the contaminants
16 with the fluorescence on it. And this was a problem
17 that was expressed by a couple of inspectors to us.

18 This condition was something that was the
19 responsibility of who to change and make you aware of,
20 or how was this handled? How could they keep it clean?
21 Who was supposed to do this?

22 THE WITNESS: The inspector in the booth,
23 it's considered at that time his responsibility to keep
24 the area clean.

1 MR. GATTOLIN: Okay, and when we observed it,
2 it wasn't, and also I believe during the conversations,
3 we found that they stated that it had been that way for
4 about two weeks beforehand. Is there anything that
5 would prevent the inspector from bringing this up and
6 saying, hey, we need this cleaned? Or just the fact
7 that they're busy, or what would a cause be to stop
8 that?

9 THE WITNESS: No, sir, it wouldn't. And my
10 experience on the floor as an inspector was that when
11 my area became contaminated, I would clean the rollers
12 or whatever.

13 MR. GATTOLIN: Is there a new program?

14 THE WITNESS: Yes, sir, it is. Again, it's a
15 daily signoff by the inspector that he's cleaned his
16 booth, and I monitor that.

17 MR. GATTOLIN: Okay. I'm finished with my
18 line of questions, and I'll turn it over to you, Mr.
19 Chairman. Oh, wait, hold it, excuse me. We have a
20 teammate here who has some questions. I'm sorry.

21 MR. BYRNE: If that would be okay with you,
22 Mr. Chairman?

23 CHAIRMAN GOGLIA: Yes, indeed.

24 MR. BYRNE: Mr. Clements, how often do you go

1 into the inspection tent?

2 THE WITNESS: I do not go in there, in the
3 tent itself and observe an actual inspection on a daily
4 basis. But again, I interact with my people on a daily
5 basis. If they have something of concern they want to
6 show me, get my opinion, I will then enter the
7 inspection booth. I have entered in there to observe
8 an inspection. But it's not necessarily on a daily
9 basis.

10 MR. BYRNE: Okay, and could you give me an
11 estimate of how often you would go into that tent,
12 either in a week or in a two week period?

13 THE WITNESS: It can only be a guesstimate.
14 But several times in a week, just depending.

15 MR. BYRNE: Before we visited in July of
16 1996, had you been in the tent in the two week period
17 before?

18 THE WITNESS: I have no recollection.

19 MR. BYRNE: Okay.

20 Mr. Clements, could you tell us how you
21 select inspectors at Delta?

22 THE WITNESS: Yes, sir. At the time of the
23 incident, an individual, there's a bid process that's
24 placed throughout the facility on the board. Any

1 interested party, person, will sign that bid. They
2 will be voted on by their peers, and the best
3 individual is then selected through that process.

4 MR. BYRNE: And how much, or describe how
5 inspectors are compensated in comparison to other
6 members of the work force in tech ops.

7 THE WITNESS: Okay. They are paid a premium,
8 do you want an exact number? They are paid a premium
9 above mechanic.

10 MR. BYRNE: Were you involved in the
11 selection process of Mr. Hilerio?

12 THE WITNESS: At that time, I was involved.
13 There was an interview, but it was primarily considered
14 only a voting by the peers. And we as management
15 reviewed that, barring any unusual circumstances, he
16 gets the job.

17 MR. BYRNE: And which of the criteria that
18 you look for in an FPI inspector does Mr. Hilerio
19 achieve?

20 THE WITNESS: Basically it's looked at that
21 his performance in his present position is at that time
22 satisfactory. And you know, he's performing
23 satisfactory in his position at that time.

24 MR. BYRNE: How often is the FPI training

1 course, the 20 hour course, conducted at Delta?

2 THE WITNESS: At the time, every individual
3 that came in the shop went through the initial 20 hour
4 training for the FPI inspection. They received their
5 OJT, a vision exam, provided they passed the test and
6 met the vision acuity, and the practical, they were
7 then certified to perform inspections.

8 MR. BYRNE: Since you have been foreman in
9 the shop, how many times has that course been
10 conducted?

11 THE WITNESS: With my people?

12 MR. BYRNE: Yes.

13 THE WITNESS: I would have to say, five, six
14 times. Of initial training.

15 MR. BYRNE: Okay.

16 THE WITNESS: New personnel.

17 MR. BYRNE: And have any members of Delta
18 senior management or FAA people attended this training
19 course?

20 THE WITNESS: I'm not, I don't have that
21 information.

22 MR. BYRNE: Have you attended the training
23 course?

24 THE WITNESS: Oh, yes.

1 MR. BYRNE: What guidance do you get from
2 Delta management on developing the training course?

3 THE WITNESS: Well, initially, I was just
4 invited to work in setting up that program. We used
5 the ATA guidelines to develop that course. And just
6 the support from management and the development of the
7 course.

8 MR. BYRNE: And has the course content
9 remained fairly stable over the past three years?

10 THE WITNESS: Yes. We have introduced new
11 items into that course, obviously, as we learn and gain
12 knowledge and experience, we add material to that,
13 information type material.

14 MR. BYRNE: Is there any take home or
15 homework assigned for this course?

16 THE WITNESS: At the time that I did the
17 course, I don't think, we had like a little home study
18 course, but their classroom training is primarily that.
19 They obviously can take their books home and study in
20 the evenings, if they so choose to.

21 MR. BYRNE: So do all 20 hours for this
22 course consists of the classroom training, or is any
23 given for homework?

24 THE WITNESS: Not all of it's classroom.

1 There's a portion of it where they actually are
2 involved in going out. There's a practical part of the
3 course where they go out with a sampling of parts, LCF
4 blocks, and perform inspections and are graded on that,
5 their performance.

6 MR. BYRNE: Okay. And when is the practical
7 examination administered, before the OJT begins or
8 after the OJT is completed?

9 THE WITNESS: Generally, we get them there
10 for a few days working with another individual and they
11 get into the course. At some point in time, there's,
12 it's not automatically that they go to the class the
13 very first thing. Sometimes it's beneficial for a man
14 to have a little visual involvement in the process, so
15 when he attends a class, he understands better.

16 MR. BYRNE: And you mentioned you had 13
17 inspectors working in your shop today?

18 THE WITNESS: Yes, sir.

19 MR. BYRNE: How many of those are magnetic
20 particle and how many are FPI inspectors?

21 THE WITNESS: They all have both methods
22 under their belt.

23 MR. BYRNE: And as far as the FPI inspectors,
24 of these 13 individuals, or, are these 13 individuals

1 FPI inspectors, or does this include processors as
2 well?

3 THE WITNESS: No, this does not include
4 processors. There are six processors that are
5 certified to do the processing.

6 MR. BYRNE: For the 13 inspectors on the FPI
7 line today, how many of those are level one qualified?

8 THE WITNESS: Today, I have 11 of them are
9 level two. The two recent additions, I still have them
10 there at level one status.

11 MR. BYRNE: And in October of 1995, how many
12 of the 11 inspectors if I have the number correct were
13 level one qualified?

14 THE WITNESS: I'm not sure of that number at
15 that time. I can't answer that.

16 MR. BYRNE: Level two qualified individuals
17 can serve as OJT instructors?

18 THE WITNESS: Yes, sir.

19 MR. BYRNE: Would you describe for me the
20 process that an inspector would matriculate from level
21 one to level two?

22 THE WITNESS: Okay. Through the experience,
23 they now go through a classroom, an additional 12 hours
24 classroom, and they're certified as level twos.

1 MR. BYRNE: And before October of 1995, was
2 that additional 12 hours of classroom required to move
3 from level one to level two?

4 THE WITNESS: No, sir.

5 MR. BYRNE: What method then was in place to
6 move from level one to level two?

7 THE WITNESS: At that time, OJT experience
8 was a minimum of 480 hours.

9 MR. BYRNE: What method was in place to make
10 sure that the level two or when somebody moved to level
11 two, before October of 1995, that they still were
12 implementing FPI according to the policy and procedures
13 of Delta?

14 THE WITNESS: That was my job, basically in
15 the shop, that I'm satisfied with their performance.
16 And based on them working with a level two individual,
17 interaction with that level two individual, if they had
18 any negatives or anything, reason not to. But it was a
19 verbal type, visual monitoring.

20 MR. BYRNE: Was there any performance or
21 practical exam given before you authorized an
22 individual to become an OJT instructor?

23 THE WITNESS: No, sir.

24 MR. BYRNE: How many hours are required

1 before an instructor or a trainee has signature
2 authority?

3 THE WITNESS: Eighty hour minimum.

4 MR. BYRNE: And is that restricted to any
5 type of part?

6 THE WITNESS: No, sir.

7 MR. BYRNE: So once they receive signature
8 authority, any part that comes down the line they can
9 inspect?

10 THE WITNESS: Yes, sir.

11 MR. BYRNE: Do you provide any guidance, or
12 special guidance and instruction about inspection of
13 critical rotating parts?

14 THE WITNESS: When they go through the
15 training and learn the importance and how to find
16 cracks, they're prepared to find cracks in any part.
17 They understand the methods, all the methods, all the
18 means. They have that ability, once we certify them as
19 level one and feel confident that they have that
20 ability. And we do find cracks.

21 MR. BYRNE: You do find cracks in critical
22 rotating parts?

23 THE WITNESS: Yes, sir.

24 MR. BYRNE: I'll get back to that in just as

1 second. Have you attended any FPI courses elsewhere?

2 THE WITNESS: Yes, sir. Again, when I
3 entered the shop, we did not have in-house training. I
4 entered an MQS Services training course out of Chicago,
5 Illinois for level two training. I've been involved
6 with different little seminars at GE, you know,
7 different OEM schools. And again, I've studied and
8 tested for the level three certification.

9 MR. BYRNE: Since you've been administering
10 your 12 hours of classroom to move from level one to
11 level two, is there an exam as well?

12 THE WITNESS: Yes, sir.

13 MR. BYRNE: Have you, has any inspector ever
14 failed that exam?

15 THE WITNESS: Not to my knowledge. I do not
16 have that. Mr. McMillan now is the instructor in that
17 course.

18 MR. BYRNE: So I'd just like to return back
19 to how an instructor, when did the 12 hours of
20 classroom to move from level one to level two, when was
21 that initiated?

22 THE WITNESS: After interview with the FAA in
23 the August of 1996 audit, based on recommendations, we
24 responded responsibly.

1 MR. BYRNE: And in that report, Exhibit 8E,
2 there are excerpts from the NDT manual that define the
3 recurrent training requirements as being continuing,
4 satisfactory, performance. Again, would you define for
5 me how continuing satisfactory performance is defined?

6 THE WITNESS: That was up to the foreman of
7 the NDT shop to make that recommendation.

8 MR. BYRNE: And what criteria did you use
9 specifically?

10 THE WITNESS: Information from my people, my
11 exposure to the individuals.

12 MR. BYRNE: You've mentioned changes in
13 training. What specific changes in training have taken
14 place after the accident insofar as handling of parts?

15 THE WITNESS: Okay. Immediately following
16 the investigation, we introduced a training course that
17 we ran all personnel through, to perform the FPI
18 process, the importance of handling, we've introduced a
19 technique sheet type aid tool with this type
20 information supplied on it, the importance of handling
21 and indexing of parts. And it's now part of the
22 course, initial course.

23 MR. BYRNE: Inspectors in your shop, you're
24 responsible for magnetic particle and two FPI lines at

1 Delta?

2 THE WITNESS: Yes, sir.

3 MR. BYRNE: The inspectors in your shop are
4 qualified for both techniques of NDI?

5 THE WITNESS: Yes, sir, both methods.

6 MR. BYRNE: When an inspector comes in in the
7 morning, what determines which line they will be
8 working on?

9 THE WITNESS: We set up a rotation schedule
10 based on our peoples' desires, intervals that they
11 desire. And we rotate that around based on that. But
12 they have a scheduled area that they work in for a
13 period of time.

14 MR. BYRNE: Okay. And when an inspector is
15 working on the FPI line, their sole task is working in
16 the inspection tent?

17 THE WITNESS: Well, they have, that's their
18 primary function. But as Mr. Hilerio stated yesterday,
19 a period of time, it's paperwork handling, other parts
20 of the inspection process that they're involved in.
21 But their function is as an FPI inspector.

22 MR. BYRNE: And did you say that the average
23 number of parts that would come through a day, major
24 parts, that an inspector would inspect, was between

1 five and seven?

2 THE WITNESS: No, sir. It's hard to say.
3 That's a general. It depends on the type of part that
4 you have coming down the line, the size of it, the
5 different type geometries of the part. One will take
6 longer to inspect than another type part, depending on
7 the part.

8 I gave a general estimate, anywhere from, you
9 know, four to eight or ten, depending on the part. And
10 that was looking at, just trying to give you around a
11 rough idea.

12 MR. BYRNE: Is there a logging system in
13 place to track the number of parts inspected by an
14 inspector?

15 THE WITNESS: Yes, sir. It's not by the
16 inspector, no. It's not used as a tool for that. This
17 system was set up by our synchronous manufacturing
18 group, as it's called. And its sole purpose is to show
19 upper management flows where it gives them a tool to
20 try to see what they need to do to even out the flow of
21 parts, where you don't have large masses coming
22 through.

23 MR. BYRNE: If you have no method to track
24 the number of parts inspected by each inspector, how do

1 you determine if an inspector is still qualified to
2 work the line?

3 THE WITNESS: Well, his qualification to work
4 the line is not based on number of parts. His
5 qualification is based on his ability through training,
6 through the OJT and his daily performance, which is
7 monitored by myself as well as outside the shop
8 personnel, whether it be QA, whether it's Mr. McMillan
9 coming down to observations. That's what it's based
10 on, his ability to perform the inspections.

11 MR. BYRNE: Are there recurrent training
12 requirements at Delta for FPI inspectors?

13 THE WITNESS: Yes, sir.

14 MR. BYRNE: Would you describe those?

15 THE WITNESS: On an annual basis, they go
16 through a recurrent training course.

17 MR. BYRNE: And what does that course consist
18 of?

19 THE WITNESS: The course, I guess information
20 that is trained, is determined by my interaction with
21 the people, Mr. McMillan, areas that he sees in his
22 observations, whether it be in my department or another
23 department that performs FPI that we think we need to
24 reiterate or bring out or work towards. If it's

1 something of that nature.

2 MR. BYRNE: How many hours is the course?

3 THE WITNESS: Three hours.

4 MR. BYRNE: And how are the inspectors
5 evaluated at the end of that course?

6 THE WITNESS: They're tested.

7 MR. BYRNE: Written examination or practical
8 examination?

9 THE WITNESS: Written examination.

10 MR. BYRNE: So on an annual basis, there is
11 no practical examination that's administered to your
12 inspectors?

13 THE WITNESS: Only the daily observation by
14 myself or Mr. McMillan or audits.

15 MR. BYRNE: What do you tell your inspectors
16 to do regarding taking breaks?

17 THE WITNESS: We do have guidelines on
18 breaks. We have every two hours a break, a 10 minute
19 break at around 9:00 o'clock, a lunch break at 11:00,
20 and then an afternoon break. But the inspector, any
21 time, he's the one who knows his limits. And if he
22 chooses to step out of the area, he makes that
23 decision.

24 MR. BYRNE: Mr. Hilerio told us in July of

1 1996, during our interview with him, that he took
2 frequent stress breaks. However, these breaks could
3 not be too long, because otherwise parts would begin
4 backing up. He also stated that, a sense of pressure
5 he felt while working was not one of inspecting a part
6 as much as it was the parts backing up on the line.

7 Would you describe the throughput of the line in
8 the workload for each inspector?

9 THE WITNESS: Okay. I'm sure as you
10 observed, we have quite a number of parts in the area.

11 This obviously is his feelings on that. And I respect
12 that.

13 There are some things, though, that we have
14 done over the past year to improve that situation, one
15 being set up in a case shop, FPI line, as well as shift
16 some of the parts from, that we just received from
17 landing gear down to another NDI shop. But this is a,
18 merely a feeling that he had.

19 MR. BYRNE: What is your observation about
20 your inspectors' workload?

21 THE WITNESS: We have a task at hand. We
22 have plenty of work to do.

23 MR. BYRNE: Do you feel you have an adequate
24 number of inspectors to process the work that you're

1 faced with?

2 THE WITNESS: Yes. We have the numbers. Of
3 course, we've added to aid us in that area. Plus with
4 the reduction of workload due to the shift-off to the
5 case shop and landing gear and some other small
6 components are now sent to another department. So
7 we've made improvements that helped in that area.

8 MR. BYRNE: Are you, are there time limits
9 placed on inspectors for inspecting parts?

10 THE WITNESS: No, sir.

11 MR. BYRNE: Are there ever any priority parts
12 at Delta?

13 THE WITNESS: Yes, sir.

14 MR. BYRNE: They get put in, do they get put
15 in ahead of line or ahead of the queue?

16 THE WITNESS: Yes, sir.

17 MR. BYRNE: How frequently does that happen?

18 THE WITNESS: It happens, it varies depending
19 on the number of tear-downs and where you're at. It
20 could be anywhere from a daily situation where you have
21 parts being put ahead of the line on a daily basis,
22 anywhere from two to three times on a heavy day to some
23 days you don't have that. So it fluctuates.

24 MR. BYRNE: Was the 219 hub in this accident

1 a priority part?

2 THE WITNESS: I do not know.

3 MR. BYRNE: Is there any paperwork that
4 follows a priority part that labels it as such?

5 THE WITNESS: There is. There's a card, in
6 our system there's a green card that's placed in it
7 which identifies it as a priority job. But I do not
8 have any information, or there's no data.

9 MR. BYRNE: What do you recall about the 219
10 hub that was in this accident?

11 THE WITNESS: How do you mean, recall about
12 this hub?

13 MR. BYRNE: Do you recall any details about
14 this hub?

15 THE WITNESS: No, sir.

16 MR. BYRNE: Does Mr. Hilerio's lack of a
17 recollection of working on this hub surprise you?

18 THE WITNESS: No, it does not.

19 MR. BYRNE: Why?

20 THE WITNESS: Because we look at ~~man~~ many
21 parts, and we look at many hubs. So it's another hub.

22 MR. BYRNE: Was Mr. Hilerio's progress as an
23 inspector typical, as he matriculated through the
24 system?

1 THE WITNESS: Yes, sir. Mr. Hilerio is a
2 fine inspector, as all the other gentlemen in the shop
3 are. I have a lot of confidence in my men.

4 MR. BYRNE: Are you aware whether you have
5 ever detected a crack in a 219 hub?

6 THE WITNESS: I'm not aware of that, no.

7 MR. BYRNE: Have you rejected a 219 hub for
8 any other reason in your shop?

9 THE WITNESS: I'm not aware of that.

10 MR. BYRNE: When an inspector detects a crack
11 or rejects a part, what happens?

12 THE WITNESS: When an inspector deems a part
13 rejected for whatever reason, he fills out a paperwork,
14 a job stop or a job reject card with the information of
15 why it's rejected. And routes it back to the
16 appropriate shop.

17 MR. BYRNE: Are you made aware each time an
18 inspector rejects a part?

19 THE WITNESS: No, sir.

20 MR. BYRNE: Are you ever called in for
21 consultation when an inspector is evaluating an
22 indication?

23 THE WITNESS: Yes, sir.

24 MR. BYRNE: What feedback would an inspector

1 receive after rejecting a part?

2 THE WITNESS: Sometimes none. If he rejects
3 a part for whatever reason, it's, he wasn't satisfied
4 with the part. If the person that receives the part
5 has questions, they may interact with him or draw me
6 into it. We will look at the part on that basis. But
7 the inspector makes the decision.

8 MR. BYRNE: You said may interact with the
9 inspector. Is that always?

10 THE WITNESS: No, sir, it's not always. It's
11 only in the occasion that I'm drawn into it. The
12 inspector makes the decision based on his skill and
13 knowledge of the issue with the part.

14 MR. BYRNE: So when he rejects a part, he's
15 rejecting a part based on his evaluation of an
16 indication at that time, and he receives no further
17 feedback whether it was a real defect or something
18 benign?

19 THE WITNESS: Sometimes, depending on the
20 situation, there are parts that we may find cracks
21 routinely in the areas. And when the inspector, it's
22 cracked and it's marked, it's cracked. If it's
23 something unusual, then there is interaction sometimes
24 and feedback, and involvement with engineering or

1 whoever need be.

2 MR. BYRNE: What is unique about the 219 hub
3 relative to other hubs that your line processes?

4 THE WITNESS: Unique in how? How do you
5 mean?

6 MR. BYRNE: You tell me.

7 THE WITNESS: It's a different shape,
8 obviously, than other parts. But it's a fairly thick
9 part.

10 MR. BYRNE: In October of 1995, was there any
11 specific instruction given to your inspectors on the
12 handling of a 219 hub?

13 THE WITNESS: Just going by the OEM
14 requirements to do a full inspection.

15 MR. BYRNE: Did you require your inspectors
16 to use the overhead hoist in the tent in October of
17 1995, when inspecting a 219 hub?

18 THE WITNESS: No, sir, it was there as a tool
19 for him if he deemed that he needed it.

20 MR. BYRNE: Did your inspectors regularly use
21 the hoist in October of 1995?

22 THE WITNESS: I couldn't say. Some probably
23 did. Some may have chosen not to.

24 MR. BYRNE: And do they now?

1 THE WITNESS: It's in our process, in our
2 techniques sheet that it is available as a tool to use
3 on parts. It's usually decided by the individual,
4 based on the size and weight of the part.

5 MR. BYRNE: I have a couple of final
6 questions for you. What type of interaction do you
7 have with other employees in similar positions at other
8 carriers?

9 THE WITNESS: At other carriers?

10 MR. BYRNE: Yes.

11 THE WITNESS: I counsel with them, either in
12 person or by phone when there's an issue arises, we
13 talk. I meet them, a lot of them have involvement with
14 the ATA NDT forums. We interact at these functions and
15 share ideas and share information.

16 MR. BYRNE: Have you in your time at Delta on
17 the FPI line, what major changes have occurred insofar
18 as hardware?

19 THE WITNESS: Okay. I introduced the PVC to
20 the rollers, plastic to the rollers to reduce the metal
21 to metal issue. That was something of mine. The
22 introduction of the technique sheets, starting the
23 introduction of technique sheets. We've also added a
24 little optical scope, if you will, a magnifier that you

1 can use to look down in holes as a visual aid.

2 Improvements to the area through our CIT with the
3 introduction of a maintenance utility person to help
4 cue the parts into the area. Things of that nature.

5 MR. BYRNE: Has the inspection booth changed
6 since you've been there?

7 THE WITNESS: The booth itself? No, sir.

8 MR. BYRNE: The FAA has a program, a research
9 program on human factors in maintenance and inspection.
10 Are you aware of that program?

11 THE WITNESS: Yes, sir, not in detail, but I
12 am aware that there is one.

13 MR. BYRNE: One of the products of that
14 program is a guide, a compendium of information on
15 human factors and maintenance and inspection. It's
16 distributed on CD or in hardbound format. Have you
17 received a copy of that guide?

18 THE WITNESS: No, sir.

19 MR. BYRNE: And finally, the tam panels are
20 used to check the, as a daily check of the quality
21 control on the line. Do you have any mechanism in
22 place at this time to perform a similar check on the
23 quality performance that your inspectors are working
24 at?

1 THE WITNESS: What we're now doing is just
2 most recently started was the introduction which I had
3 acquired the LCF blocks back in 1993, introducing those
4 as a monitoring system of our personnel.

5 MR. BYRNE: How frequently are those
6 introduced?

7 THE WITNESS: It's no schedule. We're not
8 set up on any scheduled time, just on a periodic basis.

9 And maybe Mr. McMillan will perform it, or myself.

10 MR. BYRNE: And would you describe for us
11 what's on those LCF blocks?

12 THE WITNESS: On those blocks, they're low
13 cycle fatigue crack blocks, and they have indications
14 of various sizes. I think they're down anywhere from
15 like 15,000ths in length up to 60,000ths. And you
16 process those and look for those indications. Some of
17 them are very small.

18 MR. BYRNE: Does each block contain an
19 indication, a crack or a defect?

20 THE WITNESS: Yes, sir. We're also looking
21 into capturing some parts and introducing cracks into
22 those and just place them on the line in that type
23 situation.

24 MR. BYRNE: And was a system in place before

1 October of 1995?

2 THE WITNESS: No, sir.

3 MR. BYRNE: When did it start?

4 THE WITNESS: This was recently, within this
5 past year.

6 MR. BYRNE: Okay.

7 Mr. Chairman, I have no further questions.

8 CHAIRMAN GOGLIA: Mr. Conroy?

9 MR. CONROY: Yes, thank you, Mr. Chairman.
10 I have two or three questions, and they
11 regard oversight and feedback within your department or
12 your shop.

13 Mr. Hilerio reports to you, is that correct,
14 sir?

15 THE WITNESS: Yes, sir.

16 MR. CONROY: And you report, you've
17 mentioned, to Mr. Krause?

18 THE WITNESS: Yes, sir.

19 MR. CONROY: And what is Mr. Krause's
20 position?

21 THE WITNESS: He is the manager of quality
22 assurance in the power plant area.

23 MR. CONROY: And Mr. Krause reports to Mr.
24 Maucere?

1 THE WITNESS: Yes, sir.

2 MR. BYRNE: And just for the record, his
3 position?

4 THE WITNESS: Mr. Maucere, Jim Maucere is the
5 director of quality assurance.

6 MR. CONROY: And Mr. Maucere reports to whom?

7 THE WITNESS: Mr. Valeika, Ray Valeika.

8 MR. CONROY: Okay. As Mr. Gattolin discussed
9 process, the process portion of the procedures in your
10 shop, is process part of the inspection procedure
11 overall? In other words, cleaning?

12 THE WITNESS: The processor or the process
13 itself?

14 MR. CONROY: The processor.

15 THE WITNESS: The processor is under my
16 supervision. He is not involved in the cleaning of the
17 part. That is performed by another department.

18 MR. CONROY: Is the processor, is his work
19 part of the inspection process?

20 THE WITNESS: No, sir.

21 MR. CONROY: Is Mr. Hilerio also a processor
22 in addition to an inspector?

23 THE WITNESS: His title is inspector. He's
24 trained, the whole importance of the process, he has

1 that ability and skill to perform that. The
2 processor's function is to primarily, is just to
3 process.

4 MR. CONROY: But as you're saying, it's not
5 part of the inspection process, procedure?

6 THE WITNESS: No. It's part of the FPI
7 process. The inspector can perform the process and the
8 inspection. The processor can only perform the
9 process.

10 MR. CONROY: That's where I was getting, is
11 does an inspector, I guess you could call it a final
12 inspector for your shop level, does he inspect work
13 that he has also performed the process on?

14 THE WITNESS: It happens from time to time,
15 based on personnel staffing.

16 MR. CONROY: And could you give me an idea of
17 percentages of the time in which an inspector would
18 inspect his own process work?

19 THE WITNESS: It would be minimal, probably,
20 and this again is a guesstimation, 5, 10 percent of the
21 time that he would be in that situation.

22 MR. CONROY: And that would be true of Mr.
23 Hilerio and other people that report to you?

24 THE WITNESS: Yes, sir.

1 MR. CONROY: Yesterday, Mr. Hilerio stated
2 that it was difficult to inspect in the subject drill
3 holes. Is that a fair characterization of what he
4 said?

5 THE WITNESS: Yes, sir, I would agree with
6 that.

7 MR. CONROY: And when I asked him, he said
8 that he has not found a way to help himself since the
9 accident. Is that fair? Regarding seeing into the
10 drill holes. He did mention that eddy current has been
11 added.

12 THE WITNESS: Right. Again, we've introduced
13 a little visual to a hole inspection type monitor. But
14 it's strictly a visual aid, to see if he sees any kind
15 of anomaly in the hole. But as far as the FPI, it's
16 just, to look in a hole, it's not a good tool, a hole
17 of that depth.

18 MR. CONROY: I don't recall him mentioning
19 adding a visual aid since the accident.

20 THE WITNESS: Yes, well.

21 MR. CONROY: But would he use that as an
22 inspector, or is that another part of the process?

23 THE WITNESS: It's an aid to him, just as a
24 visual light, if an individual sees something in our

1 process, it allows him to use a visual light and
2 magnifying glass to help him in that. But it does not
3 replace an FPI indication.

4 MR. CONROY: Do you have a system whereby an
5 inspector can make recommendations to you regarding
6 ideas regarding the procedures or techniques of his
7 inspections that would help him, specifically in the
8 context of what we just discussed, seeing into the
9 drilled bolt holes?

10 THE WITNESS: Yes, sir. When you say system,
11 the system is daily interaction with the people. If
12 they have concerns on a specific technique, they can
13 give me that information. I would then turn in an NDT
14 research request if I agree, or he could send it in
15 himself, requesting change to the procedure.

16 We also, as I mentioned earlier, as far as
17 improvement to the area type thing, our CIT process.

18 MR. CONROY: Has Mr. Hilerio or any other
19 person that reports to you made a suggestion regarding
20 seeing into the subject holes?

21 THE WITNESS: Not at the time, no.

22 MR. CONROY: Any time since the accident?

23 THE WITNESS: No, sir, other than discussion
24 after the accident, you know, just interaction

1 discussing the problem in that area.

2 MR. CONROY: Have any of these people that
3 report to you, any of the inspectors, made a suggestion
4 regarding improving their ability to see into the
5 drilled holes?

6 THE WITNESS: No, sir.

7 MR. CONROY: And you just mentioned a couple
8 of acronyms regarding your formal procedures. Do you
9 record suggestions that are made by your inspectors
10 such as improving technique?

11 THE WITNESS: The CIT process writes minutes
12 of their meeting and their recommendations. The other
13 is a more informal type thing. If we turn in a
14 request, that would be a tooling request, there is
15 documentation in that area. But as far as our
16 conversation, it's strictly he and I. He has the
17 ability to write that down through an AVO process if he
18 chooses, though.

19 MR. CONROY: Okay, can you tell me something
20 about the, in other words, it has to be a formal
21 written suggestion before, for want of a better term,
22 gets feedback?

23 THE WITNESS: No. No, sir, not necessarily.

24 MR. CONROY: How do you ensure that there is

1 feedback regarding a suggestion? Follow-up is probably
2 a better word.

3 THE WITNESS: Well, if they give me a
4 suggestion and we will turn it in and request, if it's
5 tooling or whatever, we'll do that.

6 MR. CONROY: Regarding inspection technique.

7 THE WITNESS: Oh, technique. Yes, the
8 procedure is once you turn in the NDI research request,
9 they will respond in a period of time with a change to
10 the document, and it will be placed in the NDI
11 procedures manual.

12 MR. CONROY: Who is they?

13 THE WITNESS: Department 521 NDT. They're
14 performing the development of the technique sheets and
15 control of the technique sheets.

16 MR. CONROY: And does your supervisor also
17 supervise that department?

18 THE WITNESS: No, sir.

19 MR. CONROY: And who are they under?

20 THE WITNESS: He's under the aircraft side of
21 QA. Mr. Raymond Worley's over that department, which
22 encompasses training and the support, NDI support for
23 the aircraft hangar side.

24 MR. CONROY: In the chain of command, where

1 do they meet?

2 THE WITNESS: In his area?

3 MR. CONROY: Yes.

4 THE WITNESS: He answers to an aircraft
5 quality assurance manager, Mr. George Stuckey, who
6 answers to Jim Maucere.

7 MR. CONROY: I see. Thank you..

8 Regarding the FAA, I think you discussed some
9 of this with Mr. Byrne, what, how many visits and/or
10 audits do you get from the FAA in your shop, let's say,
11 in a year?

12 THE WITNESS: I can only speak from my
13 experience. We do have interaction with them. They
14 come into the facility, do general oversight. We've
15 had NASIP type audits in 1994. And then they have
16 follow-up visits.

17 MR. CONROY: Who would be the principal FAA
18 person that you would see on the most regular basis?

19 THE WITNESS: The name slips me, but --

20 MR. CONROY: What would his title be?

21 THE WITNESS: Local regional FAA inspector in
22 the Atlanta region.

23 MR. CONROY: How often do you see him?

24 THE WITNESS: Interactions are from time to

1 time, maybe, it's hard to say. It's not necessarily a
2 scheduled time. But they'll drop by periodically,
3 couple months.

4 MR. CONROY: Every couple of months?

5 THE WITNESS: I don't want to say that as an
6 organized time table. But my most recent experience
7 has been of that.

8 MR. CONROY: Okay. Is there an --

9 THE WITNESS: I'll answer that like Mr.
10 Hilerio did about me. More than I desire.

11 MR. CONROY: Okay. I'm almost through. Is
12 there a system whereby you make suggestions to the FAA
13 person that comes by regarding your problems, your
14 procedures, your techniques?

15 THE WITNESS: No, sir.

16 MR. CONROY: And you, when you talk to them,
17 do you talk about problems at all in your shop?

18 THE WITNESS: Usually when we're focused on
19 issues in my area, those are the type discussions that
20 we have. But as far as, you know, communicating
21 detailed problems, we do, based on the problems that
22 they have observed. And we take corrective action,
23 responsible action immediately.

24 MR. CONROY: Is there a system of feedback

1 from the FAA of anything that they have observed or
2 that you have discussed with them? Do they get back to
3 you?

4 THE WITNESS: Yes, sir, there's follow-up on
5 it.

6 MR. CONROY: Is there a formal method that
7 you've observed?

8 THE WITNESS: They'll usually document what
9 they observe, observations or findings. And I base
10 that on my experience with the NASIP type inspections.
11 And then they follow up to ensure that we've taken
12 corrective action.

13 MR. CONROY: Yes, sir, and the last one of
14 those was in 1994, you say?

15 THE WITNESS: Yes, sir.

16 MR. CONROY: Thank you very much.

17 I believe Mr. Gattolin, Mr. Chairman, has a
18 couple more questions.

19 MR. GATTOLIN: Getting back to the FPI
20 process just for a few moments, how are the parts that
21 come from the cleaning section or division, department,
22 how are they routinely dried, specific to 219 hub and
23 larger parts?

24 THE WITNESS: They're dried with the OEM

1 approved procedure of flash drying.

2 MR. GATTOLIN: Is the drying process really
3 that important for a successful FPI inspection?

4 THE WITNESS: Yes, sir.

5 MR. GATTOLIN: Why is that?

6 THE WITNESS: You could have, if, water can
7 capillate into a flaw just as penetrant can. And if
8 that water is not dried from the part, this could
9 possibly prevent a problem for penetrant entering into
10 a crack or flaw.

11 MR. GATTOLIN: And how do you folks determine
12 that the part is adequately dry before inspection?

13 THE WITNESS: Again, they go by the approved
14 OEM procedure of flash drying, which the cleaning shop
15 has their parameters. And if we observe the part that
16 came to us obviously wet, then we would reject it back
17 to them.

18 MR. GATTOLIN: So your criteria then is if
19 the part appears dry, it is now ready for the rest of
20 the inspection process, or the FPI process, right?

21 THE WITNESS: Yes, sir.

22 MR. GATTOLIN: And one last question here.
23 Since the accident in Pensacola, have you found any
24 other hubs using either eddy current or FPI that have

1 had damage in them?

2 THE WITNESS: I believe there was one that
3 they had found where the indication with the eddy
4 current. And it was sent back to Pratt.

5 MR. GATTOLIN: Do you recall what type of
6 indication it was?

7 THE WITNESS: It was down in a tie bolt hole.

8 MR. GATTOLIN: Was it a surface anomaly? Was
9 it a crack? What were you told?

10 THE WITNESS: They picked up the signal with
11 the eddy current inspection, and it involved
12 engineering and it was sent back to Pratt. I do not
13 recall what was actually found on that.

14 MR. GATTOLIN: Okay, thank you, Mr. Clements.
15 Mr. Chairman, thank you very much. I'm
16 finished.

17 CHAIRMAN GOGLIA: Any other questions from
18 the tech panel?

19 We'll go to the parties. FAA?

20 MR. DONNER: Yes, I do have a few questions,
21 Mr. Chairman.

22 Concerning the vision requirements for your
23 inspectors, sir, how often -- forgive me if you
24 answered this before -- but how often are vision exams

1 required?

2 THE WITNESS: Okay, a period of time not to
3 exceed a two year period.

4 MR. DONNER: Who administers those exams?

5 THE WITNESS: Our first aid department,
6 nurses in our first aid department.

7 MR. DONNER: Do you receive the results of
8 those exams for the people that work for you?

9 THE WITNESS: Yes, sir, we do.

10 MR. DONNER: Do you have an idea roughly how
11 many of them require corrective lenses at this time?

12 THE WITNESS: No, I do not. I know there are
13 occasions where that has happened. I couldn't give you
14 a number, say, two individuals in my particular shop
15 that I can think of.

16 MR. DONNER: How do you assure that your
17 inspectors, those that are required to, are wearing
18 those corrective lenses?

19 THE WITNESS: By observation. Wearing them
20 on a daily basis.

21 MR. DONNER: And one final question. Does
22 the company provide those glasses to the people, or do
23 they provide them themselves?

24 THE WITNESS: They provide them themselves.

1 MR. DONNER: Thank you.

2 Thank you, Mr. Chairman.

3 CHAIRMAN GOGLIA: ALPA?

4 MR. MC CARTHY: No questions, Mr. Chairman.

5 CHAIRMAN GOGLIA: McDonnell Douglas?

6 MR. STEELHAMMER: No questions, Mr. Chairman.

7 CHAIRMAN GOGLIA: Volvo?

8 MR. THOREN: No questions, Mr. Chairman.

9 CHAIRMAN GOGLIA: Pratt?

10 MR. YOUNG: No questions, Mr. Chairman.

11 CHAIRMAN GOGLIA: Delta?

12 MR. VALEIKA: I just want to ask one
13 question. One question for clarification.

14 Do our inspectors need an ARP license before
15 they are accepted into training?

16 THE WITNESS: Yes, they do.

17 MR. VALEIKA: I'm not sure that was clear in
18 some of the questioning before. But they all must be
19 an ARP license?

20 THE WITNESS: They all must have a
21 certificate.

22 CHAIRMAN GOGLIA: Do you have any repairmen?

23 THE WITNESS: No, sir.

24 CHAIRMAN GOGLIA: Okay. Dr. Ellingstad?

1 MR. ELLINGSTAD: Just a couple of questions
2 to clarify my understanding of some of your procedures.

3 First of all, with respect to the use of these tam
4 panels. Those you have indicated are processed on a
5 daily basis. And the purpose of that is to do what, to
6 test inspectors, to calibrate the inspection, to
7 evaluate the process?

8 THE WITNESS: To evaluate the process and to
9 ensure that the process and the individuals performing
10 the process is functioning as it should.

11 MR. ELLINGSTAD: During this daily process,
12 is this examined by an inspector? Is it looked at by
13 more than one inspector?

14 THE WITNESS: It's looked at by the inspector
15 that's responsible for that line that day.

16 MR. ELLINGSTAD: Okay. So that is done once
17 it's not, that reading isn't reviewed by you or someone
18 else?

19 THE WITNESS: No, sir. It's clear. You
20 either pick up the five stars on the case of the ultra
21 high sensitive penetrant or you do not. If you do not,
22 then you correct the problem.

23 MR. ELLINGSTAD: Okay. But the purpose of
24 that is basically to evaluate that overall process as

1 it is put in operation that day?

2 THE WITNESS: That's correct.

3 MR. ELLINGSTAD: Are there any other
4 specimens with known defects processed either for that
5 purpose or for an evaluation of individuals performing
6 the process on a regular basis?

7 THE WITNESS: There is today. Now, I say
8 regular basis, it's an unprescribed intervals. We,
9 either myself or Mr. McMillan will introduce an LCF
10 block type situation on the line, have them process
11 that and look at that with them.

12 Again, we're looking into trying to acquire
13 parts and have cracks introduced to them to where we
14 could just put the parts on the line and monitor it in
15 a less obvious manner.

16 MR. ELLINGSTAD: Is the intent of doing that
17 to occasionally introduce a sample to evaluate the
18 inspectors themselves?

19 THE WITNESS: The process and the inspectors.

20 MR. ELLINGSTAD: Okay. How often would you
21 like to see that kind of a thing done to give you a
22 better tool for evaluating your people?

23 THE WITNESS: I would think we would need to
24 do it probably, or my desire would be, at least on a

1 quarterly type basis.

2 MR. ELLINGSTAD: For each inspector?

3 THE WITNESS: It would be desired, yes.

4 MR. ELLINGSTAD: And would that play some
5 role in certification or --

6 THE WITNESS: Continued satisfactory
7 performance. They are tested with pieces of parts. In
8 other words, we have sections of parts, whether it be a
9 rotating part or whatever, that we have them go through
10 on their practical and process those parts with known
11 defects.

12 MR. ELLINGSTAD: Is it important to use a
13 variety of different test samples for this kind of a
14 purpose, say, at least between a very large part like a
15 hub, and a smaller part or is a crack and crack and it
16 doesn't matter?

17 THE WITNESS: Well, a crack is, you know, a
18 crack is a crack. But if we had a part, say a rotating
19 part with a crack introduced into it, and run that down
20 the line, it would give you a level of competence of
21 his performance.

22 MR. ELLINGSTAD: A related sort of a thing,
23 again for my clarification, you talked some about
24 technique sheets. How are they developed?

1 THE WITNESS: Technique sheets, FPI, there's
2 never been that much in the industry directed in the
3 form of a technique sheet. You have a general
4 practice. The sheets we've developed since the
5 incident, its primary function is to give the person on
6 the line pointers.

7 Of course, they treat all areas equally on a
8 part. Look at the whole part to find indications. But
9 it gives them somewhat a systematic approach, if you
10 will, in looking at the particular part, with special
11 notes noting, ensure that you index the part, say if
12 you start at a particular hole, so that you ensure that
13 you get around.

14 And these are practices that were in place by
15 our inspectors before. But it puts it out there where
16 there's no question, I guess. So it's an aid in that
17 fashion. But technique sheets also are important on a
18 mag particle inspection.

19 MR. ELLINGSTAD: Do they have an official
20 status, are they an approved document?

21 THE WITNESS: Introduction to them, we now
22 are in the process of coding them, giving them a
23 numbering system. And a control system that's spelled
24 out in our TOPS manual under the quality assurance NDT

1 research request section of the manual.

2 MR. ELLINGSTAD: So these are reviewed and
3 approved?

4 THE WITNESS: Yes, sir.

5 MR. ELLINGSTAD: How often are they issued or
6 reissued or revised?

7 THE WITNESS: Well, since we started the
8 introduction, this has been over the past six months,
9 seven months, I'm not sure now, we have, I've turned in
10 some requests recently to revise it, with the reasons
11 why, typos, that kind of thing, at this point is what
12 we've observed.

13 It's been fairly infrequent up to this point,
14 but as we introduce more into the system, I'm sure
15 there will be more involvement in that area of
16 revision.

17 MR. ELLINGSTAD: Okay, and are they
18 uncarpeted into your training materials?

19 THE WITNESS: Yes, they're now being brought
20 into the training, informing the personnel. Right now,
21 they're primarily in my department, is where the
22 initial focus is. As time goes on, I hope to have them
23 introduced in all different areas.

24 MR. ELLINGSTAD: Thank you.

1 CHAIRMAN GOGLIA: Mr. Haueter?

2 MR. HAUETER: Thank you.

3 Just a couple of questions. Would you
4 describe the inspection booth tent? That's one thing
5 that hasn't happened so far. What's the size of this
6 facility?

7 THE WITNESS: I would say the approximate
8 width of the inspection area, it has a carousel type
9 roller table in the booth. The inspector actual
10 standing area or sitting area may be three foot deep by
11 five, six foot in length. The inspection table from
12 one end to the other is approximately six feet, five,
13 six feet each way.

14 MR. HAUETER: Who is the manufacturer of
15 this?

16 THE WITNESS: This was an in-house type
17 thing. It was well before my time. It's been there
18 quite a while, and it appears that it's an in-house
19 type built in.

20 MR. HAUETER: On the processing of the dwell
21 time in the soaking, will that get water out? Will the
22 penetrant remove water from a crack?

23 THE WITNESS: No. Very limited in that area,
24 if any. No.

1 MR. HAUETER: You mentioned that you felt 99
2 percent accuracy of detecting a crack, about .15?

3 THE WITNESS: Not 99. Say 90 percent, at
4 150, that's an industry accepted.

5 MR. HAUETER: How tight of a crack is that,
6 in terms of --

7 THE WITNESS: Well, assuming it is tight,
8 because that's what we primarily look for, a tight,
9 tight crack, I don't have a dimension of width, or
10 that, but the length's the only thing we have to go on.

11 MR. HAUETER: There'd be no opening to it,
12 the crack wouldn't be open, you're saying, just a
13 hairline type?

14 THE WITNESS: It would be hairline type
15 thing. It would obviously have to be open to the
16 surface for penetrant to capillate into it. But it
17 would be a real fine, faint, and it may not be able to
18 be detected. You're looking for something that's
19 possibly not detected with the visual light and
20 magnifying glass.

21 MR. HAUETER: You mentioned the FAA
22 occasionally dropped by and would take a look at the
23 process. Does the Pratt Whitney rep ever look at your
24 process?

1 THE WITNESS: Yes, sir. They were in, I'm
2 not sure, probably 1995, somewhere in there, 1994.

3 MR. HAUETER: Did they make comments on the
4 process?

5 THE WITNESS: Yes, sir, my recollection, most
6 of them were things in the area of cost, how to improve
7 your cost structure, those types of information.

8 MR. HAUETER: What about inspection
9 techniques? Did they make any --

10 THE WITNESS: I do not recall in that area.
11 They may have. I just don't recall.

12 MR. HAUETER: What about the chemical
13 suppliers like Turco? Do they come by?

14 THE WITNESS: Turco involvement is primarily
15 with taking the sampling, the brightness sampling and
16 then of course the interaction with them. I contact
17 them from time to time with questions that I,
18 information I received, things of that type. Just
19 general information.

20 MR. HAUETER: Do they ever comment on
21 inspection technique or ways to --

22 THE WITNESS: No, sir.

23 MR. HAUETER: And then finally, when you get
24 a hub back and you're ready to examine it, how many

1 reflective surfaces do you see? Is it one or two
2 little areas you have to inspect?

3 THE WITNESS: No, sir, it's the Fl hub. We
4 look at all the, obviously the bore areas, the blade
5 root areas, the main mass of it, the IDs. You look in
6 the area of the holes on both sides, as far as you can
7 see.

8 MR. HAUETER: But how many areas would be,
9 say, suspicious that might have a little extra?

10 THE WITNESS: They, it's hard to say. It
11 just depends on what he sees at that time. It could
12 vary. It could be an issue of some threading in the
13 blade root area that would give him some concern. And
14 if it was significant, he would send the part back
15 based on that.

16 MR. HAUETER: Okay. Thank you.

17 CHAIRMAN GOGLIA: Lee, I have one question
18 for you.

19 THE WITNESS: Yes, sir.

20 CHAIRMAN GOGLIA: You mentioned your
21 technique sheets. Is that an attempt to standardize
22 the inspection process between inspectors?

23 THE WITNESS: Yes, sir.

24 CHAIRMAN GOGLIA: But you do allow them some

1 flexibility in the accomplishment of their tasks?

2 THE WITNESS: Yes, sir.

3 CHAIRMAN GOGLIA: And that's drawn up by, you
4 mentioned the department number?

5 THE WITNESS: Yes, 521. I've been involved
6 in initiating this process as being a level three. But
7 they're going to be the responsible department
8 overseeing the documents. And I as a level three
9 interact with them, and we work together towards this
10 development.

11 CHAIRMAN GOGLIA: Now, as those are
12 developed, do you reach out to the manufacturer for
13 guidance?

14 THE WITNESS: Yes. We use manufacturer
15 sources, whether it be the manuals, that type thing.
16 Not necessarily communication. There has been some
17 communication with regards to questionable things, such
18 as bushings, this type thing, removal.

19 CHAIRMAN GOGLIA: Okay. That's all my
20 questions.

21 Any additional questions from the tech panel
22 or from the parties?

23 (No response.)

24 CHAIRMAN GOGLIA: Seeing none, you are

1 released. Thank you very much for your patience with
2 us. I know you sat through all day yesterday waiting
3 to be called.

4 THE WITNESS: Thank you, Mr. Chairman.

5 (Witness excused.)

6 CHAIRMAN GOGLIA: What we will do is we will
7 take a break until 20 after 10:00 at this point. And
8 we will resume with Mr. Maucere.

9 (Whereupon, a brief recess was taken.)

10 CHAIRMAN GOGLIA: Okay, we will go back on
11 the record. And the witness will be Mr. Maucere.

12 (Witness testimony continues on the next
13 page.)

14

15

16 JAMES MAUCERE, DIRECTOR OF COMPLIANCE

17 AND QUALITY ASSURANCE,

18 DELTA AIR LINES, INC., ATLANTA, GEORGIA

19 Whereupon,

20 JAMES MAUCERE

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

24 MR. HAUETER: Sir, would you provide your

1 full name and place of employment for the record?

2 THE WITNESS: My name is James Maucere, and I
3 work with Delta Air Lines in Atlanta, Georgia.

4 MR. HAUETER: And what's your position with
5 Delta?

6 THE WITNESS: My position at Delta is
7 Director of Compliance and Quality Assurance.

8 MR. HAUETER: And what's your aviation
9 background?

10 THE WITNESS: Aviation background started as
11 an avionics technician in the United States Navy. I
12 was employed by Delta Air Lines in 1968, and TransWorld
13 Airlines in 1968, I started out as an avionics
14 technician, lead mechanic, lead system technician. I
15 worked as a supervisor of aircraft maintenance, both
16 hangar and line, and coordination and engineering.

17 MR. HAUETER: And what FAA certificates do
18 you hold?

19 THE WITNESS: I'm an A and P licensed
20 mechanic.

21 MR. HAUETER: Thank you.

22 MR. GATTOLIN: Good morning, Mr. Maucere.

23 THE WITNESS: Good morning.

24 MR. GATTOLIN: Would you give us a pretty

1 good sketch of your NDT training and your FPI cleaning
2 background?

3 THE WITNESS: I have no formal training in
4 NDT. I am familiar with the procedures. Also with the
5 cleaning procedures as they apply to FPI.

6 MR. GATTOLIN: Okay, thank you. Getting into
7 the operations in your division, how often do you have
8 department meetings with the cleaning and the FPI
9 departments and the supervisors?

10 THE WITNESS: As far as NDT, probably weekly
11 meetings with my staff. We also have, I try to visit
12 all of my areas that perform functions for me about two
13 or three times a week, and on the floor, I'll talk to
14 the personnel, and that would include walking through
15 the cleaning area and NDT.

16 Within Delta, which I didn't explain, I have
17 quarterly requirements as part of my responsibilities
18 for technical operations, FAA, EPA and as a result of
19 that, I do interacting with all department in technical
20 operations.

21 MR. GATTOLIN: When you have meetings with
22 the department heads from FPI and cleaning, kind of
23 focus on that, you say you have this once a week formal
24 type of meeting with them?

1 THE WITNESS: I do not meet formally with
2 cleaning once a week. I do interact with them through
3 the order process, if there are problems. But I do
4 frequent the area, because it is part of the process of
5 NDT. With the FPI people and their organizational
6 structure, I meet with them formally once a week and
7 then again as I transit the area.

8 MR. GATTOLIN: What's the nature of the
9 meetings when you meet with the FPI people and when you
10 go into the cleaning area, and what do you talk about?
11 What goes on in those meetings?

12 THE WITNESS: We'll talk about operational
13 problems, administrative problems, problems associated
14 with doing inspections, tooling requirements, tooling
15 needs. General information.

16 MR. GATTOLIN: Okay, that's with the cleaning
17 people?

18 THE WITNESS: Cleaning people, again as I
19 interact with them, yes.

20 MR. GATTOLIN: Okay. Both of those.

21 Do you, have you encouraged, since you've
22 been -- how long have you been in the position again?

23 THE WITNESS: I've been in the position since
24 October of 1995.

1 MR. GATTOLIN: Since 1995, October 1995.
2 Okay. Do you encourage your department managers, those
3 individuals that report to you, to have a beneficial
4 suggestion program or to really make the CIT, I believe
5 it's called, work, and what methodology do you do to
6 ensure that this is going on?

7 THE WITNESS: Absolutely. We encourage it at
8 all levels at Delta. People generally have the answers
9 to the problems. We encourage that. The CIT is one
10 forum to do that. I may note that in the cleaning
11 shop, the CIT group in the cleaning shop is one of the
12 more proactive at Delta.

13 The young fellows that come in, a lot of them
14 are college educated. So they are in a position to
15 Delta, and they are very aggressive in looking at new
16 ways to perform tasks and improve.

17 THE WITNESS: In the NDT area, also qualified
18 people. We encourage that. That is both formal and
19 informal. And whether it's a written request or a
20 verbal, for the most part everyone is acting on a
21 review to see how we can improve the operation.

22 MR. GATTOLIN: Could you give me an example
23 in the cleaning area of something you recall, CIT that
24 actually solved a problem? Do you have anything that

1 comes to mind?

2 THE WITNESS: In processing parts, there
3 comes to mind some of the ways we process parts, we
4 flow parts through the area for congestion reasons to
5 make a job, again, to improve process flow.

6 MR. GATTOLIN: Can you be a little more
7 specific?

8 THE WITNESS: I think the way the parts are
9 received, how the parts are staged within the area, how
10 they're positioned so they can run the cleaning line.

11 MR. GATTOLIN: Okay. Do you have, as the
12 QAD, do you have an open door policy for your managers
13 to come to you if you're absent from the floor for any
14 period of time?

15 THE WITNESS: My door is open to all
16 employees. I have people visit me from all lines and
17 departments at Delta Air Lines. It's encouraged by
18 senior management, it's encouraged by me. And it's
19 taken advantage of quite often.

20 MR. GATTOLIN: Okay. How do you and those
21 that, I believe you report to Mr. Valeika, correct?

22 THE WITNESS: Yes, sir.

23 MR. GATTOLIN: And of course, who would he
24 report to?

1 THE WITNESS: He reports to the executive
2 vice president, Mr. Harry Howell.

3 MR. GATTOLIN: Okay. How do the three of you
4 gauge your personnel needs in the FPI and cleaning
5 areas, the needs and the levels of need? What's your
6 process?

7 THE WITNESS: I think we look at, from my
8 perspective we look at the flow rate, what we're trying
9 to achieve, with the number of engines. We have a
10 planning position or a planning meeting quite
11 frequently. And we assess those needs and ensure we're
12 adequately staffed to perform those functions.

13 MR. GATTOLIN: Have you ever -- well, how
14 long have you been with Delta, once again?

15 THE WITNESS: I've been with Delta since
16 1986.

17 MR. GATTOLIN: Since 1986. And you've been
18 in this area. At any time since your employment with
19 Delta, has there been a change in the inspection
20 department where there was a reduction in personnel?
21 Or has the department always been building up?

22 THE WITNESS: In the FPI area, actually,
23 there's been an increase in personnel. We restructured
24 in 1994 to have some focused areas of FPI. As a

1 result, we increased staffing I think from 11 to I
2 think 16 positions in total. There was an increase in
3 staffing for that reason.

4 MR. GATTOLIN: Okay. Now, how do you feel
5 about inspectors doing inspection of the part also
6 cleaning it, not only cleaning it but doing the
7 processing for that part?

8 THE WITNESS: Actually, when you look at the
9 spec, that is part of the process. The inspector does
10 that part of the process. We have processors there
11 that perform their function. But an inspector is fully
12 trained, fully capable to perform that function.

13 MR. GATTOLIN: Okay. I was a little
14 concerned about Mr. Hilerio's comment during the
15 interview back in July that he still feels that the
16 bolt hole inspections are just about as difficult now
17 as it was back then and before. And if my recall is
18 correct you purchased hand-held, I guess for lack of a
19 better term, bore scopes to look into the bolt holes.
20 Are these being used or mandated to be used? If
21 they're not, why not?

22 THE WITNESS: They are being used by the
23 inspectors. They are available in the tent. And they
24 were purchased, we came across that as a result of

1 Pratt & Whitney being here and looking at the hub, and
2 showed the tool they were using. And at that time, we
3 went out and purchased them, we purchased two, and
4 they've been positioned in the tent as an aid to
5 inspection.

6 MR. GATTOLIN: It sounds as though they're
7 not being used in a consistent fashion. Is it that the
8 inspector has the option, or a problem with using that
9 tool?

10 THE WITNESS: Not that I'm aware of.

11 MR. GATTOLIN: Is it as an option to the
12 inspector, or is it something he must do?

13 THE WITNESS: I believe it's an option to the
14 inspector.

15 MR. GATTOLIN: It is. Okay. Do you yourself
16 encourage, and maybe you've answered this already, but
17 do you yourself encourage suggestions to improve
18 technique and procedures in those people that report to
19 you?

20 THE WITNESS: Absolutely.

21 MR. GATTOLIN: That's again the CIT program?

22 THE WITNESS: It couple be CIT, it could be
23 verbal as I'm walking through the shop.

24 MR. GATTOLIN: When you receive these

1 suggestions how do you record them, what action do you
2 take upon them?

3 THE WITNESS: I would say that where we have
4 CIT or forma. suggestion programs which they can come
5 in as an AVO, which is a written recommendation, there
6 is a formal process. But again, we encourage that if
7 myself or anyone that is walking through the shop, as
8 they have ideas bring those ideas forth and we'll try
9 to look at all of them. We have made some decisions on
10 the spot for improvements, if we thought it necessary
11 to aid or improve the process.

12 MR. GATTOLIN: Okay. Regarding the FAA, how
13 often have you had communications with a PPM or partial
14 program manager or the PMI for Delta since you've been
15 in your position as the QA?

16 THE WITNESS: You're talking strictly in the
17 FPI area?

18 MR. GATTOLIN: In the FPI area, yes.

19 THE WITNESS: I basically have daily
20 interaction with the FAA for all areas of compliance
21 and QA. The FAA has an inspector basically assigned to
22 that area and frequents that area quite often. Works
23 with the individuals, does reviews if there is some
24 formal items that he wishes to have corrected, and

1 write a letter of inquiry for us to answer formally in
2 writing.

3 In many cases, he may see or observe things,
4 items, while he's there, bring it to the attention of
5 supervision, leave all the inspectors and collect those
6 items on the spot.

7 MR. GATTOLIN: How often does this FAA type
8 come in, let's say, during a, oh, it's asking you to go
9 back two years, but 1995, pre-hub, up through the end
10 of 1995? How often do you recall being an inspector
11 being there?

12 THE WITNESS: I can't answer pre-1995. I
13 don't know. I have been involved with the FAA since
14 being at Delta and the standard group and the FAA
15 liaison group and the FPI liaison group. So I have a
16 general knowledge of the FAA. The FAA interaction with
17 us is on a daily basis.

18 MR. GATTOLIN: They do have someone directly
19 assigned to the FPI shop?

20 THE WITNESS: I believe now that there is an
21 individual assigned to that area, specifically.

22 MR. GATTOLIN: Okay. Before, say, the
23 accident?

24 THE WITNESS: I'm not aware of someone being

1 specifically assigned.

2 MR. GATTOLIN: Okay. And so the process, if
3 they find a problem in the past, and of course the
4 present, they will formally notify you that you have to
5 let them know what your action will be, is that what
6 you're saying?

7 THE WITNESS: They may inform supervision,
8 supervision may take action. If there is a letter
9 written, then I do become involved in that action.

10 MR. GATTOLIN: All right. Let's go into the
11 cleaning process. Before we hit that, do you have a
12 self-auditing system at Delta, do you not?

13 THE WITNESS: Yes, sir.

14 MR. GATTOLIN: It's called a continuous
15 analysis surveillance system, CASS?

16 THE WITNESS: Yes.

17 MR. GATTOLIN: Would you explain what this
18 means, and how it works?

19 THE WITNESS: Yes, sir. The quality auditing
20 system at Delta is a two tier system. Under the CASS
21 program, it's all under the CASS program by regulation,
22 like you said, a two tier system. The first part of it
23 is that we have individuals who are trained as
24 auditors, go through an audit training program, that

1 work in the individual departments to perform audits.

2 So it's a peer evaluation. They look at
3 their own processes and procedures, look at different
4 things and how we function to our total operations
5 policy and procedure.

6 The second tier of that is a group called
7 technical standards. The technical standards group is
8 an independent group that has no production or
9 productivity responsibility requests directly to me,
10 that will go in and do oversight audits of the
11 different areas within technical operations. And they
12 also cover vendor supplies, they cover a wide spectrum
13 of responsibility.

14 MR. GATTOLIN: And how often does this, let's
15 speak specifically to the cleaning of the FPI shops.
16 How often does this take place?

17 THE WITNESS: Most shops are on a two year
18 cycle. And that depends again on findings,
19 recommendations and things that we see. If we find
20 systemic type problems in a particular area, then
21 audits will be more frequent.

22 MR. GATTOLIN: And do you have a formal
23 report that is completed at the conclusion of their
24 review?

1 THE WITNESS: Yes, sir, we do. We have a
2 closed loop system, we have an out-brief, an in-brief
3 prior to the audit on the oversight group, technical
4 standards. They perform the audit, they have an out-
5 brief, a verbal out-brief. They write a written
6 report, and all items must be responded to within 30
7 days.

8 And that goes into a common data base with
9 not only the technical standards type audits, but the
10 peer audits that are done in the CASS program on the
11 floor, the residual common type data base. And that
12 sets, it reviews trends, individual type problems plus
13 trends and systemic type programs.

14 MR. GATTOLIN: Who in the cleaning shop is
15 responsible for ensuring that the cleaning solutions
16 and the rinse waters meet the quality standards set by
17 the manufacturer?

18 THE WITNESS: It would be the supervisor and
19 the lead in the shop.

20 MR. GATTOLIN: And how do they go about
21 checking it?

22 THE WITNESS: The solutions are checked, two
23 samples are checked, taken once per week. And the
24 samples, one goes to our maintenance lab, and one is

1 held for the manufacturer, I believe it's Turco, most
2 of the solutions.

3 That is performed, that analysis is
4 preformed, comes back to the supervisor or lead, and
5 adjustments are made accordingly.

6 MR. GATTOLIN: These procedures you just
7 described were in place before the accident?

8 THE WITNESS: Yes, sir.

9 MR. GATTOLIN: It's been going on as long as
10 you've been involved with the operation?

11 THE WITNESS: To my knowledge.

12 MR. GATTOLIN: Okay. I want you, if you
13 would, if you could in detail, describe the aqueous
14 cleaning process, from the moment the part is removed.

15 Let's talk about the hub. Let's say when the hub is
16 removed from the engine and it is brought onto the
17 cleaning table, what happens?

18 First of all, what is it placed onto, and why
19 is it placed onto this unit that's on the floor? And
20 take it from there as to where the things are in the
21 cleaning shop.

22 THE WITNESS: The parts come in, and
23 depending on the size of the parts, placed in the
24 basket. And the basket will be dipped in a degreaser,

1 which is a light duty cleaner. The part will then come
2 out of the cleaner, be rinsed, depending on whether it
3 goes for additional degreasing.

4 In the particular case of a 219 hub, it would
5 go to a second solution that's called 41A1 to be
6 dipped, and would be brought and rinsed. It would go
7 into a third solution at that time in which was used
8 for anti-gallant and dried for removal. It would be
9 cold water rinsed.

10 At the end of the rinse, it would have a hot
11 flash drying. It would be checked to ensure it was
12 dry, visually checked to ensure it was dry.

13 At that point, the part would be processed to
14 the plastic media area where the plastic media would be
15 focused on the fir tree areas for removal of the
16 softener, drying and anti-gallant.

17 It would be removed from the plastic media
18 booth, it would be blown off with air. And at that
19 point, it would be delivered to the FPI line.

20 MR. GATTOLIN: Okay. During the cleaning
21 process, you said it is dipped into the 5940, I think
22 it is?

23 THE WITNESS: 5948.

24 MR. GATTOLIN: All right. What are the

1 various temperatures that this hub is going to
2 experience in the solutions? Are there specific
3 temperatures that are called out for?

4 THE WITNESS: There are specific
5 temperatures. And I think the 5948 is between 145 and
6 155 degrees temperature. The second solution, 4181, I
7 believe, is in the same range. When it comes out and
8 goes to flash dry, the temperature of the hot rinse
9 tank I believe is 160 degrees. And those are the
10 different temperature ranges.

11 MR. GATTOLIN: And after it's removed from
12 the first degreasing tank, the 5948 I believe it is,
13 that's the product number, it is rinsed over, how is it
14 rinsed? What do you do with it? How do they rinse
15 this off?

16 THE WITNESS: It's rinsed off with a,
17 originally I believe with a hose.

18 MR. GATTOLIN: Okay.

19 THE WITNESS: Then it's dipped in a cold
20 rinse tank.

21 MR. GATTOLIN: Then it's dipped into a cold
22 rinse tank.

23 THE WITNESS: Cold rinse tank, which is
24 ambient water, ambient temperature, city water. From

1 there it is lifted out and taken to the next process.

2 MR. GATTOLIN: And the next process is that
3 4181?

4 THE WITNESS: 4181, which is a more
5 aggressive alkaline cleaner. It will be again dipped
6 in that, and I can't quote the prescribed time at this
7 moment. It again would be cold water rinsed in ambient
8 temperature water and processed through the next step.

9 MR. GATTOLIN: How long does it sit in the
10 rinse water after each process, do you know?

11 THE WITNESS: I can't quote off-hand.

12 MR. GATTOLIN: When it sits in the rinse
13 water, does it just sit there like a frog on a log?

14 THE WITNESS: The cold rinse tanks are
15 agitated. It has air agitation for proper rinsing.

16 MR. GATTOLIN: So they are air agitated?

17 THE WITNESS: Yes, sir.

18 MR. GATTOLIN: All right. Now, what type of
19 quality product errors can compromise cleaning?

20 THE WITNESS: Improper mixture of the tank.
21 But again, the process is redundant, because it goes
22 into several different cleaning solutions. So there is
23 redundancy built into the cleaning process. I would
24 say that the most prevalent would be improper mixture.

1 MR. GATTOLIN: Improper mixture?

2 THE WITNESS: Of the solution. But it's
3 checked to preclude that.

4 MR. GATTOLIN: How often are these tanks
5 emptied, cleaned, and then refilled with new solutions,
6 water and solutions?

7 THE WITNESS: There's no specification.
8 There's no criteria written. It basically says that
9 for the solution, that the solution is adequate to
10 clean the part, it is okay. And we find that with the
11 periodic checks, the weekly checks, that we're able to
12 maintain a proper mixture in the tanks.

13 MR. GATTOLIN: How do you keep all the, say
14 on the 5948 tank, how do you keep all the material that
15 is removed from the hubs and other parts from becoming
16 part of the solution and perhaps even getting into
17 areas that it shouldn't be getting into? What kind of
18 system is there?

19 THE WITNESS: The system itself is
20 periodically the tanks are drained, and say, desludged,
21 on a periodic basis. I don't know what that, I
22 couldn't quote what that actual frequency is. But
23 again, it depends on the mixture and concentration or
24 the effectiveness of the solution, is what the manual

1 states.

2 MR. GATTOLIN: And so an individual basically
3 in your department, in the cleaning department, makes
4 the decision as to when to do the cleaning of the
5 tanks?

6 THE WITNESS: Yes, sir.

7 MR. GATTOLIN: Okay, very good. All right,
8 the cleaning of these various parts, would it be to the
9 advantage of the cleaning person to have the steps for
10 a particular part, the steps that it must go through to
11 be cleaned? Would it be to an individual's advantage,
12 and if so, why, if not, why?

13 THE WITNESS: He has them today. At the end
14 of each product line, there is the process standard
15 which we use to process parts. It is available to him
16 and the primary manual is available in the shop. But
17 at each end of each product line or each tank, for that
18 strip, it gives the requirements for that alkaline
19 solution or solution and how it is to be used. It is
20 available to the cleaner at each position.

21 MR. GATTOLIN: You say now it is?

22 THE WITNESS: Now it is.

23 MR. GATTOLIN: Prior to the Pensacola event,
24 was this available also?

1 THE WITNESS: The manual is available in the
2 shop. Was it broken out on each individual line, no.

3 MR. GATTOLIN: Okay. What type of training
4 does a parts cleaner have, and how do these parts
5 cleaners receive any changes in procedures?

6 THE WITNESS: The, up to 1995, and recently,
7 our only means of training a cleaner was through on the
8 job training. And what would happen is the supervisor
9 or the lead would on a new employee, someone entering
10 into the area, would receive specific training on the
11 process standard, how it was to be applied. That would
12 be reviewed with the individual. He would work with
13 another cleaner in the shop.

14 When the lead and supervisor felt that he was
15 competent to perform that task, that task would be
16 entered on his qualification sheet, the shop sheet,
17 which said he was now qualified to do that. If the
18 individual were to move from line to line or a
19 different process, that system would start over.

20 Again, he'd review the process standard, he would
21 work with a cleaner familiar with that line until they
22 felt he was competent to perform that task. He would
23 work with an individual, but he would be assessed by
24 the lead.

1 Changes that came down to the shop will come
2 down basically in one primary form or two forms. One
3 may be by a bulletin, a maintenance bulletin that says,
4 we're going to change cleaners or change a product, or
5 by an engineering evaluation, repair authorization.

6 That information would go in the front of the
7 manual to be reviewed with everybody verbally. It
8 would be discussed. It would be changed, it would be
9 put in the front of the manual as a supplemental data
10 until the book was revised outright. The temporary
11 revision would come out and the primary revision would
12 go in the book.

13 MR. GATTOIN: What has changed, since, let's
14 say August of 1996, to improve the training and to get
15 this information out to these people, besides having it
16 in the manual?

17 THE WITNESS: Today we have a formal training
18 class that is reviewed with every individual. We have
19 read and sign, and had read and sign back then for
20 changes. Because a formal training class, it is
21 documented, it is put into our automated data base.

22 Each change that does come down is extracted, is
23 put in the individual line books so it is readily
24 accessible. And the rest of the process would be the

1 same.

2 MR. GATTOLIN: This is basically in reaction
3 to the accident and what the FAA found during its
4 investigation?

5 THE WITNESS: Yes, sir.

6 MR. GATTOLIN: Okay. After the 219 hub is
7 pulled out of the hot water rinse, let me rephrase it.

8 When does the operator know when to pull the hub out
9 of the rinse water, that hot water rinse?

10 THE WITNESS: The flash dry technique, which
11 we're referring to, the standards say, based on the OEM
12 recommendations, is to leave the part, any part, in the
13 solution, the hot rinse tank, until the temperature
14 reaches, the temperature of the part reaches the
15 temperature of the water and then taken out.

16 In the recommendations by Pratt & Whitney, it
17 says to ensure flash dry, maintain the part in the
18 solution for approximately one minute, or the hot rinse
19 tank, at 160 degrees for approximately one minute. It
20 also states that depending on geometry you may have to
21 leave the part in there longer.

22 A 219 hub to my collection is left in about
23 four to five minutes. It is taken out. The cleaner
24 reviews that, looks at the part, if he has evaporation,

1 evaporation of the part, appears to be dry, he will
2 inspect the part further for being properly dry and
3 possibly use shop air to accelerate that process. If
4 you wind up with water and some trapped areas, which is
5 totally possible with certain geometry.

6 MR. GATTOLIN: On the 219 hub, where would
7 you find trapped water?

8 THE WITNESS: In the recess, in the bottom
9 sometimes you take it out, possibly in the fir tree
10 area. It's possible.

11 MR. GATTOLIN: So that's where he would be
12 blowing the air, basically?

13 THE WITNESS: That's correct.

14 MR. GATTOLIN: Okay. How important is it to
15 have that water at a temperature that you specified,
16 and why is it important?

17 THE WITNESS: In order to have the flash dry,
18 it's very important to have that immediate evaporation
19 once you take it out. And again, the recommended
20 temperature I believe is 160 degrees, and that's what
21 the tank is set at.

22 MR. GATTOLIN: Okay. What can flash drying,
23 in fact, why don't you define for all of us, you and I
24 both know what it is, but why don't you, if you would,

1 please, define what flash drying is, flash drying after
2 it's removed.

3 THE WITNESS: Hopefully I'll get this right.

4 MR. GATTOLIN: Well, I'll score you.

5 (Laughter.)

6 THE WITNESS: Flash drying is, again you put
7 the part into a hot solution, and as you take it out,
8 the part is, the temperature is a high temperature. As
9 it is removed from the water, you have immediate
10 evaporation. And the surface becomes completely dry to
11 the touch.

12 MR. GATTOLIN: So it's a surface drying
13 process?

14 THE WITNESS: Yes, sir.

15 MR. GATTOLIN: And what happens, when we were
16 down there in July, that shop felt like it was about
17 110 degrees with about 200 percent humidity. It takes
18 a while for that surface to dry like that?

19 THE WITNESS: No, sir. If you bring it out,
20 again depending on the part and the temperature of the
21 part, it should be immediate.

22 MR. GATTOLIN: So the atmospheric humidity
23 really doesn't have a bearing on it then?

24 THE WITNESS: No, sir, not that I'm aware of.

1 MR. GATTOLIN: What are the limitations of
2 flash drying? What kind of limitations do we have on
3 that?

4 THE WITNESS: The limitations of flash dry
5 would be the entrapment of water into areas that you
6 can't readily see or flaws or in some cases, it could
7 be a manufacturing defect.

8 MR. GATTOLIN: What's the, maybe you've been
9 told this, maybe you haven't, maybe you know it from
10 experience, what's the percent probability of getting
11 rid of water in a crack, let's say, such as a crack in
12 this hub?

13 THE WITNESS: I don't know. I don't know the
14 statistics on that.

15 MR. GATTOLIN: Okay. Now, if we had a colder
16 than specified rinse water, how would that affect the
17 flash drying again? If the rinse, the final rinse, was
18 not at the 160 I believe you said?

19 THE WITNESS: The final rinse, again you
20 could also have air, you can do flash dry, or if the
21 part sits out in air, it will also dry. So again,
22 depending on the water temperature, if you didn't have
23 it, if it wasn't dry, let me back up, if the part
24 wasn't dry, it would be reprocessed. If when the

1 cleaner took it out of the tank, it was not dry, it
2 would be reprocessed.

3 MR. GATTOLIN: Okay. So they would
4 reprocess. How do they measure the temperature of the
5 water, pre-accident? Let's talk about pre-accident
6 now.

7 THE WITNESS: It was a manual thermometer.

8 MR. GATTOLIN: How often would they dip it
9 in?

10 THE WITNESS: There was a check at that time
11 once a week.

12 MR. GATTOLIN: Once a week they'd check the
13 water temperature?

14 THE WITNESS: Yes, sir.

15 MR. GATTOLIN: And how is the water heated,
16 if I may ask?

17 THE WITNESS: Through steam valves, through
18 steam valves to the tank itself.

19 MR. GATTOLIN: Okay. All right, you have
20 another process that this part goes through when it is
21 removed from the cleaning and is allowed to flash dry
22 or get the water off the surface, as you say. It's
23 called plastic medium blasting.

24 THE WITNESS: Yes, sir.

1 MR. GATTOLIN: Would you explain what that is
2 and how it's done in fair detail, please?

3 THE WITNESS: Yes, sir. The part is moved to
4 a tank or to an enclosure cabinet, if you will. At
5 that point, the part must be dry or it's not processed.

6 We use, we have two different types of grit, 1620 and
7 3040, and depending on the part depends on the grit you
8 would use. It is applied with a spray applicator.

9 The focus would be the areas of dry film or
10 anti-gallant lubricant for the operator. He would
11 focus that stream in a sweeping motion at
12 approximately, I think no greater than 40 psi to remove
13 that lubricant. And at that point, the part would be
14 extracted from the cabinet. It would be cleaned off
15 with shop air and then further process.

16 MR. GATTOLIN: Then it goes from the plastic
17 medium blasting to the dye dip, if you will?

18 THE WITNESS: Yes, sir.

19 MR. GATTOLIN: Okay. And you've had, how
20 much training have you had in this area? Have you had
21 much training in this area?

22 THE WITNESS: No, sir. I'm familiar with the
23 process, but not formally trained.

24 MR. GATTOLIN: Okay, very good.

1 And that is part of the cleaning shop or the
2 FPI shop?

3 THE WITNESS: That is part of the cleaning
4 shop.

5 MR. GATTOLIN: All right. What kinds of
6 anomalies can take place with the plastic bead or
7 plastic medium blasting?

8 THE WITNESS: Based on the OEM
9 recommendations, you would look for not, there's a wide
10 range of spectrum. The OEM manuals give you anywhere
11 from 30 to 80 degrees angle at which you're supposed to
12 apply the plastic media, give you different grit sizes
13 for different operations. And I guess you look for,
14 you want to prevent entrapment of media into different
15 areas, common areas.

16 MR. GATTOLIN: Common areas would be what?

17 THE WITNESS: Areas that could collect, I
18 guess, the media itself.

19 MR. GATTOLIN: Let's go back to the 219 hub.
20 What, how could the medium be trapped in that area?
21 What areas could be trapped?

22 THE WITNESS: The, really on a 219 hub,
23 unless there was a basically it's a pretty smooth face.
24 The holes are rarely exposed. And the fir tree area

1 is basically a clear area to hit with the plastic
2 media.

3 MR. GATTOLIN: Okay. And after this part is
4 bead-blasted, not bead, but medium blasted, is there
5 any etching?

6 THE WITNESS: No, sir.

7 MR. GATTOLIN: Are you familiar why a part
8 would be etched after plastic beading?

9 THE WITNESS: If in fact you were to cause
10 overlapping or moving of material that would hide or
11 mask a failure, yes, then you would etch a part.

12 MR. GATTOLIN: What type of material, what
13 are we talking about? Give me an example.

14 THE WITNESS: I guess, I can't at this point.
15 I know the 219 was a titanium hub and etching is not
16 part of the process with the plastic media.

17 MR. GATTOLIN: Okay. But in the plastic
18 medium blasting, sometimes there's etching that's
19 associated with it, as we both understand. And you say
20 this could, the plastic beads or plastic medium could
21 move material over something?

22 THE WITNESS: Correct.

23 MR. GATTOLIN: What would that be, other than
24 just something that's already machined, what else could

1 it be? What could it been over, if you will? Are we
2 talking at perhaps the lips of a crack, or what are we
3 talking about?

4 THE WITNESS: Well, if there was a flaw in
5 the part and you were to not be an expert in plastic
6 media, I guess the potential exists that you could put
7 material over a crack or a flaw in a part.

8 MR. GATTOLIN: Okay. Have you ever read
9 anything about the plastic medium filling in between
10 cracks, between the lips of a crack? Have you ever
11 heard about that?

12 THE WITNESS: I'm not aware of, the OEM
13 recommendations really only speak to entrapment. They
14 don't get into the area of cracks. There's nothing on
15 it that I'm aware of in writing. And in reviews of
16 plastic medium and in some of the audits we've had,
17 it's never been a topic or cause of concern or brought
18 to our attention.

19 MR. GATTOLIN: Okay. You're fairly high up
20 the chain of command. There's two others before you,
21 correct, before we get to the president?

22 THE WITNESS: Yes, sir.

23 MR. GATTOLIN: How important is it for an
24 individual in your position to have a working knowledge

1 of the FPI cleaning and inspection process? How do
2 you, in order to function in your position?

3 THE WITNESS: I think I should be familiar
4 with. I don't know if I should be an expert. In my
5 view, I have very highly trained, dedicated, competent
6 individuals performing those tasks, both in the
7 training and supervisory areas.

8 MR. GATTOLIN: So it's important that you
9 have a what, between all of you?

10 THE WITNESS: I would say a familiarity with
11 the different processes.

12 MR. GATTOLIN: And you do have a good line of
13 communication with these individuals, as you said?

14 THE WITNESS: Yes, sir.

15 MR. GATTOLIN: Do you have any control over
16 personnel changes in that department from the
17 standpoint of reduction of personnel or increasing it?
18 Or is that something that's left up to the foreman?
19 What type of control do you have?

20 THE WITNESS: I have control over that, if
21 through analysis and in our procedures, we show that we
22 need additional personnel, then I can submit that in
23 writing to the senior vice president for approval with
24 my recommendation.

1 MR. GATTOLIN: Very good. Well, at this
2 time, I've finished asking you the questions.

3 Mr. Chairman.

4 CHAIRMAN GOGLIA: Any further questions from
5 the tech panel?

6 MR. BYRNE: I have a couple, Mr. Maucere.

7 THE WITNESS: Yes, sir.

8 MR. BYRNE: Does Delta Air Lines have a
9 cleaning process engineer?

10 THE WITNESS: We have, what we have is
11 materials process engineers that are familiar, that
12 work, their responsibility is the process standard in
13 those areas. Yes, sir, they are engineers.

14 MR. BYRNE: Do they work with the OEM to
15 establish what policy or what standard practice Delta
16 will follow in cleaning the part?

17 THE WITNESS: Absolutely. They work on a
18 continuing basis with the recommendations that do come
19 in, both from industry data, OEM data, they interact
20 with the cleaning shop on processes or problems or
21 concerns for that purpose.

22 MR. BYRNE: And their qualifications are?

23 THE WITNESS: They're engineers.

24 MR. BYRNE: Okay. How often do you interact

1 with these individuals?

2 THE WITNESS: I would say it's probably not
3 on a frequent basis. I am aware of changes or things
4 that are brought to my attention. I would interact
5 with them, or consult them on issues that come to my
6 attention.

7 MR. BYRNE: In the cleaning shop at Delta,
8 what's the average tenure of a cleaner?

9 THE WITNESS: In today's environment, it's
10 about three or four years. There's been very little
11 turnover in the last three or four years with our
12 situation. It's been fairly stable. So the experience
13 level is quite high at this point, probably three to
14 four years per individual.

15 MR. BYRNE: And could you give me an estimate
16 of how they're compensated relative to other workers at
17 the technical operations center?

18 THE WITNESS: Basically I'd say it's an entry
19 level position, they do pass some mechanical aptitude
20 tests, they're brought in at that. Again, it's an
21 introductory position into Delta.

22 MR. BYRNE: You described that the hub was
23 placed, or the part was placed in a basket. Would you
24 elaborate on how the 219 hub is placed in this basket

1 before it's routed through the cleaning line?

2 THE WITNESS: It's picked up by a hoist with
3 a collar fixture, with an adapter. It's picked up and
4 placed in the basket.

5 MR. BYRNE: Where does that collar fixture
6 come from?

7 THE WITNESS: I believe it's an approved tool
8 of Pratt & Whitney.

9 MR. BYRNE: Do they provide any other
10 fixtures to help handle this part?

11 THE WITNESS: I'm sure they do. I'm not
12 aware specifically of how many fixtures we have, but
13 I'm sure we do. If we need it, we would go acquire it.

14 MR. BYRNE: And when the hub is lowered onto
15 the basket, is it aft, face down?

16 THE WITNESS: Yes. Correct.

17 MR. BYRNE: The standard practice for
18 cleaning describes two pressure rinses, pressure water
19 rinses. What's the purpose for those water rinses?

20 THE WITNESS: To remove contaminants and
21 items from the, from any part.

22 MR. BYRNE: How is the aft face of the hub
23 cleaned if it's sitting down on this basket?

24 THE WITNESS: Well, the basket is, I guess to

1 borrow their word, porous. It's an open, I don't know
2 what the correct word would be, but it's an open
3 basket, so the water and the agitation would be
4 accessible to all areas of the part.

5 MR. BYRNE: Do inspectors routinely raise the
6 basket up to a level that they can direct the water
7 spray to the aft face of this hub?

8 THE WITNESS: Are we talking in the cleaning
9 process now?

10 MR. BYRNE: Yes.

11 THE WITNESS: The cleaners, it wouldn't be an
12 inspector --

13 MR. BYRNE: That's what I mean, excuse me,
14 cleaners.

15 THE WITNESS: -- would leave the part in.
16 When the part comes out, he would assess the
17 cleanliness, and any part that wasn't clean would be
18 reprocessed.

19 MR. BYRNE: Let me go back to my question.
20 As far as the cleaners go, when they're doing these two
21 pressure spray rinses, do they raise the basket that
22 the hub is placed in to a level that they can then
23 direct the water spray to the aft face of this hub?

24 THE WITNESS: The basket would come out of

1 the solution, the part would be checked in its sitting
2 position, the part would be rotated and looked at to
3 ensure the cleaning had taken place on all surfaces.
4 And yes, if it was not cleaned, it would probably be
5 reprocessed and put back in the solution.

6 MR. BYRNE: Is there any hand cleaning that
7 goes on with this 219 hub?

8 THE WITNESS: There is approved procedures, I
9 believe, in the Pratt & Whitney manual, for hand
10 cleaning.

11 MR. BYRNE: Does Delta implement these
12 procedures?

13 THE WITNESS: Yes, they do, as required.

14 MR. BYRNE: How? By hand cleaning, I mean as
15 I would wash a dish in my sink with a scouring pad.

16 THE WITNESS: There are certain abrasives
17 that are allowed to be used that are recommended by
18 manufacturers. And they are available to the cleaners
19 for that purpose.

20 MR. BYRNE: Does Delta routinely use hand
21 cleaning on the 219 hub?

22 THE WITNESS: I can't answer that. I don't
23 know if it's routine or not. I would say it's as
24 required.

1 MR. BYRNE: Does Delta use any hand cleaning
2 to clean the bolt holes?

3 THE WITNESS: Again, I think if the cleaner
4 felt it required that, then he would.

5 MR. BYRNE: Have you visited other carriers
6 to observe their cleaning lines?

7 THE WITNESS: No, sir, but personnel in the
8 cleaning area, engineering and different CITs have.

9 MR. BYRNE: So you've never made a shop visit
10 to another carrier or operator of --

11 THE WITNESS: I have personally not, no.

12 MR. BYRNE: When you were there earlier this
13 month, receiving a tour of how the 219 hub was
14 processed and cleaned, bead blasted and FPI inspected,
15 the technician who was doing the bead blasting did not
16 mask this hub. Is that a routine process?

17 THE WITNESS: The procedure y the OEM is as
18 required to prevent entrapment. And no, he did not
19 mask that hub. Again, it's a judgment call on the part
20 of the cleaner. All three of the OEM requirements, all
21 the OEM requirements speak to is an as required step.

22 MR. BYRNE: How often is a 219 hub masked?

23 THE WITNESS: I would say probably never.

24 MR. BYRNE: And is there any -- check that.

1 I have no further questions.

2 CHAIRMAN GOGLIA: Mr.Conroy?

3 MR. CONROY: Yes, sir, just two questions.

4 Regarding follow-up to problems or
5 suggestions in your department, sir, and you talked at
6 length about that with Mr. Gattolin, there was one area
7 I wasn't clear on. What form of record keeping, if
8 any, do you have that a problem or suggestion has come
9 to you up the chain of command, and to ensure that you
10 follow up on that problem?

11 THE WITNESS: If it was written, it would be
12 called an AVO, which stands for avoid verbal order.
13 They are logged into a data base and they are reviewed.
14 And if action is taken, it would go into that data
15 base.

16 MR. CONROY: And an AVO is a fairly informal
17 procedure, can be written on a shop floor, for example?

18 THE WITNESS: Yes, sir.

19 MR. CONROY: Handwritten?

20 THE WITNESS: Handwritten, yes, sir.

21 MR. CONROY: The other one regards drying.
22 You mentioned flash drying with Mr. Gattolin. And he
23 had several questions regarding it. And the follow-up
24 question I have regards, if there were a crack in a

1 part, do you have knowledge regarding how flash drying
2 or any other procedure would ensure getting water out
3 of that crack?

4 THE WITNESS: No. I think it needs to be
5 noted that what we know today, what we know today with
6 cleaning and the potential of water being retained in
7 the crack, that the process, particularly the FPI
8 process, may not be the best process to use.

9 So in answer to that question, I don't know
10 specifically how it happens, but I do know that if it
11 did happen, possibly using the FPI process would not be
12 the best inspection to use for that, to do an
13 inspection.

14 MR. CONROY: That leaves me a little
15 confused. Are you saying then that you're not sure
16 that the FPI process works if there were a crack there?

17 THE WITNESS: No, sure, I'm saying that with
18 the cleaning, we know the cleaning process works,
19 because we find cracks. I think the thing is we're not
20 sure, that we probably need further research on, which
21 is, if you had a, what would you call it, a
22 manufacturer's defect, such as what it appears we may
23 have had, and you have water that gets into that, then
24 you would have to have some other inspection method.

1 To find that, an FPI might not be the best method.

2 MR. CONROY: Can you name another inspection
3 method to find that?

4 THE WITNESS: Probably eddy current.

5 MR. CONROY: All right, that's all I have.
6 Thank you, Mr. Chairman.

7 CHAIRMAN GOGLIA: Anyone else on the tech
8 panel?

9 (No response.)

10 CHAIRMAN GOGLIA: We'll go to the parties.
11 FAA?

12 MR. DONNER: We have no questions, Mr.
13 Chairman.

14 CHAIRMAN GOGLIA: ALPA?

15 MR. MC CARTHY: No questions, thank you.

16 CHAIRMAN GOGLIA: McDonnell Douglas?

17 MR. STEELHAMMER: No questions, Mr. Chairman.

18 CHAIRMAN GOGLIA: Volvo?

19 MR. THOREN: No questions, Mr. Chairman.

20 CHAIRMAN GOGLIA: Pratt & Whitney?

21 MR. YOUNG: No questions, Mr. Chairman.

22 CHAIRMAN GOGLIA: Delta?

23 MR. VALEIKA: No questions, Mr. Chairman.

24 CHAIRMAN GOGLIA: Dr. Ellingstad?

1 MR. ELLINGSTAD: Just a couple of questions
2 here to clarify some of the procedures. The processing
3 standards that apply to the cleaning and inspection
4 processes that we've been talking about here are
5 developed and approved for Delta, is that correct?

6 THE WITNESS: They are approved for the
7 industry by the OEMs, for the industry, not just Delta.
8 The cleaning processes that we use are the industry
9 norm, which are the OEM procedures.

10 MR. ELLINGSTAD: Okay. Do the cleaning and
11 inspection lines that we've been talking about process
12 only Pratt & Whitney parts?

13 THE WITNESS: No, sir. They practice Rolls
14 Royce, as well as GE.

15 MR. ELLINGSTAD: Are the recommendations, the
16 procedures, etc., consistent between these
17 manufacturers?

18 THE WITNESS: I would say they're fairly
19 consistent with the type of fluid, the mixture and the
20 types of things you have to do to clean parts, yes.

21 MR. ELLINGSTAD: So that there are no
22 different processes?

23 THE WITNESS: There are different processes
24 by different manufacturers for different parts, yes.

1 There would be.

2 MR. ELLINGSTAD: And how, do you use a
3 standard set of cleaning and inspection procedures for
4 all of the parts, or do you change?

5 THE WITNESS: We generally comply with the
6 OEM recommendations and stay within the confines of
7 those recommendations. In other words, we develop a
8 standard based on those recommendations that would
9 encompass all the recommendations to try to do the job
10 correctly.

11 MR. ELLINGSTAD: What I'm driving at here is,
12 you're saying that there are at least some
13 inconsistencies or some differences --

14 THE WITNESS: Yes, sir.

15 MR. ELLINGSTAD: -- between manufacturing
16 procedures. Yet you have developed a way of doing
17 these processes that is applied the same between the
18 different parts?

19 THE WITNESS: Let me clarify. If the
20 manufacturer were to recommend something that was
21 outside the present process, we would go to that
22 manufacturer for approval to either approve our process
23 or change our process to comply with that requirement.

24 Keep in mind that if an AD comes out, you

1 have to comply with the OEM procedures. There is no
2 deviation. Unless you get alternate means of approval,
3 some alternate means of approval.

4 So you have to comply with the OEM, if it's
5 significant, you have to go to the OEM for approval of
6 that process that changed.

7 MR. ELLINGSTAD: But the procedures that you
8 are using you believe are satisfactory to meet all of
9 these different recommendations?

10 THE WITNESS: They are approved procedures,
11 yes, sir.

12 MR. ELLINGSTAD: Okay. In your description,
13 and it was a very detailed description, thank you for
14 that, of the cleaning and inspection processes, it
15 impresses me that in most of these operations, the
16 steps are fairly prescriptive with respect to each
17 stage of cleaning and processing.

18 Except perhaps for the final step in terms of
19 the FPI inspection itself. And here we talked about
20 the inspector having options of using this new device,
21 it was described as a bore scope. Is that in fact what
22 it is?

23 THE WITNESS: No, sir, I believe it's like an
24 optical mirror. It's a thin optical mirror you can put

1 down a hole to view it with a bright light, to give
2 them better visibility.

3 MR. ELLINGSTAD: Okay, but that is not, the
4 use of that device is not prescribed, or a specific way
5 of conducting the visual inspection is not prescribed,
6 is that --

7 THE WITNESS: No, sir. That would be a fair
8 statement. Again, it's provided as an aid. I think
9 probably some inspectors probably feel more comfortable
10 doing certain inspections than others. And the aids
11 are there to raise that level of confidence.

12 If an inspector does not feel he can do a
13 proper job, or feels there's some problem, he can step
14 out, get another inspector and someone else to perform
15 that task. The inspectors need to be comfortable to do
16 the job and feel confident. And I think when they do
17 it, they are confident and competent that they can get
18 it done correctly.

19 MR. ELLINGSTAD: Do you feel that that
20 inspection process is sufficiently prescriptive, or
21 sufficiently prescribed?

22 THE WITNESS: Yes, sir, I do.

23 MR. ELLINGSTAD: Even for parts like the hub
24 with deep holes?

1 THE WITNESS: It's the best method we have at
2 this time.

3 MR. ELLINGSTAD: Is the FPI a sufficient
4 inspection technique for deep holes?

5 THE WITNESS: I would say there's better
6 methods, better methods being eddy current for that
7 process. I agree with that, there are better methods.

8 MR. ELLINGSTAD: Did you say that it wasn't
9 sufficient for this, the FPI was not sufficient?

10 THE WITNESS: The FPI is the recommended
11 procedure by the manufacturer. But I believe that the
12 eddy current --

13 MR. ELLINGSTAD: That's not my question.

14 THE WITNESS: I think the eddy current is a
15 much better procedure for that particular hub, for
16 those holes, eddy current would be a better procedure,
17 yes, I do.

18 MR. ELLINGSTAD: Okay, thank you.

19 THE WITNESS: Yes, sir.

20 CHAIRMAN GOGLIA: Mr. Haueter?

21 MR. HAUETER: Just two quick ones.

22 On the question about this plastic media,
23 would you say that the 219 hub is not plastic media
24 treated?

1 THE WITNESS: Yes, sir, it is, in the fir
2 tree area.

3 MR. HAUETER: It is, okay. Just in the fir
4 tree area.

5 THE WITNESS: Yes, sir.

6 MR. HAUETER: And I guess the other one is on
7 an eddy current. Do you have any idea how much more
8 time it would take to eddy current all these holes
9 versus FPI? Is it a significant difference?

10 THE WITNESS: I don't know what the time
11 frame would be. But it would be an additional time,
12 absolutely.

13 MR. HAUETER: Thank you.

14 CHAIRMAN GOGLIA: We'll go back to the tech
15 panel. Any questions?

16 MR. CONROY: Just one more, Mr. Chairman.

17 Regarding your last discussion regarding your
18 belief in eddy current, was your shop or your
19 department using eddy current prior to this accident on
20 hubs such as this?

21 THE WITNESS: No, sir, but after the
22 accident, we helped develop the procedure for eddy
23 current with Pratt & Whitney and the FAA.

24 MR. CONROY: And you mentioned, if I can try

1 to characterize you fairly here, that you said you're
2 note sure that water would be brought out of a crack in
3 flash drying technique?

4 THE WITNESS: That is correct.

5 MR. CONROY: Did you have that feeling prior
6 to the accident?

7 THE WITNESS: I wasn't aware of it prior to
8 the accident.

9 MR. CONROY: Thank you.

10 CHAIRMAN GOGLIA: Frank?

11 MR. GATTOLIN: Thank you.

12 Mr. Maucere, you folks at Delta do cleaning
13 of not just Pratt & Whitney parts, but GE and Rolls
14 Royce, is that correct?

15 THE WITNESS: That is correct.

16 MR. GATTOLIN: Do any of the OEMs require
17 oven drying of a part before it goes into the FPI?

18 THE WITNESS: Yes, sir. Rolls Royce requires
19 for group a parts, which are life limited parts an oven
20 dry prior to FPI process.

21 MR. GATTOLIN: Did Rolls Royce ever explain
22 to you why they would require the oven drying?

23 THE WITNESS: No, sir, I'm not aware of the
24 technical data that supports that recommendation.

1 MR. GATTOLIN: What benefit would oven drying
2 give, from your perspective, to a part, before it goes
3 to the FPI line?

4 THE WITNESS: I think it would ensure it
5 would be totally dry from all aspects. Totally dry.

6 MR. GATTOLIN: That would include any
7 potential anomalies or cracks, things of that nature?

8 THE WITNESS: Yes, sir.

9 MR. GATTOLIN: Okay. Also, would you clarify
10 the level one and level two qualifications,
11 capabilities and responsibilities on the FPI line?

12 THE WITNESS: Yes, sir. The level one for an
13 inspector, if he's an A and/or P mechanic, or a
14 certificate mechanic, receives 20 hours of classroom
15 and 80 hours of OJT, on the job training.

16 The processor, who may not be an A&P mechanic
17 or a repairman, receives 160 hours OJT prior to being
18 allowed to process parts on the line.

19 When you go to level two, we have instituted
20 there is nothing in print requiring this, I believe it
21 was mostly experience. We now require a 12 hour
22 additional training class for that, for them to be
23 assessed as a level two.

24 MR. GATTOLIN: Okay, now, the inspector level

1 one is qualified to inspect rotating parts as well as
2 other non-rotating parts?

3 THE WITNESS: Yes, sir. If he feels
4 comfortable doing those inspections, and once he runs
5 through the training class, he can request additional
6 training. When he feels competent, and we feel he's
7 competent, he performs that task. That's correct.

8 MR. GATTOLIN: Very good. Thank you. I have
9 no other questions.

10 CHAIRMAN GOGLIA: No one else on the tech
11 panel?

12 (No response.)

13 CHAIRMAN GOGLIA: Any of the parties?

14 (No response.)

15 CHAIRMAN GOGLIA: I have a question for you.

16 THE WITNESS: Yes, sir.

17 CHAIRMAN GOGLIA: The metal people, the
18 metallurgists tell me that they believe the crack had
19 progressed out of the hole and was visible on the
20 surface.

21 THE WITNESS: Yes, sir.

22 CHAIRMAN GOGLIA: If that were the case, and
23 it was clearly missed on an inspection.

24 THE WITNESS: If there were contaminants in

1 the crack or potentially water in the crack, the crack
2 would not be detectable under those conditions.

3 CHAIRMAN GOGLIA: And we also have the POD
4 that is somewhere, 80 to 90 percent, which --

5 THE WITNESS: Yes, sir, we do.

6 CHAIRMAN GOGLIA: And was that a factor in
7 your adopting of the eddy current, the additional
8 inspection of eddy current?

9 THE WITNESS: I believe that's been adopted
10 with the AD, also. But yes, that was taken into
11 consideration.

12 CHAIRMAN GOGLIA: Thank you. Thank you very
13 much for your testimony and cooperation. You are
14 released.

15 THE WITNESS: Thank you, Mr. Chairman.

16 (Witness excused.)

17 CHAIRMAN GOGLIA: We will call our next
18 witness, which is LuVern Dokter.

19 (Witness testimony continues on the next
20 page.)

21 LU VERN DOKTER, FORMER FAA PMI,
22 DELTA AIR LINES, AND CMO MAINTENANCE
23 INSPECTOR SUPERVISOR, FAA CMO, ATLANTA, GEORGIA

24

1 Whereupon,

2 LU VERN DOKTER

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

6 MR. HAUETER: Mr. Dokter, would you provide
7 your full name and place of employment for the record?

8 THE WITNESS: My name is LuVern Dokter, I
9 work for the Federal Aviation Administration in
10 Oklahoma City, in the Office of Aviation Systems
11 Standards.

12 MR. HAUETER: And what's your current
13 position there?

14 THE WITNESS: I'm the manager of the
15 maintenance and engineering branch.

16 MR. HAUETER: And you were previously
17 assigned here to Delta?

18 THE WITNESS: That's correct. Prior to that,
19 I was the supervisory principal maintenance inspector
20 assigned to the Delta certificate management office
21 here in Atlanta.

22 MR. HAUETER: And could you provide a brief
23 history of your aviation background and experience?

24 THE WITNESS: I began my aviation career,

1 like so many other people, in the military. I started
2 in the Air Force in 1958. I served four years there.
3 That's where I got my start in aircraft maintenance.

4 In 1963, I began to work for Trans~~W~~
5 Airlines, worked there in various areas. In 1970, I
6 took my first supervisory position at TWA. I left TWA
7 in December of 1995. And I started to work for the
8 Federal Aviation Administration in 1986 as an aviation
9 safety inspector in Denver, Colorado. And from there,
10 I worked different positions in airworthiness
11 maintenance arena for the FAA. And I began work as the
12 principal maintenance inspector in September of 1991 in
13 Atlanta.

14 MR. HAUETER: And do you have any FAA
15 certificates?

16 THE WITNESS: I have an air frame and power
17 plant certificate.

18 MR. HAUETER: Thank you.

19 Mr. Gattolin?

20 MR. GATTOLIN: Good morning, Mr. Dokter.

21 THE WITNESS: Good morning.

22 MR. GATTOLIN: How many years were you the
23 PMI for Delta?

24 THE WITNESS: Just about five years.

1 MR. GATTOLIN: Five years. And what are your
2 areas, what areas do you consider your areas of
3 specialization? Do you have anything at all?
4 Maintenance wise or just general?

5 THE WITNESS: I guess I wouldn't consider
6 myself a specialist in any area. I've worked in a lot
7 of different areas.

8 MR. GATTOLIN: Okay, very good. Thank you.

9 What were the oversight requirements that
10 were mandated by the CFRs that ensured compliance with
11 the FPI cleaning and examination processes relative to
12 this in-service hub that we have here? In other words,
13 what regulations would require your involvement or your
14 PPM, your partial program manager's involvement?

15 THE WITNESS: There's a variety of
16 regulations that come into play. But Delta is
17 certificated under 121 part of our rules, and there are
18 several sections that talk about their maintenance
19 programs and their processes. And I can't quote you
20 all the regulations off the top of my head, Frank.

21 MR. GATTOLIN: But there is a specific
22 regulation that would require the FAA's inspection of
23 the facility on a periodic basis, is that correct?

24 THE WITNESS: Under the law, we're charged

1 with oversight of all the air carriers. The FARs
2 themselves don't really speak to our role in that
3 arena.

4 MR. GATTOLIN: Okay. If an FAA inspector, or
5 I'll just use the acronym PPM if that's okay with you?

6 All right. What would that individual's method be to
7 ensure that the FPI process, cleaning and inspection,
8 were in compliance with the OEM?

9 THE WITNESS: Essentially we would go to the
10 operator, in this case Delta, we would go to Delta and
11 look at their procedures, their processes for
12 performing that inspection.

13 If the inspector had any questions, they
14 would direct it to either the inspector performing that
15 particular process or the supervisor. In this case, we
16 would seek out a person that had level three authority,
17 because they're the experts in this arena.

18 Beyond that, we have a system, as you are
19 aware, we can go to our FAA engineering people in the
20 ACO, in this case it would be the engine directorate.

21 We also have the ability to discuss with our
22 engine, aircraft evaluation group in the New England
23 region to ask questions and get help if we don't
24 understand an operator's process or if we think they're

1 not following the process completely. We have a lot of
2 folks that we rely on to make those judgments.

3 MR. GATTOLIN: Okay. If we can get back, I'd
4 like to go into your actual duties and responsibilities
5 as a PMI for Delta. How did you structure your program
6 for being the PMI at Delta?

7 THE WITNESS: Well, as a supervisory
8 principal maintenance inspector, I had a number of
9 people that I worked with. And those folks had primary
10 assignments. Basically, we have people who are
11 responsible for fleets of aircraft that are in
12 operation. So our office was divided by aircraft type.

13 So a partial program manager was assigned by
14 aircraft type to fleets. In some cases, they would
15 have responsibility for two fleets, depending on the
16 number of aircraft in a fleet.

17 MR. GATTOLIN: Would that be one person per
18 type of aircraft?

19 THE WITNESS: Basically, yes.

20 MR. GATTOLIN: Okay. And how many inspectors
21 were dedicated to Delta when you assumed
22 responsibilities as the PMI?

23 THE WITNESS: Seven.

24 MR. GATTOLIN: And how many were in that

1 capacity, if you will, when you transferred out to
2 Oklahoma City?

3 THE WITNESS: Thirteen.

4 MR. GATTOLIN: Okay. Can you explain the
5 program tracking report system, I guess the acronym is
6 PTRS system?

7 THE WITNESS: I'll do the best I can, yes.

8 MR. GATTOLIN: How does it work?

9 THE WITNESS: It's a system of recording a
10 lot of functions that all of our inspectors perform.
11 We record in there certification functions, technical
12 functions, surveillance functions.

13 Essentially, we put in a manual descriptions
14 of most of the functions we do. And put a numerical
15 equivalent to that and a job number, I guess would be a
16 good way to explain it.

17 So when a person performs one of those
18 functions, they have the responsibility to either make
19 out a form to document that they've done that, or in
20 the latest changes, they can enter the information
21 directly into our computer system. It's an automated
22 system, I should have said that up front, of recording
23 different things that we do.

24 MR. GATTOLIN: And how often does the PTRS

1 surveillance information come across your desk?

2 THE WITNESS: Well, in the office here, we've
3 review the PTRS data from inspectors worldwide on a
4 weekly basis.

5 MR. GATTOLIN: On a weekly basis?

6 THE WITNESS: Right.

7 MR. GATTOLIN: Okay. And how would you use
8 the PTRS data to structure surveillance of Delta, your
9 maintenance inspectors or your PPM surveillance of
10 Delta?

11 THE WITNESS: We used that data to look for
12 indicators of increasing problems with different fleets
13 of airplanes. Each partial program manager reviewed
14 their fleets for all the comments. We identified any
15 trends that we saw, we identified to the operator and
16 asked for their plan to correct whatever the situation
17 may have been.

18 There's a report that we pulled out
19 periodically that gave you juste an overview of
20 numbers, which doesn't give you a good feel for exact
21 trends, since some things were classified by ATA
22 classification, so you could have two or three
23 different things in the same ATA category.

24 MR. GATTOLIN: Could you give me an example,

1 or give us all an example of that?

2 THE WITNESS: For example, if you looked at
3 ATA 25, which is cabin seats and galleys and things
4 like that, if someone coded that an ATA 25, you could
5 have a combination of all three of those. And you
6 would just be looking at the numbers. You have to go
7 look at the background data in order to determine if
8 there's an actual trend developing in an area.

9 MR. GATTOLIN: Okay. Did you say that
10 certain types of technical data would also come across
11 on the computer system?

12 THE WITNESS: No.

13 MR. GATTOLIN: Did you ever have any reports
14 that you can recall that were related to the dash 200
15 series hub for the JT8 engine?

16 THE WITNESS: No.

17 MR. GATTOLIN: Okay. And before this
18 accident, were you aware of any "problems" that the 200
19 series hub may have had?

20 THE WITNESS: No, I was not.

21 MR. GATTOLIN: If you were made aware of
22 them, how would that have come through? Who would have
23 informed you about this?

24 THE WITNESS: Wel --

1 MR. GATTOLIN: What methods are out there?

2 THE WITNESS: It comes to a lot of different
3 ways, Frank. I mean, we have our ears open all the
4 time for occurrences. That's one way we hear of it.
5 If we didn't get it that way, we would get information
6 through the AEG folks in the New England region, if it
7 was an engine problem, and they send us information all
8 the time.

9 We also get copies of manufacturers service
10 bulletins. We get handbook bulletins and flight
11 standards information bulletins come in all the time,
12 informing us of problems or areas to be aware of.

13 MR. GATTOLIN: As well as word of mouth from
14 mechanics and personnel in maintenance?

15 THE WITNESS: Well, if it was something at
16 the operator we were working with or responsible for,
17 yes, we would get information that way also.

18 MR. GATTOLIN: Okay. When you came into this
19 responsibility, you had seven, I believe, inspectors.

20 THE WITNESS: Right.

21 MR. GATTOLIN: And you ended up with 13
22 before you transferred out.

23 THE WITNESS: Right.

24 MR. GATTOLIN: What caused the increase? Why

1 the difference?

2 THE WITNESS: Several increases, several
3 positions were increased based on requests from our
4 office for increased staffing to do specific jobs.
5 About, let me think now, about three years ago, I
6 believe Congress authorized the FAA to hire a number of
7 inspectors over what we had at that time.

8 Our office got three positions -- excuse me,
9 four positions in the maintenance arena out of that
10 authorization. And those positions came to us based on
11 a study that was performed through some folks at
12 headquarters.

13 MR. GATTOLIN: Okay. Did you, how many of
14 the inspectors that were brought in as PPMs for Delta
15 working with you were assigned to Delta's cleaning and
16 FPI shop area? Was anyone assigned, or how did these
17 people end up getting the surveillance activity to
18 perform?

19 THE WITNESS: We don't have anyone
20 specifically assigned to that shop. We have two folks
21 that are responsible for the entire power plant shop at
22 Delta. And in the normal course of their business,
23 they would be the people we would expect to do, perform
24 surveillance there.

1 MR. GATTOLIN: From what you can recall, did
2 either one of these individuals have any NDT training
3 or FPI training or experience?

4 THE WITNESS: They had not formal FPI
5 training nor experience that I'm aware of. And I don't
6 believe that either one of them had formal NDI training
7 of any kind.

8 MR. GATTOLIN: Okay. If they didn't have the
9 training, how would they go about doing the inspection,
10 if they didn't have a background in it? How would they
11 know what to look for, what to ask, or shall we say,
12 use the term, what to dig into to find out things were
13 doing?

14 THE WITNESS: There again, depending on
15 problems that we become aware of with an operator, we
16 would focus our attention in certain areas. As I said
17 before, we were not aware of a problem with Delta in
18 this arena.

19 So we performed our normal surveillance
20 functions and we have responsibility for general
21 oversight of the carrier systems and they're actually
22 the people that are responsible for compliance with all
23 the various rules and all the required procedures from
24 the manufacturer.

1 Our folks would, as I described before, and I
2 think I got stopped kind of in the middle there, but we
3 go into the operator's facility and we'll look at their
4 process, what are they going to do. And we follow
5 whatever inspection they're doing or whatever
6 maintenance process they're applying to any component
7 or part or aircraft, and ensure that they follow their
8 procedures.

9 If we have a question about where those
10 procedures generated from, did they incorporate the
11 manufacturer's recommendations, did they get the
12 manufacturer's approval to deviate in certain cases,
13 then we'll ask them to provide us that documentation,
14 and we'll ask them to take us through their engineering
15 analysis. Beyond that, we go to our own engineering
16 folks, as I described before.

17 MR. GATTOLIN: You had said that they, I
18 believe that would be Delta, are responsible to adhere
19 to the OEM requirements, is that correct?

20 THE WITNESS: They have under the rules, they
21 incorporate those recommendations into their program.
22 And any time they want to change those, as I believe
23 Mr. Maucere mentioned earlier, they go to the original
24 equipment manufacturer and get that process changed

1 improved.

2 MR. GATTOLIN: Okay. I had misinterpreted it
3 as saying that they were responsible for assuring
4 compliance, and that, the FAA was. I'm sorry.

5 Okay, what qualifications does the FAA
6 require for a person to be assigned as a PPM, on, let's
7 say your team for Delta?

8 THE WITNESS: Basically the qualification is
9 to come into our office, the same as it was for any air
10 carrier maintenance inspector. We look for people who
11 have a minimum of three years of supervisory
12 maintenance experience. That could be as a supervisor
13 or a lead mechanic, someone who supervised mechanics.

14 We want folks that have experience in
15 maintaining aircraft that are over 12/5. And we want
16 them to have experience working in a 121 operation or
17 large repair station.

18 MR. GATTOLIN: Were those the types of people
19 that were brought into your operation?

20 THE WITNESS: Yes. All the folks that we
21 hired met that criteria.

22 MR. GATTOLIN: They did meet the criteria.
23 Okay. Did you have anything to do with the hiring of
24 these individuals or was that something that came down

1 from above?

2 THE WITNESS: I was directly involved in the
3 hiring process.

4 MR. GATTOLIN: And the hiring process, could
5 you just briefly describe that hiring process that
6 you're involved in, other than the qualifications that
7 you've just given us?

8 THE WITNESS: Well, there are several avenues
9 that we have to bring people in. And I don't know how
10 familiar everybody is with what those are. So I'll try
11 to describe them briefly.

12 Essentially, folks who want to work for the
13 FAA apply to what we call a register in Oklahoma City.

14 And they present all the background information, their
15 experiences and qualifications and those things. And
16 the first review of all that is made at that point.

17 When an office wants to hire folks, we would
18 send a formal request through our regional office to
19 the registry in Oklahoma City and say, we want to hire
20 three people, for example, as air carrier maintenance
21 inspectors. They provide us a list of names for us to
22 interview and hire from. And we get to review their
23 application.

24 And those names are set out in a numerical

1 order. They apply a rating system to all applicants,
2 and they come to us in numerical order. And our rules
3 are that you must hire out of the top three people
4 numerically. And so, you review, like I say, you
5 review the peoples' resumes, so to speak, and then you
6 make your selection from that.

7 There is one other process that's available
8 to us, and that's, I'm trying to think what the acronym
9 is, Veterans Readjustment Act, I believe, VRA process.
10 Certain veterans are eligible to be hired without
11 going through the process I just described.

12 So their applications are presented and if
13 they meet our experience requirements, they can be
14 hired in in a non-competitive basis. And then if they
15 complete our training program and demonstrate their
16 abilities and capabilities, then they can bid on a
17 competitive job, become a permanent employee. It's an
18 appointed position, in effect, for the first two years.

19 MR. GATTOLIN: Okay. Are these, so they meet
20 the qualifications, that's the same qualifications you
21 just stated a short time ago?

22 THE WITNESS: Yes, sir.

23 MR. GATTOLIN: All right, thank you.

24 During the time that you were assigned as the

1 PMI for Delta, how often did you make an inspection of
2 the FPI line, the cleaning and the inspection shop? Or
3 did you ever?

4 THE WITNESS: It wasn't part of my
5 responsibilities to make those inspections.

6 MR. GATTOLIN: It was assigned to a PPM?

7 THE WITNESS: Exactly.

8 MR. GATTOLIN: Okay. All right. How often
9 did any of these inspectors do this?

10 THE WITNESS: On a formal basis, I believe
11 that they would be in the area a couple times a year.
12 Informally they were there more often than that.
13 Oftentimes, folks would be at Delta doing one thing and
14 decide to just walk over and glance at what's going on
15 in an area. That isn't considered a formal
16 surveillance.

17 MR. GATTOLIN: Right. You say that there
18 were some formal surveillances?

19 THE WITNESS: Yes.

20 MR. GATTOLIN: Did they fill out a report
21 form for you to review?

22 THE WITNESS: Yes.

23 MR. GATTOLIN: Okay. Did you --

24 THE WITNESS: Not for my review.

1 MR. GATTOLIN: For the PTRS?

2 THE WITNESS: Right.

3 MR. GATTOLIN: And did they discuss their
4 findings with you?

5 THE WITNESS: Yes.

6 MR. GATTOLIN: Do you recall any of these
7 discussions at all?

8 THE WITNESS: I don't recall any discussion
9 regarding the FPI process specifically, Frank.

10 MR. GATTOLIN: All right. Maybe I asked this
11 question before, but again it's short memory, excuse me
12 for doing it a second time, if it was done. How many
13 inspectors working with you had NDT training?

14 THE WITNESS: Three.

15 MR. GATTOLIN: Three of them had that.

16 THE WITNESS: They had NDT training, yes.

17 MR. GATTOLIN: Okay. And were any of these
18 inspectors trained in FPI?

19 THE WITNESS: No.

20 MR. GATTOLIN: Okay. So you had 13 by the
21 time you transferred?

22 THE WITNESS: Yes.

23 MR. GATTOLIN: Three had NDT, and none of the
24 13 had FPI experience or training?

1 THE WITNESS: They had no formal training in
2 FPI. Three folks in our office went to a course in
3 Oklahoma City that gave them some information on how to
4 evaluate NDI systems. It wasn't detailed formal, what
5 you, I wouldn't define it as formal NDI training at
6 all.

7 MR. GATTOLIN: There was an evaluation course
8 that they had taken, you said?

9 THE WITNESS: It's a course to help our
10 inspectors evaluate operators' NDI systems.

11 MR. GATTOLIN: And did any of those gentlemen
12 or ladies have that experience, that training?

13 THE WITNESS: Yes.

14 MR. GATTOLIN: They had gone through that
15 evaluation course?

16 THE WITNESS: Yes.

17 MR. GATTOLIN: How many of those individuals
18 went through that course?

19 THE WITNESS: Three.

20 MR. GATTOLIN: Three of them. And that was
21 the same three that had the experience, the NDT
22 training?

23 THE WITNESS: I believe one of the people
24 that went through the detailed training also went

1 through that evaluation course.

2 MR. GATTOLIN: Okay. Who at the certificate
3 management office was responsible to ensure that the
4 inspectors were trained for the areas that they were
5 expected to survey in?

6 THE WITNESS: That would be the supervisor or
7 myself, depending on what office.

8 MR. GATTOLIN: How often were these
9 individuals, how often did they get the training?

10 THE WITNESS: Training is conducted all the
11 time. We had people in training year around.

12 MR. GATTOLIN: In other words, they would go
13 to Oklahoma City for the training, or wherever, to a
14 contractor?

15 THE WITNESS: Yes.

16 MR. GATTOLIN: And the training budget
17 allowed these individuals to take the training that was
18 necessary, or was that ever restricted, to your
19 knowledge?

20 THE WITNESS: I don't understand.

21 MR. GATTOLIN: In other words, say the
22 inspector said, well, you really should get some
23 background in, for the sake of discussion, NDT. And
24 yes, I'd like to go do that. And so he puts in for it,

1 and they say, well, the budget does not allow for that
2 now, you'll have to wait for another year or whatever.

3 Did that occur with any consistency?

4 THE WITNESS: I would say probably four or
5 five years ago, that may occur more than it does today.

6 We have made a change in our training process.

7 MR. GATTOLIN: Okay, so there has been a
8 change in that. When you found, or one of your
9 inspectors found a problem at Delta where there was
10 some non-compliance, could you tell us what process you
11 would go through to ensure compliance with a particular
12 regulation or procedure?

13 THE WITNESS: Any time a person becomes aware
14 of an area of non-compliance, the first thing we would
15 do is inform the operator, operator's representative,
16 whoever that might be at the site we're at, so that we
17 stop whatever the area of non-compliance is, that's our
18 first priority of business.

19 Then normally the inspector would talk to
20 some member of management as soon as possible, to put
21 them on notice that we are aware of this area of non-
22 compliance.

23 Then they would come back to the office, and
24 there's usually some discussion internally amongst the

1 inspectors. They would discuss it with me, we would
2 make a decision on how we were going to address
3 whatever the issue is.

4 In the case of non-compliance with an FAR, we
5 would ordinarily write a letter of investigation to
6 Delta Air Lines, in this case. And then we have an
7 investigative process that we go through to find all
8 the facts and we allow the operator a response time,
9 typically it's 10 days, and depending on how
10 complicated the issue may be, we may allow a little
11 more time, depending on how complicated the issue is.

12 And then beyond that, once we decide how
13 we're going to process that particular investigation,
14 it will either go into the normal enforcement channels,
15 or it will be closed with a corrective action, based on
16 how the operator addressed the issues.

17 MR. GATTOLIN: How often were you involved in
18 enforcement actions with these, with Delta?

19 THE WITNESS: Oh, I can't give you a number.
20 I mean --

21 MR. GATTOLIN: Ball park it, if you could.
22 Percentage, or would you get compliance through
23 enforcement or through --

24 THE WITNESS: Well, compliance through

1 enforcement is not our choice of --

2 MR. GATTOLIN: I understand.

3 THE WITNESS: -- it's not a real effective
4 means of getting compliance. So we used the compliance
5 avenue when we couldn't do anything else.

6 MR. GATTOLIN: Okay. Did that happen very
7 often while you were the PMI with Delta?

8 THE WITNESS: Not often.

9 MR. GATTOLIN: And can you recall a specific
10 instance where you had to go that route?

11 THE WITNESS: Oh, yes.

12 MR. GATTOLIN: Could you share one of those
13 with us?

14 THE WITNESS: Well, specific ones, I'll have,
15 let me think just a minute here.

16 MR. GATTOLIN: Sure.

17 THE WITNESS: When we do the NASIP
18 inspections, issues always come up. And occasionally,
19 we'll find there is non-compliance. And in -- I'm
20 trying to remember some specific ones that came up in a
21 NASIP inspection that we went through the enforcement
22 process. I can only talk about things that are closed,
23 so I've got to be, I'm trying to go through my memory
24 banks. Can't talk about things that are active, in

1 other words.

2 MR. GATTOLIN: Okay, tell you what. Why
3 don't we just go ahead and strike that. But your
4 methodology, you found to get compliance was, the
5 enforcement action would be the last step that you'd
6 use?

7 THE WITNESS: Yes.

8 MR. GATTOLIN: All right. And would usually
9 the enforcement action be a result of a disagreement or
10 an interpretation of regulation?

11 THE WITNESS: Not always.

12 MR. GATTOLIN: Not always. Okay. Well, I'm
13 finished with the questioning at this time.

14 Mr. Chairman, I'm finished with the
15 questioning, thank you.

16 CHAIRMAN GOGLIA: Mr. Conroy?

17 MR. CONROY: Yes, sir, a couple of questions,
18 please.

19 Mr. Dokter, I'm still confused about
20 something that Mr. Gattolin asked you a couple of
21 times. I know the question was asked a couple of
22 different ways. I believe you said that the original
23 equipment manufacturer is responsible for changes in
24 procedures, is that true or is that not true?

1 THE WITNESS: In certain cases, when they
2 change, when an operator changes procedures, they have
3 to coordinate those with the original equipment
4 manufacturer. That's true. In the 121 arena,
5 operators have the ability to change a lot of their
6 operating, their manual procedures, without approval
7 from the manufacturer.

8 MR. CONROY: As a former PMI for Delta, are
9 you still responsible for oversight regarding those
10 changes, such as those? Or is the FAA in general
11 responsible for oversight and approval of such changes?

12 THE WITNESS: Well, most of their manual is
13 not an approved manual, it's an accepted manual. So in
14 the areas where it has to be approved, those things are
15 coordinated internally within the FAA during the
16 approval process. I know I'm not answering -- I'm
17 trying to figure out what your question is. And I'm
18 not --

19 MR. CONROY: Maybe I need to ask it another
20 way.

21 Regarding inspection procedures for a fan
22 hub, such as this, and whether or not, where the
23 lifetime is set, what knowledge you gain from usage,
24 materials such as this, would you be involved in

1 changes to the inspection procedures?

2 THE WITNESS: We would not do the approval on
3 that. There was one part of your question there that
4 talked about lifetime. We don't change the lifetime of
5 any component, if it's a life limited component.
6 Operators can't do that either.

7 MR. CONROY: Who does?

8 THE WITNESS: The FAA, in concern with the
9 manufacturer, is the only people that can adjust those
10 lifetimes.

11 MR. CONROY: Someone over your head?

12 THE WITNESS: It's our engineering people who
13 work with the manufacturers that set those lifetimes.

14 MR. CONROY: But the FAA is still involved,
15 is that correct, in the oversight?

16 THE WITNESS: Yes.

17 MR. CONROY: And I'm getting back to Mr.
18 Weaver's testimony of yesterday, where he corrected me,
19 when I mentioned Pratt & Whitney making requirements.
20 He mentioned to me that they are only recommendations,
21 that the FAA sets the requirements. Is that a correct
22 statement?

23 THE WITNESS: I'm trying to remember what he
24 said.

1 MR. CONROY: In regard to whether a fan hub
2 needed to be inspected when it was piece parted.

3 THE WITNESS: Right. I understood him to say
4 that the manufacturer does not mandate an inspection of
5 that hub while it's in service. If it is removed from
6 an engine for some reason, then there are criteria to
7 inspect it, and the operators are expected to follow
8 those criteria.

9 MR. CONROY: Now, is that approved by the FAA
10 or not?

11 THE WITNESS: I don't believe that inspection
12 process is approved by the FAA.

13 MR. CONROY: Who would set it and approve it,
14 then?

15 THE WITNESS: It's a recommendation from the
16 operator, and it's in their manual. And we expect
17 operators to follow the manufacturers' manuals.

18 MR. CONROY: Now I'm even more confused.
19 It's a recommendation to the FAA or to whom?

20 THE WITNESS: It's in the manufacturers'
21 manuals. And those manuals, I'm trying to think of the
22 FAR that applies here. I believe it's 43.13. And that
23 regulation says that people that do maintenance must
24 follow the manufacturer's manual. In the case of a 121

1 operator, they have the ability to incorporate those
2 recommendations into their manual, and they have the
3 ability to make certain changes without approval.

4 MR. CONROY: Without approval from the --

5 THE WITNESS: FAA.

6 MR. CONROY: -- FAA. So is it a fair
7 characterization, then, that the manufacturer requires
8 the changes? Who does require the changes? Who makes
9 the final decision that those changes are in effect?

10 THE WITNESS: I'll focus on that hub, since
11 that's what we're here for.

12 MR. CONROY: Yes, sir.

13 THE WITNESS: If an operator wanted to change
14 a process involving that hub, they would coordinate
15 that with the manufacturer, and the manufacturer would
16 say yes, your process is approved.

17 MR. CONROY: Is the FAA involved in that?

18 THE WITNESS: No.

19 MR. CONROY: Thank you, Mr. Chairman.

20 CHAIRMAN GOGLIA: Is there a statutory or FAR
21 requirement that they coordinate that?

22 THE WITNESS: Not to my knowledge.

23 CHAIRMAN GOGLIA: So they could just re-write
24 the manual themselves, using their own engineering

1 data, insert it into their manual, and it would be
2 accepted by the FAA?

3 THE WITNESS: In some areas, that's true.
4 There are some processes that are in fact FAA approved.
5 And I couldn't sit here and tell you exactly what
6 those are. And those processes are coordinated with
7 the manufacturer who in turn talks to our engineering
8 folks for that approval.

9 It's a continuous process. And the folks in
10 my office, we would be aware of a significant change
11 like that. And we would have the opportunity to make
12 our input to the engineering people, FAA engineering
13 people in that case.

14 CHAIRMAN GOGLIA: Can you tell me how often
15 you received manual revisions from Delta, specifically
16 maintenance manual revisions?

17 THE WITNESS: On about a weekly basis.

18 CHAIRMAN GOGLIA: And were these packages
19 single sheets of paper, or were they significant
20 changes, quantities?

21 THE WITNESS: It varied. Some of them were
22 single sheets, some of them were, you know, a
23 significant revision to a chapter.

24 CHAIRMAN GOGLIA: And upon receipt of this

1 material from Delta, these manual revisions, was
2 somebody assigned to review those?

3 THE WITNESS: Yes, sir.

4 CHAIRMAN GOGLIA: In a timely manner?

5 THE WITNESS: Yes, sir.

6 CHAIRMAN GOGLIA: In dealing with the
7 deficiencies that you found on a normal basis, a
8 routine basis, as we all find in every OEM operation,
9 can you explain to us the reception you or your people
10 received from Delta when these issues were raised?
11 What I'm looking for, was there cooperation toward
12 compliance?

13 THE WITNESS: For the most part, they were
14 very cooperative. We had our differences, like you
15 would with any organization. We were able to work
16 through those, and they, from my experience, have
17 demonstrated a very compliance-oriented attitude.

18 CHAIRMAN GOGLIA: And -- I'll be careful, I
19 don't want to put words in your mouth, here. But in
20 your experience, have you found that compliance through
21 cooperation to be a better method than just imposing
22 fines?

23 THE WITNESS: Yes.

24 CHAIRMAN GOGLIA: The FAA operates a hotline

1 in Washington for people to call with compliance
2 issues, they can raise compliance issues. During the
3 period of time that you were PMI, did you receive any
4 reports of hotline calls from Washington?

5 THE WITNESS: Yes.

6 CHAIRMAN GOGLIA: The DOT also operates a
7 hotline. And persons working in the transportation
8 industry across the board can call DOT hotline also,
9 other modes, additionally. Did you ever receive any
10 notifications of calls going to the DOT hotline about
11 problems on Delta?

12 THE WITNESS: I don't know that specifically
13 we got them from DOT. They all came to us through a
14 chain of command, so to speak. Sometimes we weren't
15 aware of where they originated from.

16 CHAIRMAN GOGLIA: So there would be no
17 difference in the way you would handle either one of
18 those?

19 THE WITNESS: No.

20 CHAIRMAN GOGLIA: And did you notice at any
21 time during the period of time that you were PMI any
22 increase in frequency of the use of the hotline?

23 THE WITNESS: Not really.

24 CHAIRMAN GOGLIA: Okay. Where did I leave

1 off with this witness? We haven't done the parties
2 yet, right?

3 MR. HAUETER: That's correct, sir.

4 CHAIRMAN GOGLIA: Is there anyone else on the
5 tech panel that has any questions?

6 (No response.)

7 CHAIRMAN GOGLIA: Then to the parties.
8 McDonnell Douglas?

9 MR. STEELHAMMER: No questions, Mr. Chairman.

10 CHAIRMAN GOGLIA: Delta?

11 MR. VALEIKA: No questions.

12 CHAIRMAN GOGLIA: Volvo?

13 MR. THOREN: No questions, Mr. Chairman.

14 CHAIRMAN GOGLIA: Pratt?

15 MR. YOUNG: No questions, Mr. Chairman.

16 CHAIRMAN GOGLIA: ALPA?

17 MR. MC CARTHY: Mr. Chairman, as much as the
18 pilots would love to hear more about this new FAA
19 attitude on compliance through enforcement, I'm not
20 going to ask any questions, because I know what the
21 answer would be.

22 CHAIRMAN GOGLIA: Do I detect a tone of doubt
23 in kinder and friendlier FAA?

24 MR. MC CARTHY: Never, Mr. Chairman.

1 CHAIRMAN GOGLIA: To the FAA?

2 MR. DONNER: I guess I can't ask Kevin
3 McCarthy any questions. And I have none for this
4 witness.

5 (Laughter.)

6 CHAIRMAN GOGLIA: If you pass him to me, I
7 would maybe entertain that thought.

8 (Laughter.)

9 CHAIRMAN GOGLIA: Dr. Ellingstad?

10 MR. ELLINGSTAD: Just a couple clarifying
11 questions with respect to your role in all of these
12 processes. You basically have indicated that as PMI
13 you did not have a role with respect to the process
14 standard for cleaning, processing and inspection that
15 Delta applied? Did you review, approve?

16 THE WITNESS: We would review those, yes.

17 MR. ELLINGSTAD: But you exercised no
18 authority over those?

19 THE WITNESS: We can exercise authority. But
20 we don't formally approve them. If a process has
21 changed, and we find fault with it, yes, we can
22 exercise authority to have it changed.

23 MR. ELLINGSTAD: If it isn't changed, you
24 would not have occasion to look at it?

1 THE WITNESS: No. We look at processes in
2 our normal course of business. And it happens for a
3 lot of different reasons. So, are you asking do we do
4 a formal review?

5 MR. ELLINGSTAD: I'm just trying to establish
6 what your role as PMI or the, more generally, the FAA's
7 role is with respect to the process standards that
8 applied to these operations at Delta.

9 THE WITNESS: That's a real broad area.

10 MR. ELLINGSTAD: You have reviewed, but you
11 do not approve them, right?

12 THE WITNESS: Exactly.

13 MR. ELLINGSTAD: What is your role as PMI, or
14 was it in terms of assessing the adequacy of Delta's
15 oversight of these processes?

16 THE WITNESS: We looked at their system for
17 how they managed their processes, the training
18 programs, what their audit functions were, how they did
19 that, what the results of those were, corrective
20 actions, those type of things.

21 MR. ELLINGSTAD: How often did you do that?

22 THE WITNESS: That varied, depending on
23 problem areas that we had identified.

24 MR. ELLINGSTAD: What would trigger that kind

1 of a look?

2 THE WITNESS: If we became aware of a trend
3 in a specific part of their operation, we would look
4 deeper at their systems. It could be a number of
5 things. If there's an operational problem with a fleet
6 of aircraft, we would look at, and if the problem was
7 focused in one area of the aircraft, we would look into
8 their maintenance processes for whatever component was
9 causing a difficulty.

10 MR. ELLINGSTAD: But there wouldn't be a
11 regular process of examining inspection processes in
12 their engine shop?

13 THE WITNESS: Yes, there was. Mr. Gattolin
14 asked me about new people that have, not new people,
15 but new positions. And we had a person, two people in
16 fact, that were within the last year who were assigned
17 to the engine repair facility specifically to look at
18 their processes in that entire facility. It's a rather
19 large facility. So I wouldn't pretend to tell you that
20 they looked at everything every year. Because it would
21 just be impossible.

22 MR. ELLINGSTAD: Okay. Finally, then, with
23 respect to your role as PMI, or more generally the
24 FAA's role in the actual review of operations, you've

1 indicated that there were visits where your inspectors
2 would look at these processes, were there periodic
3 reviews of records, periodic observations of the actual
4 inspection procedures?

5 THE WITNESS: Yes.

6 MR. ELLINGSTAD: And that's a continuing
7 oversight responsibility?

8 THE WITNESS: Yes, it is.

9 MR. ELLINGSTAD: Are you satisfied that you
10 have sufficient resources to do that?

11 THE WITNESS: Well, with the continued growth
12 of this operator, I believe we're going to need to add
13 a few more resources. And in discussions with the
14 people that I used to work with, they're going to get
15 two more positions in the near future. So we are
16 growing as the operator grows. So we're better able to
17 perform our oversight functions.

18 MR. ELLINGSTAD: Thank you.

19 CHAIRMAN GOGLIA: Anybody else from the tech
20 panel? From the parties?

21 (No response.)

22 CHAIRMAN GOGLIA: Okay. Mr. Dokter, hearing
23 no further questions, then you are released. Thank
24 you.

1 (Witness excused.)

2 CHAIRMAN GOGLIA: This is a very convenient
3 time for us to break for lunch. We will reconvene at
4 1:30.

5 (Whereupon, a luncheon recess was taken.)

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

23 (Time noted: 1:40 p.m.)

24 CHAIRMAN GOGLIA: Now that we've had a nice,

1 long leisurely lunch, I'm sure everybody is full, if I
2 catch anybody sleeping up here, there's dishes that
3 will be done.

4 All right, back on the record, and we'll have
5 the afternoon session. Our next witness is Mr. Joseph
6 Hahn.

7 (Witness testimony continues on the next
8 page.)

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JOSEPH HAHN, DIRECTOR, TECHNICAL SERVICES,
MAGNAFLUX CORPORATION, GLENVIEW, ILLINOIS

1 Whereupon,

2 JOSEPH HAHN

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

6 MR. HAUETER: Mr. Hahn, for the record would
7 you provide your full name and place of employment?

8 THE WITNESS: Joseph Hahn, Magnaflux,
9 Chicago, Illinois.

10 MR. HAUETER: And what's your position with
11 Magnaflux?

12 THE WITNESS: I'm the General Manager.

13 MR. HAUETER: Would you please provide a
14 brief history of your background?

15 THE WITNESS: Certainly. I'm a graduate
16 chemical engineer from Northwestern in 1984. Upon
17 graduating, I became a safety engineer for a company
18 called Safety Consulting Engineers, where I did failure
19 modes and effects analysis, faulty analysis, that kind
20 of stuff, for about a year.

21 I went on to Magnaflux in 1985, have been
22 there ever since. And at Magnaflux, I have worked in
23 the chemistry laboratory, I have designed and built
24 chemical production facilities where these penetrant

1 materials are made. And I went up to marketing and to
2 general managership.

3 MR. HAUETER: All right.

4 Mr. Gattolin?

5 MR. GATTOLIN: Thank you.

6 Good afternoon again, Mr. Hahn.

7 THE WITNESS: Goodafternoon, Frank.

8 MR. GATTOLIN: I'd like to start off
9 basically with a description of the FPI process, but
10 preface it with, your company produces the chemicals
11 for the cleaning as well as the inspection. Do they
12 also offer equipment that can be used in conjunction
13 with the chemicals?

14 THE WITNESS: Yes, we do.

15 MR. GATTOLIN: Could you tell us what type of
16 equipment is produced and offered to the customers?

17 THE WITNESS: We provide a broad range of
18 both standard and custom fluorescent penetrant and
19 magnetic particle equipment. These systems range as
20 small as virtual tabletop systems to extremely large
21 systems that would likely fill this room.

22 MR. GATTOLIN: Okay, and you folks have
23 worked with companies that operate jet engines and
24 reciprocating engines, is that correct?

1 THE WITNESS: Absolutely. We've worked with
2 a number of carriers and we've worked with a number of
3 engine manufacturers and suppliers to engine
4 manufacturers and carriers.

5 MR. GATTOLIN: Okay, very good. Does your
6 company, would you explain this, but does your company
7 assist a customer in setting up an FPI line?

8 THE WITNESS: Yes, we do. We're often asked,
9 as a matter of fact, to provide such guidance in
10 setting up an inspection system, to do what they wish
11 to do. And that can entail anything from process
12 improvements to understanding specifications to
13 incorporating process equipment that will meet those
14 specifications. When we're involved, we tend to be
15 involved soup to nuts.

16 MR. GATTOLIN: Okay. If you would, would you
17 describe the cleaning and the inspection process, or
18 the examination process, that's associated with FPI and
19 orient the cleaning around the aqueous process, not the
20 vapor degreasing.

21 THE WITNESS: Certainly. First of all, for a
22 fluorescent penetrant inspection to be successful, it's
23 not only critical, it's absolutely imperative that the
24 parts come to that process clean and dry. That means

1 free from grit, grime, oils, dirt, water, you name it.

2 The vapor degreasing process was a very convenient
3 method because it inherently avoided some of the
4 pitfalls of water.

5 Aqueous cleaning provides some of the exact
6 same results of vapor degreasing, it can provide a
7 great measure of cleanliness to the part. And there
8 is, however, a concern that that water is involved.

9 So traditionally what we find as just a
10 variety in cleaning processes, most often, if there's a
11 mechanical process that's used, it tends to be used on
12 the front end, that is the first one that's done, if
13 it's grit blasting that's done early on.

14 An etching operation tends to follow that at
15 some point. The aqueous processes are done oftentimes
16 in series, as we've heard this morning, with varying
17 types of cleaners, alkaline based, some have silicates
18 in them for corrosion protection, etc. And they're
19 followed by water rinses, cold water rinses, hot water
20 rinses, and the hot water rinse at the end to raise the
21 temperature of the part is pretty common.

22 MR. GATTOLIN: The facilities that are
23 required for the cleaning would be, for the aqueous
24 cleaning would be the tanks. Could you describe those,

1 please, and if you would, walk through I guess you
2 could say how your company would recommend cleaning a
3 part, up to the point where it's ready to be dipped
4 into the dye penetrant and solution.

5 THE WITNESS: Okay. Assuming that there is,
6 let's say, one tank of an aqueous cleaner that's used,
7 again, to start off with, the part comes in covered
8 with grit, grime, foreign material, rust, scale, things
9 of that nature, if there's a media blast to be done,
10 that's the time to do it. Again, an etch at some point
11 should follow that.

12 At that point, what typically gets used are a
13 series of roller conveyors and tanks so the part will
14 be placed on a roller conveyor. It will be dipped into
15 an aqueous cleaning solution, air agitation is
16 oftentimes used to provide better cleaning for that.
17 It goes back up on the conveyor, dipped into, often, a
18 cold water rinse, it's just another tank. Sometimes
19 agitation is used, sometimes not. The part comes back
20 up on the conveyor.

21 If there is a second cleaner that wants to be
22 used, it can be dipped again into another tank. It's
23 just a series of tanks and conveyors. And the final
24 one tends to be a hot water rinse.

1 In general, after the hot water rinse, we
2 will without fail recommend the use of some dryer, some
3 hot forced air dryer. And again, when I mention dryer,
4 I think it's important to note that the movement of air
5 is critical. The dryer that dries your clothes in your
6 house, that dryer is something that emits the humidity.

7 Otherwise, you get hot, wet clothes. The
8 same goes with parts. You want a dryer that has moving
9 air, so that you get hot, dry parts.

10 MR. GATTOLIN: Okay, thank you. What type
11 of, we'll go into the examination also. For persons
12 doing the cleaning, what are the, if you want to use,
13 the personal qualities that that individual should
14 have? Does it require a great deal of skill or a great
15 deal of intellect, or can a person of an average
16 intellect do the job? What is your feeling on that?

17 THE WITNESS: Well, intellect aside, I would
18 say that attention to detail is probably the most
19 important factor. And that probably carries through,
20 all the way through FPI. I think it's important that
21 the person that's involved in the cleaning process
22 understand what's happening to the part down the line,
23 why does the part need to be dry, why does the part
24 need to be clean, why is that important.

1 I think a person of average intelligence who
2 understands that is going to, and has attention to
3 detail, is going to do a much better job in cleaning
4 that part and doing so in such a way that it doesn't
5 impede future operations.

6 MR. GATTOLIN: So would you also say that the
7 FPI inspector, as you said, should have the attention
8 to detail? Would it be important for the inspector to
9 have a knowledge of the cleaning process as the cleaner
10 would have to have a basic knowledge of the inspection
11 process?

12 THE WITNESS: Yes, I would say so. No
13 question that the processor and the inspector, or if
14 they are the same person, should definitely have some
15 idea, if not detailed knowledge, of the part's history.

16 When it came to the FPI line, when was the
17 last time it was dried, how long ago was it, did it sit
18 around in an area where perhaps dust could have fallen
19 on the part. Some idea of the history I think is
20 important.

21 The attention to detail of the processor, and
22 particularly an inspector, even more so, many of the
23 clients that I work with day in and day out, spend a
24 lot of time making sure the people that work for them

1 are very detail oriented kinds of people.

2 MR. GATTOLIN: Is it important that the
3 respective shop foreman or supervisors, or leaders,
4 managers, whatever you wish to tag them with, be in a
5 position of responsibility and authority, is it
6 important that these individuals have a fairly clear
7 understanding of what the other shop does, i.e.,
8 cleaning versus FPI?

9 THE WITNESS: I would say so.

10 MR. GATTOLIN: For the same reasons that you
11 just elaborated upon?

12 THE WITNESS: Agreed.

13 MR. GATTOLIN: What are the misperceptions
14 held by industry regarding the aqueous cleaning and
15 FPI? I know there might be thousands of them.

16 THE WITNESS: How much time do you have?

17 MR. GATTOLIN: Why don't we just go through
18 the most obvious or the ones that are the most common,
19 if you will.

20 THE WITNESS: I think as far as cleaning
21 goes, I think the biggest area of concern that we as
22 the manufacturers have is that aqueous cleaners aren't
23 the volatile, non-flammable cleaners that they've been
24 used to. Vapor degreasing was such an excellent

1 technique, it provided so much benefit with so little
2 downside, that when you add the vagaries of aqueous
3 cleaning, you change the process parameters.

4 That doesn't necessarily mean that you make
5 the process impossible to perform well. Quite the
6 opposite. You can still do it and do it well, and it's
7 done every day.

8 But there are differences. And in
9 particular, understanding that the aqueous materials,
10 if they're alkaline, have got to be off the part prior
11 to dipping it penetrant, because perhaps they could
12 impede or at least make the penetrant less viable over
13 time. But I would say, if I had one concern with
14 aqueous cleaning, certainly it's in the fact that
15 there's water, and you've got to dry that part.

16 As far as FPI is concerned, FPI is a very
17 robust technique. That means that you can take
18 liberties with many of the process parameters and still
19 get away with it. And I think that can work for it and
20 work against it. I have worked in the lab, I have
21 processed parts, and I have varied dwell times, I have
22 varied wash times, I have varied wash temperatures.
23 And I've still gotten decent inspection results.

24 However, when I have not varied those

1 parameters, when I have held them constant, I have
2 always gotten solid inspection results.

3 So the key is, I think, that the method is
4 very robust. But the parameters that need to hold true
5 need to be held true for the reason that if you want to
6 get probability detection up as high as you want it,
7 they're there for a reason.

8 MR. GATTOLIN: Okay. What factors, and you
9 can be really specific now, what factors would prevent
10 a successful examination in the fluorescent penetrant
11 inspection?

12 THE WITNESS: Okay. Start with the obvious,
13 that if you've got a part that has a defect that is
14 subsurface, you're not going to find it with FPI. FPI
15 needs to have a defect open to the surface for it to be
16 successful. So if you're looking for subsurface
17 defects with FPI, forget it. Can't happen.

18 But assuming that you have a part that has a
19 defect that is open to the surface, things that can
20 prevent it from working, if the part is wet, if the
21 crack itself is wet. They say that oil and water don't
22 mix. That's true. Penetrant is basically an oil. And
23 if there is water in a defect, then the water will
24 repel that penetrant and make it difficult if not

1 impossible for entry to occur.

2 The same thing applies to dirt, grime,
3 grease, oil, things of this nature. If they're on a
4 part that also can prevent it from, the penetrant from
5 entering the defect and make it impossible to inspect
6 the part correctly. So foreign matter in a defect make
7 it tough.

8 In addition to that, excessive background,
9 and I'll explain that a little bit, I assume it's been
10 explained a little bit ahead of time already. But the
11 fluorescence that you want to see on a part should be
12 limited to areas where there are indications. So the
13 only fluorescence you really want to see is the
14 indication.

15 If you've got excessive background on the
16 part, in other words, there's green blotches all over
17 the part, it makes it more difficult to read that part.

18 So you want to reduce that. So that means that wash
19 times are critical, and emulsification times are
20 critical.

21 And even things as simple as the following.
22 There's a number of clients I work with that will have
23 two sets of gloves, so that when the processor is
24 working on the green part, he'll have his green gloves

1 on.

2 But the minute that part leaves, say, the
3 emulsification area, he'll take those gloves off, leave
4 them at that end of the station, pick up gloves that do
5 not have penetrant on them, and work those all the way
6 through.

7 Why is that important? Because if you've got
8 green on your gloves and you handle the part, later on
9 in the process, you get green on the part. It makes
10 reading more difficult. Impossible, no. More
11 difficult, certainly.

12 So those are just a few examples of ways that
13 you can inhibit the proper inspection of a part.

14 MR. GATTOLIN: Could you just talk a short
15 time about the emulsification? You say if it stays a
16 little too long, would you elaborate on that, please?

17 THE WITNESS: Yes. When you're looking at
18 the removal of penetrant, you have to understand that
19 at least in this case, this penetrant is what we call
20 non-water washable. What that means is, it's an awful
21 lot like Vaseline. If you get Vaseline on your hands,
22 you can't just wipe it off, you have to wash it off
23 with soap.

24 Now, if you turn the water on hard enough,

1 you'll blast off a lot of that Vaseline. And that's
2 what the pre-rinse phase is all about. The pre-rinse
3 phase knocks off mechanically, not by washing, but
4 mechanically, a lot of that extra penetrant. The
5 emulsifier is the soap. The emulsifier is the material
6 that turns that oil, the penetrant, the Vaseline, to be
7 water washable.

8 So, when you dip the part in that emulsifier
9 solution, if you don't dip it in there long enough,
10 then you won't render it water washable enough and
11 you'll have more background, too much background. If
12 you leave it in there too long, then the action will be
13 greater than you want and you could potentially render
14 the penetrant in the defect water washable and foil the
15 inspection that way.

16 MR. GATTOLIN: Why is it important to have
17 the dryer oven that's used after the emulsification,
18 before the applications developer, to be a certain
19 temperature and to have the part in there?

20 What would happen if the part's left in too
21 long or too short, and also if the developer that is
22 put onto it after the part has been in the oven is
23 applied too sparsely or in too great a quantity?

24 THE WITNESS: Okay. Two separate questions.

1 I'll handle them in turn.

2 Let's talk first of the dryer. If the dryer
3 temperature is insufficiently warm, that means it's too
4 cold in the dryer, you won't dry the part completely
5 enough. What will that do? Well, when it gets to the
6 developer station, then the developer may adhere to
7 areas of the part, become sticky, become wet, not good
8 for the process.

9 Prior to the dryer, however, it's also
10 important, if you've got parts of complex geometry, to
11 offer either, I think, an air blow-off stage or a
12 vacuum stage to remove areas of entrapped water. Water
13 can be collected in cavities. And removing that water
14 by blow-off or by vacuum can help that matter
15 immensely.

16 Because even if the dryer is properly set, if
17 you've got pools of water, those pools will tend to be
18 left after 10 minutes of drying.

19 So it's important to get those out. A lot of
20 people use vacuums these days, so that they reduce the
21 risk of blowing blotches of penetrant all of the part.

22 If the dryer is too warm, conversely, if it's
23 too hot in there, two things can happen. First of all,
24 the penetrant itself, although designed to very

1 tolerant of excess heat, can exhibit a quality that we
2 call fluorescence fade or heat fade, where the
3 penetrant becomes less brilliant because of that.

4 Even more so, though, you tend to exaggerate
5 background issues. And you can also, in fact, if it's
6 really hot, you can take penetrant entrapped in a
7 crack, bring it out of the crack, spread it out and
8 make it more difficult to read.

9 MR. GATTOLIN: Okay. What flaws are, I'll
10 use that term for lack of a better, but what flaws are
11 below the FPI's cleaning and inspection process? What
12 types of flaws? I know we have the ones that are
13 subsurface. But what others?

14 THE WITNESS: You're talking size, now?

15 MR. GATTOLIN: Size, yes.

16 THE WITNESS: Very process and part
17 dependent. However, I'll give some generalities. In
18 general, an ultra high sensitivity penetrant can find
19 defects in the micron range to a micron wide and maybe
20 three microns long. And an ultra high sensitivity
21 penetrant can find that.

22 But I think the key thing to note more than
23 the length and width of a crack, when you're addressing
24 sensitivity, is the depth of that crack. The more

1 sensitive a penetrant you have, the more able you are
2 to find shallow defects.

3 Typically, ultra high sensitivity penetrants
4 find cracks, I'll pick a number, 10 microns in depth.
5 When you get down to medium or high sensitivity, that
6 might go to 20 and 30 microns depth required to hold
7 that penetrant.

8 And when you're talking visible dye, red
9 penetrant, the least sensitive method may be as deep as
10 a 50 micron depth crack is necessary to hold the
11 penetrant.

12 So I think it's important to consider that
13 penetrants can find very, very fine defects. No
14 question about that. They do vary based upon the
15 sensitivity of the process and the part, and depth must
16 also be considered.

17 MR. GATTOLIN: Okay. Regarding an
18 inspector's daily performance, what is in your mind or
19 as well as those that you work with on a daily basis,
20 or interact with, what is the best way to check a line
21 inspector's performance, daily performance?

22 THE WITNESS: I think if it was a perfect
23 world and I had my way, I'd ensure that there were
24 actual parts running through the process, with actual

1 defects that you could tag that the inspector would be
2 required to find. Cracked panels, cracked blocks,
3 things of this nature, are great, and they have their
4 place.

5 They really do evaluate the process, and
6 they're designed to do that, and they do a good job of
7 that. But an inspector obviously knows what the panel
8 looks like and knows he's supposed to find cracks in
9 it, and then will.

10 If you have a part that comes through and
11 it's a part like every other part that he sees, he
12 believes it to be a normal part, one that's going to go
13 back into a jet engine, if you know it's got a crack in
14 it and he finds it, I think you can feel very confident
15 about your inspector.

16 If on the other hand these parts go through
17 and those indications are not found, that would open
18 more questions and force you then to go back and
19 retrain.

20 MR. GATTOLIN: In the examination booth or
21 tent or area for FPI there's various types of equipment
22 that you've heard earlier today that it contains. What
23 is important in your mind about the ultraviolet light?

24 What really should be, what concerns should

1 be with that? What about visible light within the
2 tent? What really should be allowed?

3 Should an inspector have the capability of
4 having a light bulb above him that turns a light on
5 when something comes in, turns it off and then gets
6 going with the black light? Should he have eye
7 protection? Should this be something that he should
8 wear? What can UV light that is just being used each
9 day in the tent, what can it, how can it affect an
10 individual's eyes to perform his job?

11 So just talk about that environment, if you
12 would. Those are some of the areas I'd like you to
13 address.

14 THE WITNESS: I'll try to remember all those
15 questions.

16 MR. GATTOLIN: Well, I'll hit you some more.

17 THE WITNESS: I had a feeling you might.

18 First of all, the inspection booth, it's got
19 to be dark. And the standard that's typically called
20 out is two foot candles. And there are means of
21 measuring that.

22 Most booths that I've been in are pretty good
23 at eliminating extraneous white light. Almost every
24 booth I've ever been in has got some measure of a white

1 light, some way for an inspector to view the part under
2 white light.

3 And I think that's important, because don't
4 forget that once the inspector finds a defect, he's got
5 to find some way to tag that defect, he's got to be
6 able to see and put a mark on it, maybe a circle around
7 it, things of that nature. And white light is the
8 method by which they can see to do that. So I tend to
9 think that's okay and is in keeping with the practice.

10 I think that the inspection booth needs to
11 relatively cool. An inspection booth by nature can
12 tend to get hot. So I think there should be some means
13 of ventilating the booth. And it's strictly for the
14 operator's ergonomics, to make sure that he's
15 comfortable in doing his job.

16 Black lights. Should you wear goggles?
17 Certainly. They help filter out the UV rays, etc.
18 They're available, they can be worn, they should be
19 worn. I do.

20 What else? Oh, the heat of the black light.
21 Somebody mentioned either late yesterday or today
22 about the heat of the black light. You can always tell
23 an FPI inspector, at least from the old days, because
24 they've got a big mark above their forehead, right

1 about here. That's where they've reached down to look
2 at an indication and they've burned their head on the
3 black light.

4 There are black lights available today that
5 are fan cooled that you can grab and they're at ambient
6 temperature. And I think that's important to look at
7 as well.

8 So you want to keep the environment ~~at~~,
9 clean. White light's okay. Overhead black lights are
10 good to have. By no means are they the only thing you
11 should have. You need to have hand-held black lights
12 as well.

13 And any other aids that are necessary, and I
14 won't get into specifics here, because with the various
15 complex geometries, that will determine whether you
16 need things such as magnifying glasses or mirrors or
17 things of this nature. But anything that can help this
18 process certainly should be in there.

19 MR. GATTOLIN: Why is it important to have
20 the examination area clean?

21 THE WITNESS: Well, for one thing, it's
22 important to have it clean, meaning tidy, so that the
23 inspector doesn't trip and fall. And I've seen that
24 before. So certainly keeping it tidy is important.

1 Clean meaning no background, when you are
2 inspecting a part, you can always tell a pretty clean
3 part. When I mean pretty I mean beautiful. It tends
4 to have a purplish hue to it under black light, and you
5 can very easily spot any indications that are there.
6 They're very easy to pick up with the eye.

7 But if there's a lot of extraneous background
8 around it, it tends to be distracting. It tends to
9 bring on more fatigue, at least in my case. So it's
10 important so that the only fluorescence you see is the
11 indication. That's probably a little bit of a perfect
12 world instance, but you can go a long way towards
13 making sure that occurs.

14 MR. GATTOLIN: Okay. Would you talk a little
15 bit about the use of the tam panel and the various ways
16 to clean it and which of the various ways to keep it
17 clean for use in your opinion are the best?

18 THE WITNESS: Sure. Tam panels I think have
19 got a very important use in the FPI process. For one
20 thing, the thing that's been mentioned so far
21 heretofore today is the chrome plated side, which has
22 got the five star indications on it. And that's not
23 only to find those defects, but the chrome plating
24 serves another purpose. Chrome is a very difficult

1 surface to wet.

2 So if the penetrant can successfully wet
3 chrome, it's going to successfully wet and cover all
4 areas of the subject part. That's important.

5 The other half of the panel is sandblasted.
6 So that also tests the background of the process
7 itself. So if your tam panel comes through and the
8 sandblasted side is clean, the chrome plated side is
9 fully wet, and you're finding five stars, then your
10 process is working successfully.

11 It's important, however, that the panel be
12 clean. In the past that meant again ultrasonic
13 cleaning with volatile, non-flammable solvents, with
14 more pressure on the non-use of those solvents, more
15 people are going to flammable solvents, such as
16 alcohol, naphtha, and the like.

17 But that's critical. I've taken tam panels
18 that have got penetrant in them and bled them back
19 dozens of times after I've sprayed solvent on them and
20 wiped them and sprayed solvent and wipe them. I've
21 seen them bleed back a lot. Ultrasonic cleaning with a
22 good solvent tends to keep that from happening.

23 MR. GATTOLIN: So that basically, the
24 ultrasonic with a good solvent tends to clean the

1 panel, get rid of all the residue from the previous
2 use, and have it give you a valid indication when you
3 use it again the next time?

4 THE WITNESS: That's a fair statement.

5 MR. GATTOLIN: All right. How often should,
6 yes, that would be the best way to put it, how often
7 should the aqueous cleaning solutions and the rinse
8 water be changed? When are good indicators for that,
9 and how would you tell?

10 THE WITNESS: I'm certainly not an expert on
11 all the various aqueous cleaners that are out there.

12 MR. GATTOLIN: Oh, I understand.

13 THE WITNESS: I think that there's two ways
14 of looking at it. One is by means of statistical
15 process control where you gain experience in knowing
16 approximately how many of a certain type of your parts
17 can go through this process before the tank is needing
18 to be cleaned. Visually, certainly another indication
19 of that as well.

20 Running parts through there and running
21 actual parts through there can be a neat way of doing
22 it. For instance, if you want to check out the FPI
23 process, with a part with a known indication, it might
24 not be a bad idea to run that part through the aqueous

1 cleaning process as well and check that too.

2 So those are some indicators, they're not
3 very scientific, but again, it's certainly not my area
4 of expertise.

5 MR. GATTOLIN: Okay. If you would, describe
6 the flash drying process and what it can consistently
7 accomplish.

8 THE WITNESS: Consistent with what has been
9 said before, parts are immersed into a hot water rinse,
10 rinse tank, left in there for as long a time as is
11 necessary for it to reach the temperature of the
12 surrounding water. And upon removal from the water,
13 theoretically the water evaporates and the part becomes
14 surface dry. And I think that's what it primarily can
15 accomplish, is that the part can become surface dry.

16 I think there are a lot of variables that go
17 into that. Again, I believe myself that following any
18 immersion of a part in any water bath whatsoever, if
19 you're going to follow that up with FPI processing,
20 then it would make sense to have a dryer to facilitate
21 that process.

22 Things such as conditions, humidity, things
23 of this nature, I believe can affect this process. And
24 again, how long to leave the part in there, the

1 temperature of the water, all those sorts of things I
2 think are variables.

3 And I think in FPI processing, as well as any
4 other NDT process, there's a certain measure of
5 redundancy that you want to ascribe to. Whether you're
6 trying to find an indication with FPI or eddy current
7 or ultrasonics or radiography or what have you, the
8 more safeguards you can put into that process, the
9 better. I think that adding a drying step post flash
10 dry is a wise thing to do.

11 MR. GATTOLIN: Okay. Something I've
12 wondered, how does the operator, the cleaning operator,
13 know that the part has attained the temperature of the
14 water it has been placed into?

15 THE WITNESS: I don't know.

16 MR. GATTOLIN: Is there any way to tell that
17 would be accurate, other than whimsey or time?

18 THE WITNESS: Not to my knowledge. I suppose
19 if you took a block of steel and put it in the water
20 and took it out and sectioned it and took the
21 temperature of it, and then did that a couple times,
22 there are certain ways you can determine that the heat
23 transfer characteristics of the metal, you could do it
24 formulaically if you wanted to, and get reasonably

1 accurate.

2 But again, that's at a certain temperature
3 and a certain type of metal and a certain size. And
4 again, the heat transfer characteristics of a part with
5 fins on it certainly differs than that of a part that's
6 just a block of steel. So I think that it's tough to
7 know intuitively that that's occurred.

8 MR. GATTOLIN: Let's say that in the flash
9 drying process that some of the water is removed from
10 the crack. What down the line could take place that
11 would create a problem in the inspection side, the
12 actual FPI?

13 THE WITNESS: So if you say if some of the
14 water has been removed but not all of it?

15 MR. GATTOLIN: Let's just say, at the surface
16 some of it managed to evaporate for some reason. Let's
17 say this individual blew some air on it, figuring, oh,
18 it will hurry up the drying process and blow some air,
19 may or may not have gotten a good shot right on this
20 area where this defect was, whatever.

21 THE WITNESS: If there's water in a defect
22 it's going to certainly compromise the inspection process
23 somewhat. Again, if it's filled with water, I don't
24 see how any penetrant can get into that defect.

1 That having been said, I'll tell you right
2 now that I have done tests myself where I've soaked a
3 part in water and done FPI in it and still found
4 defects. That can happen. But again, I think you're
5 rolling the dice a little bit.

6 If you've got water in a defect, a lot of it,
7 penetrant won't get in. A little of it, the penetrant
8 will be diluted. And you'll also impede your ability
9 to determine the depth of the crack.

10 Part of the beauty of the bleedback technique
11 is that it gives you some measure of the depth of the
12 indication. If you do the bleedback technique twice
13 and no more penetrant comes out, you can get some idea
14 that there's a defect, but it's fairly shallow.

15 If it keeps bleeding back and keeps bleeding
16 back and keeps bleeding back, then there's more depth
17 to it, you would assume. If there's water in there and
18 less penetrant, it will give you a false read of that,
19 I believe.

20 MR. GATTOLIN: Okay. Have you had any
21 experience with plastic medium blasting at all?

22 THE WITNESS: Yes, some.

23 MR. GATTOLIN: Would you mind explaining your
24 knowledge of this, please? What is this process? What

1 does it accomplish?

2 THE WITNESS: It's not entirely dissimilar
3 from other types of blasting operations, sandblasting,
4 grit blasting. The major idea behind these types of
5 processes is to remove coarse types of inconsistencies
6 to the part, rust, scale, things of this nature. And
7 plastic media tends to be used, I believe, because it
8 tends to be a softer media and can cause less part
9 damage than, say, your harder ones. I've seen steel
10 used before in the past, and it's like leaving your car
11 out in a hailstorm.

12 So plastic media blasting is less damaging
13 than that, and serves essentially the same purpose.

14 MR. GATTOLIN: What are the potential
15 anomalies with that process?

16 THE WITNESS: Anomalies as it relates to FPI?

17 MR. GATTOLIN: As it relates to FPI, yes,
18 when you plastic bead a part before it goes to the dye
19 dip.

20 THE WITNESS: Okay. If you've got a crack
21 that is open to the surface but has got a protruding
22 edge, it is possible that the plastic media blasting
23 canpeen over that edge and thereby mask the
24 indication. That's possible. It's possible that the

1 plastic media can shear or become powdery. And if it's
2 recirculated over and over again, it is possible,
3 although there haven't been too many studies that I've
4 seen that have shown this effect, but it is logical
5 that this media can become entrapped in areas of the
6 part, and perhaps even the defect, thereby masking it.

7 All of which speaks to the importance of etching
8 following it.

9 MR. GATTOLIN: Did you say etching should
10 follow?

11 THE WITNESS: I believe so.

12 MR. GATTOLIN: Okay. Couple more questions
13 here. Are there some materials that are more difficult
14 to inspect using FPI than others? For example, parts
15 made from titanium versus parts from aluminum or steel,
16 stainless steel?

17 THE WITNESS: Shiny, smooth surfaces
18 sometimes can be difficult to wet. Very coarse
19 surfaces sometimes can be difficult to remove
20 background fluorescence from it. But in general, I
21 believe that the materials themselves are not that big
22 of an issue as far as FPI is concerned. And we've
23 inspected titanium, aluminum, steel, and magnesium,
24 even, without any difficulties.

1 MR. GATTOLIN: Okay, just a couple more here,
2 then I'll turn it over.

3 In your mind, what would be a good method for
4 a company that does a lot of inspecting of parts using
5 FPI to ensure that the part has been thoroughly
6 inspected? Are there redundant systems? That's what
7 I'm talking about.

8 THE WITNESS: Well, yes. There are a number
9 of customers that I work with that do redundant FPI,
10 redundant inspection, do x-ray and FPI. Each NDT
11 technique, in my estimation, has got definite
12 advantages and some definite disadvantages. And those
13 are easily overcomable.

14 However, if you use redundant techniques, you
15 can get the best of both worlds. Plus you get a
16 measure of security, in that I think if you've got a
17 probability detection of say, .95 with one method and
18 .95 with another, and you do both, or you do FPI twice,
19 that probably, mathematically, gets better.

20 There's one manufacturer I deal with very
21 closely, and they do no fewer than seven FPI
22 inspections on a part they're manufacturing. Now,
23 they're not entirely altruistic in doing this. They're
24 doing it for their own benefit as well, because they do

1 FPI at certain levels of manufacturing so that they're
2 not putting in a lot of value that down the road will
3 prove to be unsalvageable.

4 However, by doing a number of FPI inspections
5 on that part, by the time they get to the end, you can
6 be pretty sure they've caught most if not all of any
7 possible indications that are going to be there.

8 MR. GATTOLIN: Okay. The last one. You
9 mentioned earlier that you provide a soup to nuts
10 approach to things, the company does, Magnaflux, I
11 believe.

12 THE WITNESS: Yes.

13 MR. GATTOLIN: Does that mean that you
14 actually have a complete FPI procedures manual? Do you
15 have that that you follow or do you design it? How do
16 you provide this soup to nuts?

17 THE WITNESS: To say that we have a manual
18 would be an exaggeration. Because to say that there is
19 a manual that is applicable to every single person and
20 every single company's application would be wrong.

21 For instance, somebody that is doing FPI on
22 aluminum castings and is looking for gross defects,
23 some of these people don't even use developer, and the
24 penetrant process works great. It really does. So for

1 them, to try to apply what they need to the manual
2 would be improper.

3 What we do is we provide pamphlets, leaflets,
4 books, that give you general guidelines for FPI and
5 some specifics there for you as well. But what we
6 offer more than anything else is, we'll come and see
7 you, we'll sit down with you, we'll understand your
8 process and then we'll try to design a system that
9 suits your needs.

10 MR. GATTOLIN: Okay, thank you.

11 Mr. Chairman, I'm finished with my
12 questioning.

13 CHAIRMAN GOGLIA: Are there any other
14 questions from the tech panel?

15 Mr. Conroy?

16 MR. CONROY: Yes, sir, one more regarding the
17 answer you just gave Mr. Gattolin in regards to soup to
18 nuts. I'm a little confused.

19 Do you provide advice or writing or either,
20 and/or neither, regarding the specific problems, if you
21 will, for want of a better word, of a particular
22 company? Do you help them in procedures manuals
23 regarding the FPI, or do you just give them leaflets or
24 manuals that generally describe your product?

1 THE WITNESS: We're not going to write their
2 FPI manual for them, if that's what you mean. No, we
3 don't do that. They with their OEMs come up with the
4 methods that they need to use.

5 However, in the course of putting together,
6 say they want a penetrant system, if they say, what
7 we're going to do is go directly from the dryer to the
8 developer station to the inspection booth, and we're
9 not going to be put any equipment in there for dwell
10 time, we'll say, this is inconsistent with good FPI.

11 You need to have some area for dwell after
12 developer and prior to inspection, as an example.

13 So again, leaflets, pamphlets, materials to
14 help them generally provide their own guidelines. But
15 if they ask us questions, we can certainly provide
16 those answers. But as far as telling them how to
17 inspect parts, what's the best inspection method for
18 this part, we tend to stay away from writing their FPI
19 manual. That's for them to do. They know their parts
20 better than we do.

21 MR. CONROY: Do you give them any advice at
22 all regarding what you just said, how to inspect that
23 part, what to do? How to use your product?

24 THE WITNESS: Certainly. If somebody sends

1 us a part and says, how would you inspect this part, we
2 will oftentimes take that part into our laboratory and
3 inspect it and process it and give them advice on it.

4 A good example would be areas of entrapment.

5 We'll say, look, if you're going to fixture this part
6 in this way, you're heading for a bruising, because
7 you're going to entrap water in all these areas, and
8 you need to fixture this in this way.

9 So in the areas of fixturing and all this,
10 these are the areas that we help them in.

11 MR. CONROY: One last question, regarding
12 customers. Do you return to visit and discuss these
13 things I just asked you about? Do you periodically go
14 back and see how they're doing?

15 THE WITNESS: Absolutely.

16 MR. CONROY: How often would you do it with
17 an average customer?

18 THE WITNESS: Well, I'll pick one account,
19 and I won't name them, but they've got seven locations
20 in the United States. And I will go and visit each and
21 every one of those locations an average of twice a
22 year.

23 MR. CONROY: To see how they're doing with
24 your product?

1 THE WITNESS: To see how they're doing and do
2 they need any help. And of course if they call me, and
3 in fact, during the break, I had a message from one of
4 these guys, if they call me, I'll go see them, or I'll
5 call them back, whatever they need.

6 MR. CONROY: And that customer you're talking
7 about, you visit each of their seven locations twice?

8 THE WITNESS: Yes, on average that's about
9 right.

10 MR. CONROY: Thank you.

11 Thank you, Mr. Chairman.

12 CHAIRMAN GOGLIA: Any other questions from
13 the technical panel?

14 MR. EINDLER: I've got one question. Would
15 you today build any cleaning NDT line without
16 introducing heating, an oven or a hot air drying
17 process?

18 THE WITNESS: Do you mean would we provide
19 cleaning equipment without providing a dryer prior to
20 FPI?

21 MR. EINDLER: No, I mean if you should design
22 a line like the one we're talking about, with the
23 cleaning directly followed by NDT process, would you
24 recommend any such line without hot air drying or oven

1 drying?

2 THE WITNESS: No, we wouldn't.

3 MR. EINDLER: Thank you.

4 CHAIRMAN GOGLIA: To the parties? Federal
5 Aviation Administration?

6 MR. DONNER: No questions.

7 CHAIRMAN GOGLIA: Pratt & Whitney?

8 MR. YOUNG: No, thank you, Mr. Chairman.

9 CHAIRMAN GOGLIA: ALPA?

10 MR. MC CARTHY: Mr. Chairman, just a couple
11 of points for the record, Mr. Hahn.

12 You made the suggestion of running a covert
13 part with a known defect through the line as a means of
14 ensuring that your inspectors are doing an adequate
15 job. Are you confident with your knowledge of parts
16 tracking in this industry that we would not have any
17 risk of such a part subsequently getting back into
18 inventory? Just for the record question.

19 THE WITNESS: I would not be able to
20 speculate on that.

21 MR. MC CARTHY: Second question has to do
22 with the use of white light for the ease of the
23 inspector within the booth. Going back upon the way it
24 used to be on board ship, has any consideration ever

1 been given to using red lights in the booth instead of
2 white lights, to allow the inspector to do whatever
3 optical work he needs to do?

4 THE WITNESS: Not to my knowledge.

5 MR. MC CARTHY: Just so that dark adaptation
6 is no longer a problem.

7 THE WITNESS: I understand.

8 MR. MC CARTHY: And I suppose a third
9 question is a follow-on to the gentleman from Sweden,
10 and that's, you heard testimony here of the three
11 engine manufacturers whose parts the airline has to
12 inspect. Only one apparently specifies that the part
13 be mechanically dried following cleaning. And given
14 your strong testimony, does that surprise you?

15 THE WITNESS: I guess it's my belief that
16 that should be done. I'm certainly not an expert in
17 their parts, their geometries and how they would
18 process those parts. And I would defer to them as far
19 as knowing how to process their parts.

20 From my experience, my standpoint,
21 understanding the FPI process, I believe it's an extra
22 measure of protection that is worth doing. Is it
23 absolutely required? I wouldn't speculate on it for
24 their parts. But certainly from my standpoint, I would

1 strongly recommend it.

2 MR. MC CARTHY: Thank you.

3 CHAIRMAN GOGLIA: Volvo?

4 MR. THOREN: Nothing, thank you.

5 CHAIRMAN GOGLIA: McDonnell Douglas?

6 MR. STEELHAMMER: No questions, Mr. Chairman.

7 CHAIRMAN GOGLIA: Delta?

8 MR. VALEIKA: No questions, Mr. Chairman.

9 CHAIRMAN GOGLIA: Dr. Ellingstad.

10 MR. ELLINGSTAD: Just a real quick question
11 or two. Your company produces tam panels or an
12 equivalent?

13 THE WITNESS: Yes, we do.

14 MR. ELLINGSTAD: Do you produce any other
15 kind of specimens, test specimens for use, either in
16 examination of inspectors or training materials?

17 THE WITNESS: We provide some other test
18 blocks, both for NPI and FPI, cracked aluminum blocks,
19 things of this nature. Nothing in the way of actual
20 parts, things like that. But we do provide some, what
21 they call artificial defect items, such as tam panels,
22 cracked aluminum blocks, 2QIs, as they're called, for
23 NPI. Yes, we provide those.

24 MR. ELLINGSTAD: And is your customer base

1 good for these things? Do these tend to be --

2 THE WITNESS: Yes, we sell of a lot of them.

3 MR. ELLINGSTAD: Is this pointed toward
4 training materials, or --

5 THE WITNESS: It's pointed really towards
6 both, both training and process control. It's, we find
7 we sell a lot of them to laboratories who are going to
8 train their inspectors, certainly. But we also sell
9 them to industry for process and checking their
10 process, tam panels especially.

11 MR. ELLINGSTAD: Okay, thank you.

12 THE WITNESS: Certainly.

13 CHAIRMAN GOGLIA: Mr. Haueter?

14 MR. HAUETER: No, thank you.

15 CHAIRMAN GOGLIA: And the Chairman has no
16 questions. Anybody want to revisit?

17 (No response.)

18 CHAIRMAN GOGLIA: Okay, Mr. Hahn, thank you
19 very much for your testimony.

20 THE WITNESS: My pleasure.

21 (Witness excused.)

22 CHAIRMAN GOGLIA: Our next witness will be
23 Mr. Robinson.

24 (Witness testimony continues on the next

1 page.)

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14 SAMUEL ROBINSON, DIRECTOR OF TECHNICAL SERVICES,

15 SHERWIN CORPORATION, SOUTH GATE, CALIFORNIA

16 Whereupon,

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SAMUEL ROBINSON

18 was called as a witness by and on behalf of the NTSB,

19 and, after having been duly sworn, was examined and

20 testified on his oath as follows:

21 MR. HAUETER: Mr. Robinson, would you provide

22 your full name and place of employment for the record?

23 THE WITNESS: My name is Sam Robinson, I'm

24 the technical director of Sherwin Corporation, South

1 Gate, California.

2 MR. HAUETER: And could you provide a brief
3 history of your background and experience?

4 THE WITNESS: I'm a graduate chemist from
5 Northern Illinois. I have 18 years of experience in
6 laboratory testing, formulating usage of penetrant
7 materials. I've given several talks, papers, seminars
8 on NDT penetrant materials, mag particle materials. I
9 am the ASNT methods division chairman of the Tech
10 Council.

11 I am also a member of SAE Committee, which is
12 the NDT board of mag particle and penetrant. We write
13 material specifications. And I also am a member of
14 ASTM, which is a society in this case that writes
15 processing specifications.

16 MR. HAUETER: Thank you.

17 Mr. Gattolin?

18 MR. GATTOLIN: Good afternoon, Mr. Robinson.
19 Thank you for coming.

20 I'll kind of start the line of questioning
21 very similar to what Mr. Hahn just experienced. I'll
22 be adding one or two here to get your thoughts on some
23 of his responses.

24 To just begin with, does your company,

1 Sherwin, does it offer hardware to customers to perform
2 the cleaning and inspection for FPI?

3 THE WITNESS: No, we don't.

4 MR. GATTOLIN: It's strictly chemicals?

5 THE WITNESS: Correct.

6 MR. GATTOLIN: Do you go in and help set,
7 help the customer set up the inspection procedures?

8 THE WITNESS: We would go in as a consultant
9 type individual as to talking about the right process,
10 the right level of materials to use, based upon who
11 he's doing work for. Normally, those companies will
12 have specific requirements for what type of materials
13 and things to use.

14 MR. GATTOLIN: Okay, very good.

15 Would you please describe the FPI cleaning
16 and examination process as you understand it? Just go
17 through it in general, and I'll be asking some
18 questions.

19 THE WITNESS: Okay. The process as it exists
20 today essentially is turned into an alkaline type pre-
21 cleaning methodology. It's gone from the vapor
22 degreaser days to alkaline cleaning. A part would go
23 through a series, and maybe there's two or three
24 different cleanings, rinses, and I can't stress the

1 rinsing too much.

2 But it would go through a series of rinses,
3 drying, and then finally get into penetrant inspection
4 to have the fluorescent material applied, processed,
5 and then finally inspected in some finite time frame.

6 MR. GATTOLIN: Okay. The facilities, we've
7 talked about that and you heard Mr. Hahn's testimony.
8 Is there anything that you would add to what he had
9 said regarding the type of materials, the need of any
10 way of cleaning it differently as an example.

11 THE WITNESS: There's a variety of ways of
12 cleaning it. And what people are finding out is that
13 alkaline cleaning isn't going to necessarily do all the
14 cleaning that has to be done.

15 In many instances, you have a series of
16 different cleaning steps that one runs. Alkaline
17 cleaning will not go after waxes and some of the
18 greases, some of the silicone greases it won't have any
19 effect on. You need different solvents, different
20 methods.

21 It depends upon, and the key to cleaning is,
22 what are you cleaning? What's the contaminant you're
23 trying to clean? And so you usually choose a system to
24 do just that.

1 MR. GATTOLIN: In your mind, the individuals
2 doing the cleaning, the processing and the examination
3 of an FPI, what are some of the qualities that you
4 believe they should have?

5 THE WITNESS: I agree with Mr. Hahn, I think
6 creative detail is very important. I think it's also
7 important to have someone very conscientious. And of
8 course, honesty. And to be able to read the sheets and
9 know what materials are, the different codes that are
10 applied. And that becomes apparent to detail.

11 MR. GATTOLIN: Why would it be important for
12 supervisors in the cleaning and FPI shop to understand
13 each other's processes, and to what detail would they
14 need to understand each other's processes?

15 THE WITNESS: It would be utopia if they did.
16 But it's very unusual to have them even talk to each
17 other.

18 It would nice if they knew and understood
19 what both had to deal with and the requirements for
20 both processes. In most cases, neither foreman has an
21 understanding of what the other has to do.

22 MR. GATTOLIN: Why would it be good or nice
23 to have them understand?

24 THE WITNESS: Well, it would be very nice

1 because then the foreman in the cleaning end of the
2 process then would have a better feel for what has to
3 come off those parts, what kind of cleaning has to be
4 done, what kind of controls need to be in existence to
5 assure that a good, clean part gets on into penetrant.

6 And vice versa, the penetrant guy then would
7 have a better feel for knowing what type of cleaner is
8 being used, what kinds of things could be left in the
9 crack, what effect that would have on some of the
10 penetrants, and what he would see in case of some of
11 the indications.

12 MR. GATTOLIN: Okay. As I asked Mr. Hahn,
13 and he elaborated to some degree on this, what are the
14 incorrect perceptions held by industry that this
15 process of aqueous cleaning and FPI can accomplish that
16 you are aware of?

17 THE WITNESS: Incorrect?

18 MR. GATTOLIN: Yes. What are some of the
19 misconceptions, if you will?

20 THE WITNESS: That aqueous cleaning will
21 clean everything. I think that's one of the biggest
22 things that people have to deal with. It won't clean
23 all kinds of soils and things. That penetrant is an
24 ineffectual method. There's a variety of different

1 idiosyncracies that people have assigned, good or bad.

2 MR. GATTOLIN: What do you mean by that, if I
3 may ask?

4 THE WITNESS: People have assigned the fact
5 that FPI or fluorescent penetrant is not a very viable
6 method, that there should be other means,
7 electronically or whatever. For the type of parts, for
8 the number of parts, for the conditions and the things
9 that have to be found, it becomes the only method of
10 choice that will do those kinds of things. And you
11 can't choose a method that will solve all the problems.

12 MR. GATTOLIN: Okay. Is the FPI procedure
13 tolerant of operational, operator error? And how
14 tolerant would it be? Again, that's not trying to be a
15 trick question.

16 THE WITNESS: No, I understand. I think the
17 penetrant materials became a lot more tolerant since
18 the specifications changed back in 1984. They are a
19 lot more resistant to over-washing, to thermal fade, to
20 ultraviolet fade, to some of the parameters that the
21 parts would see in the process itself.

22 MR. GATTOLIN: What type of things are you
23 aware of that would cause the cleaning process to just
24 completely break down, or, that would not be a right

1 way to say it. I apologize. Let's say that would make
2 the cleaning process questionable, would give some fits
3 to people on the FPI side.

4 THE WITNESS: Well, anything that you can
5 leave on the surface, any residue that you leave is
6 going to be a problem for FPI. And most cleaning is
7 done to paint parts. And that's detrimental for a
8 penetrant inspection. You want to ensure you have a
9 clean surface that has no residue. And you also want
10 to make sure that any indications or cracks have no
11 residue from the cleaning compound.

12 MR. GATTOLIN: Okay. In the, could you
13 address the emulsification of the part, as to what
14 problems it could create, over or under?

15 THE WITNESS: Well, over-emulsification, you
16 always have the risk of washing away the penetrant. If
17 you take the penetrant away, then you certainly will
18 not have a very good inspection. If you under-
19 emulsify, then you're going to have a background, or
20 you're going to leave surface penetrant on there, and
21 it will be difficult or impossible to find indications
22 in that field.

23 MR. GATTOLIN: Okay.

24 THE WITNESS: Now, in the case of some of the

1 particular parts, they're restricted as to how long
2 they can be emulsified.

3 MR. GATTOLIN: Okay. All right. How large
4 of a crack can the FPI miss?

5 THE WITNESS: It depends upon the processing.
6 It would be more consistent how small a crack will it
7 find.

8 MR. GATTOLIN: Okay, how small a crack will
9 it find?

10 THE WITNESS: It's not the material itself,
11 it's, can it be seen. The material can easily find and
12 the industry has proven in many cases that 5,000,
13 15,000 on a reliable large, huge part, you'd be lucky
14 to find a 50,000 reliable.

15 MR. GATTOLIN: Okay. And with regard to
16 inspector handling, what are some of the problems with
17 the handling of a part during the examination?

18 THE WITNESS: You always worry about smudging
19 indication, you always worry about creating
20 indications, masking indications with touching it with
21 penetrant, per se. You can give yourself false
22 indications or you can actually take indications away
23 so that they're not seen by rubbing off the developer.

24 MR. GATTOLIN: How would you the indication?

1 THE WITNESS: Well, by having a penetrant on
2 your glove, hand or in the area that it could rub onto
3 from a roller, from a strap, from whatever.

4 MR. GATTOLIN: Okay. How do you feel an
5 inspector's daily performance should be checked? We
6 can go to the utopian world, or we can go to the real
7 world.

8 THE WITNESS: Well, if you had utopia, the
9 ideal thing is to have actual parts. You have actual
10 parts, you have the other side of the coin, as was
11 brought up, you know, how do you ensure those parts
12 stay where they should be, and not out into the real
13 world.

14 Then to do that, then you have to put some
15 kind of a marking on it. If you put a marking on it,
16 then you've defeated your purpose. So it becomes a
17 difficult situation.

18 The key I guess would be to have some kind of
19 a test piece that you could run in some kind of
20 periodic testing loop, fatigue cracks, whatever.

21 MR. GATTOLIN: And the test piece, would it
22 just be a block of aluminum or an actual part?

23 THE WITNESS: Well, GE has a series of test
24 pieces that are low cycle fatigue cracks. They're very

1 expensive, but there's a variety of cracks, anywhere
2 from 10,000ths to 60,000ths. And those cracks, and GE
3 will go around to different vendors and take their
4 little set of cracks and say, okay, process these and
5 let me know what you see. And they evaluate people
6 that way.

7 MR. GATTOLIN: Okay. The examination area,
8 where the inspector will be working. Could you address
9 from your vantage point how this should, the
10 environment should be for this inspector, as well as
11 the types of tools, what's available, what would be a
12 good thing for him to have?

13 THE WITNESS: Ideally, the first thing you'd
14 like him to have is some way to manipulate the part, so
15 he doesn't have to stand on his head. The more he can
16 move the part around realistically without having to
17 try to manhandle things, the better the inspection will
18 be.

19 MR. GATTOLIN: Okay.

20 THE WITNESS: You always want enough room
21 that you can move parts in and out, and the man around
22 the inspection piece. You certainly would like it
23 clean, you would like it tidy, you would like it
24 uncontaminated. And also, you'd want an adequate black

1 light.

2 MR. GATTOLIN: What's the problem with having
3 the fluorescence residue in the area? What does that
4 cause?

5 THE WITNESS: Well, you always sum the risk
6 of taking a part of an indication that's flaked off and
7 putting it back onto a part. Now, if that indication's
8 back on the part, by rights, the individual, the
9 inspector then is going to have to go through a
10 rebleed, or a reevaluation of that particular area.
11 That adds to the time the part's going to be in there.

12 MR. GATTOLIN: All right. Are there checks
13 for, pardon the term, good dye and emulsifier, or
14 usable? What types of checks are there?

15 THE WITNESS: There's a lot of specification
16 and a lot of primes and a lot of civilian
17 specifications now that has a whole litany of in-use
18 penetrant testing. And there are periodic tests that
19 are required to be made. In the case of fluorescent
20 dye, the test calls out a quarterly inspection with a
21 fluorometer. It's an ASTM 1135 test. That's mandated
22 every quarter.

23 There is tests for the emulsifier, there's
24 refractometer tests that one does weekly, there's

1 removability tests that one does. One has to have some
2 kind of sandblasted panels to run side by side
3 comparisons. There's a variety of tests and in-use
4 testing that are required in both civilian and prime
5 specifications.

6 MR. GATTOLIN: Okay. On tam panels, we'd
7 spoken about this in the past in my request for
8 information. But what is the purpose of a tam panel,
9 and how should it be cleaned and stored?

10 THE WITNESS: The purpose of the panel, which
11 was produced back in the 1970s, was created for just to
12 ensure that the penetrant line is performing.

13 The whole idea of the panel was to ensure
14 that if I run a panel and I see how many cracks I see,
15 whether it's three, four or five, that I see that
16 number of cracks every day, that I see that crack as
17 bright yellow-green. I don't see it blue-white. I
18 don't see a dull indication. I see a bright
19 indication. I don't see a large amount of background.

20 It was produced and required for the testing of the
21 line itself, to assure that all the processing is being
22 done correctly.

23 As far as cleaning and how you clean,
24 ultrasonic cleaning with some kind of solvent has

1 always been the best method. But before it goes in
2 that, it should go through a surfactant and water rinse
3 to get the developer off, and then dry and then into
4 your ultrasonic cleaner.

5 MR. GATTOLIN: Okay, and how should that
6 panel be stored? Just hang it out in the open or a
7 drawer with other parts?

8 THE WITNESS: It gets stored in a variety of
9 ways. The ideal situation is to store it in a solvent.
10 But you have to realize that when you come out the
11 next morning to run that panel that you have to give
12 that solvent some time to evaporate before you process
13 that panel.

14 MR. GATTOLIN: Okay. In the aqueous cleaning
15 area, again, what type of products can compromise the
16 ability of materials to perform as they are supposed
17 to? Say for your products, how are they involved?

18 THE WITNESS: In the cleaning itself?

19 MR. GATTOLIN: Yes, sir.

20 THE WITNESS: The concern always is what
21 you're going to leave in the crack. If you leave any
22 alkaline and go through a dryer, as normally would
23 happen, you now have the risk of evaporating off the
24 water and now you have a very caustic situation in that

1 crack. That caustic material will go after the
2 penetrant. It goes after the fluorescent dye. And you
3 run the risk of having no indication.

4 MR. GATTOLIN: Okay. Would you address the
5 limitations, we've heard an explanation of flash
6 drying, what it is, would you care to add anything to
7 the explanation of flash drying?

8 THE WITNESS: I think it's been described as
9 well as I could do.

10 MR. GATTOLIN: Are there any limitations to
11 flash drying that you would like to discuss?

12 THE WITNESS: I don't know about limitations.
13 I just, it would be a concern in the different
14 humidities and the different parts of the country how
15 well the system would work. And then you look at the
16 international market and it becomes even more suspect.

17 MR. GATTOLIN: In what way, if I may ask?

18 THE WITNESS: You're into different
19 humidities, you're into different temperature ranges,
20 from very cold to very hot.

21 MR. GATTOLIN: Can flash drying get rid of
22 trapped water, such as in a crack? From your
23 experience?

24 THE WITNESS: Again, it's going to depend

1 upon the crack. If it's a very shallow tool mark, if
2 you will, a scratch, it may do very well. If it's a
3 fairly deep fatigue crack, which is what this
4 particular situation is, it's doubtful whether you're
5 going to remove that from a fatigue crack. And it's
6 going to depend on the depth of that crack. The deeper
7 the crack, the worse the case.

8 MR. GATTOLIN: Do you concur with Mr. Hahn
9 that a sure way of getting the water from these cracks,
10 potential cracks, would be the use of either oven
11 drying or hot air blowing over the part?

12 THE WITNESS: Oven drying will get you better
13 conditions than the blowing hot air. The concern of
14 hot air, in any area you blow, you always want to make
15 sure it's filtered air.

16 MR. GATTOLIN: All right. Now, in the flash
17 drying process, what is the method that the operator
18 would be able to use to determine the temperature of a
19 part that is in its final hot water rinse? What are
20 some of the methods that you're aware of? Some folks
21 will say, leave it in for one minute or two minutes.
22 We've done this testing, I don't know what type of
23 testing it was, but what can be done?

24 THE WITNESS: I would assume that they have

1 some kind of guidelines and that someone would have
2 done some research to provide that information on that
3 part. To just make an arbitrary statement of one
4 minute or two minutes will get you the temperatures you
5 need, I don't know how you could do that.

6 There's temple sticks, there's surface
7 thermometers, there's thermal imaging type apparatus
8 that one can use, whether they're available or not I
9 don't know.

10 MR. GATTOLIN: So you're saying, you would
11 just leave it up to the operator to determine if it's
12 hot? How do you feel about that?

13 THE WITNESS: I think you're placing an awful
14 lot of a burden on an operator that really doesn't have
15 all the information he needs.

16 MR. GATTOLIN: Okay. The plastic bead or, I
17 keep saying bead because that was the first thing I
18 heard, but the plastic medium blasting to clean a part,
19 to get rid of the scales, so on and so forth, what are
20 some of the problems that can create?

21 THE WITNESS: Well, again, I think it was
22 addressed earlier today, you do have to worry about
23 peening, you have to worry about smearing meld, you do
24 have to worry about shearing, and plugging indications

1 with the plastic. Those are all very much concerns.

2 MR. GATTOLIN: Is that something that exists
3 in the real world in your mind?

4 THE WITNESS: Extremely so.

5 MR. GATTOLIN: Very likely?

6 THE WITNESS: And it's a great concern when
7 you don't follow it with some other kind of step, with
8 a washing step.

9 MR. GATTOLIN: What type of washing step
10 would be used?

11 THE WITNESS: One would need an aggressive
12 surfactant of some sort, even another alkaline rinse
13 would behoove you. You could get some lubricity to get
14 some of the dust and the plastic away.

15 MR. GATTOLIN: How about if it was to be
16 blown off just with an air hose?

17 THE WITNESS: Again, I think you're into the
18 experimental stage.

19 MR. GATTOLIN: Okay. In your opinion, should
20 the plastic medium blasting be performed before dye
21 penetrant immersion without the use of additional
22 cleaners?

23 THE WITNESS: I think you're just adding
24 another variable to the process of whether you'll get a

1 good indication or not.

2 MR. GATTOLIN: By putting it in there without
3 doing the cleaning? Okay.

4 Now, in your mind, do you feel that there is,
5 that redundancy in crack detection would be beneficial
6 and cost effective or would it be something that would
7 be nice to have but hard to do?

8 THE WITNESS: Redundancy meaning?

9 MR. GATTOLIN: Meaning we have an FPI and
10 then we'll use, oh, in the case of this we'll use eddy
11 current and perhaps we'll do something else besides
12 that.

13 THE WITNESS: There is a lot of that in
14 process right now. There are several companies that
15 will do tandem inspections. That is not unusual to do.
16 And that's, again, it's because there's no one
17 methodology that will solve all your problems.

18 MR. GATTOLIN: All right. Mr. Chairman, I
19 have completed my line of questioning. Thank you.

20 CHAIRMAN GOGLIA: Any further questions from
21 the technical panel?

22 MR. CONROY: Yes, sir, one or two questions.

23 Just to clear up in my own mind, you
24 mentioned earlier in your testimony with Mr. Gattolin

1 the problems, and I believe you were talking about
2 cleaning over or under, is that a phrase you used, that
3 you could, you have a chance of losing your indication
4 by two?

5 THE WITNESS: I think we were talking about
6 emulsification at that point.

7 MR. CONROY: Okay. Could you explain that a
8 little bit, and which do you see most often?

9 THE WITNESS: Usually you'll see
10 over-emulsification more than under-emulsification.
11 Under-emulsification means that the part will come into
12 the inspection booth and after developer is applied,
13 you have a whole green glowing part. And that at that
14 point, you're very assured that there is a problem and
15 it usually goes back and then is reprocessed.

16 When you over-emulsify, you run the risk of
17 washing indications away. And there is no guarantee
18 other than the fact that the part looks awfully clean,
19 to assess that you have over-emulsified the part.

20 MR. CONROY: Do you see one more than the
21 other?

22 THE WITNESS: Over-emulsification.

23 MR. CONROY: The part looks awfully clean, is
24 your phrase?

1 THE WITNESS: Yes.

2 MR. CONROY: If it's under-emulsified, do
3 these indications remain?

4 THE WITNESS: The indications are there, but
5 the problem is that you have so much background that
6 you can't evaluate the indications. And so it's, the
7 part at that point goes back through cleaning and
8 reprocessing.

9 MR. CONROY: What we call a false positive,
10 if we had so much background?

11 THE WITNESS: Well, you can't even call it an
12 indication, because the background is so large that you
13 don't know that anything exists.

14 MR. CONROY: I see. And Mr. Gattolin had
15 asked you I think in some of his first questions
16 regarding your setting up procedures, or do you set up
17 procedures with various manufacturers in the use of
18 your product, and how formally do you get involved, and
19 the question goes to follow-up as well?

20 THE WITNESS: It would be awful impossible to
21 say that we set up conditions. Usually the conditions
22 exist from the people that the party is doing work for.

23 They have a set of requirements for those
24 parts, the type of material that will be used, and some

1 of the engine manufacturers even go so far as to say
2 how long you can pre-wash, how long you can emulsify.

3 So those conditions are there. They are
4 requirements. You hope to show them the right material
5 to be able to use. And that's about the most you can
6 do for them.

7 MR. CONROY: Would you make suggestions if
8 you thought the time should be changed?

9 THE WITNESS: I could make suggestions, but
10 in the case of one engine manufacturer, those times are
11 set in stone and they mean nothing, you can't change
12 them.

13 MR. CONROY: Thank you very much.

14 Thank you, Mr. Chairman.

15 CHAIRMAN GOGLIA: Any further questions from
16 the technical panel?

17 MR. EINDLER: Based upon your experience, how
18 long a time can you expect a normal FPI inspector to
19 work non-stop in a dark room with reliable results?

20 THE WITNESS: Non-stop for what time frame?

21 MR. EINDLER: Yes.

22 THE WITNESS: How long?

23 MR. EINDLER: Yes, how long time? I mean,
24 it's a matter of human factor here, and what would be a

1 normal duration non-stop working?

2 THE WITNESS: Every individual is different.

3 Usually most inspectors would like to finish a part,
4 depending upon the size of the part, it may be several
5 hours. Every indication that shows up, to evaluate
6 that indication, a white light is turned out to
7 evaluate what that indication really is. And so then
8 you have some time frame to go back.

9 When you get into rebleeding indications, you
10 have to allow that developer to develop for, and
11 unfortunately, if people are working 1417 now, it's
12 only a three minute duration. Otherwise it was a 10
13 minute duration for every rebleeded indication.

14 So every time you saw something, that just
15 added more time to how long you're going to be in
16 there. It's not unusual for people to be there for an
17 hour, hour and a half, two hours, three hours, going
18 over a part.

19 MR. EINDLER: Okay, so you have the feeling
20 that does not affect the reliability of the inspection?

21 THE WITNESS: I don't know how you could
22 establish a time frame for every individual. It would
23 be impossible to say that after a certain five minute,
24 ten minute, hour, somebody isn't doing as thorough and

1 as good a job as he did 10 minutes ago. It would be
2 impossible to put a time frame on that.

3 MR. EINDLER: Okay. No more questions, Mr.
4 Chairman.

5 CHAIRMAN GOGLIA: To the parties, Federal
6 Aviation Administration?

7 MR. DONNER: Yes, sir, just a couple.

8 Mr. Robinson, I heard your remarks on oven
9 drying, and I wondered if that represented your view or
10 the view of your company, the Sherwin Company. Does
11 Sherwin recommend oven drying after cleaning?

12 THE WITNESS: If you get into the standard
13 committee type specifications, it's been mandated in
14 165 after alkaline cleaning since day one. Can we
15 mandate such a requirement? No. Can we strongly
16 suggest it? Yes.

17 But you have to realize, that in most cases
18 what we're starting to see now is a vapor degreasing
19 industry that's being changed over to an alkaline
20 cleaning. In the case of vapor degreasing, you didn't
21 have a drying oven, because the part came out hot, the
22 solvent evaporated and it went right over to penetrant.

23 So you're into a catchup phase right now,
24 where people have to cycle up for new tanks and

1 requirements.

2 MR. DONNER: Did I hear you just mention that
3 there was an industry standard or an SAE standard?

4 THE WITNESS: There's an SAE standard called
5 E165 that mandates or calls out, I should say calls
6 out, if you're going to do alkaline cleaning, that you
7 oven dry.

8 MR. DONNER: Okay, thank you. You were
9 talking about tam panels and the cleaning process for
10 them. Is there a standard or a written guidance of any
11 kind for the proper handling of tam panels?

12 THE WITNESS: Last week, I just put on a
13 little discussion of tam panels at ASNT. And before
14 that, I also put out a paper on the guidelines.
15 Because there's been some general things that I've
16 done.

17 But I think both Magnaflux and myself put out
18 a brochure with the panel that talks about proper
19 cleaning, talks about the steps. In our case, we go so
20 far as to talk about what it should really be used and
21 how to clean it, how to store it, that kind of stuff.
22 And that's been around for a long time.

23 MR. DONNER: Okay, thank you very much, sir.

24 CHAIRMAN GOGLIA: Pratt & Whitney?

1 MR. YOUNG: No questions, Mr. Chairman.

2 CHAIRMAN GOGLIA: ALPA?

3 MR. MC CARTHY: No questions, Mr. Chairman.

4 CHAIRMAN GOGLIA: Volvo?

5 MR. THOREN: No questions, Mr. Chairman.

6 CHAIRMAN GOGLIA: Delta?

7 MR. VALEIKA: No questions, sir.

8 MR. STEELHAMMER: No questions, Mr. Chairman.

9 CHAIRMAN GOGLIA: That's the quiet end of the
10 room over there.

11 Dr. Ellingstad?

12 MR. ELLINGSTAD: Just one question. Are you
13 aware of any company that employs a regular systematic
14 testing of inspectors using specimens such as the GE
15 cracked specimen that you talked about?

16 THE WITNESS: GE had a program not too long
17 ago that they reported at one of the ASNT conferences,
18 and talked about their viability of going around and
19 testing different airlines around the world. And they
20 shared those results at that meeting. And GE is one of
21 the few, I know PRI gets into the madcap audits and
22 things, and they have some of those things that they
23 run periodically.

24 MR. ELLINGSTAD: Thank you.

1 CHAIRMAN GOGLIA: Mr. Haueter?

2 MR. HAUETER: No questions.

3 CHAIRMAN GOGLIA: And the Chairman has no
4 questions. So Mr. Robinson, thank you very much for
5 sharing your knowledge with us. You're released.

6 THE WITNESS: Thank you.

7 (Witness excused.)

8 CHAIRMAN GOGLIA: Why don't we take a brief
9 break, and we will come back with Mr. Grainger.

10 (Whereupon, a brief recess was taken.)

11 CHAIRMAN GOGLIA: We're ready to go back on
12 the record.

13 Our next witness will be John Grainger.

14 (Witness testimony continues on the next page.)

15

16 JOHN GRAINGER, DIRECTOR OF TECHNICAL SERVICES.

17 TURCO CORPORATION, CORNWELL HEIGHTS, PENNSYLVANIA

18 Whereupon,

19 JOHN GRAINGER

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

23 MR. HAUETER: Mr. Grainger, could you provide
24 your full name and place of employment for the record,

1 please?

2 THE WITNESS: My name is John Grainger, I'm
3 with Turco Products, working out of Long Beach,
4 California.

5 MR. HAUETER: And what's your position with
6 Turco?

7 THE WITNESS: I am the director of technical
8 services.

9 MR. HAUETER: And could you provide a brief
10 background of your experience in the field?

11 THE WITNESS: I have a B.S. in chemistry from
12 the California State University of Los Angeles. I've
13 been working with Turco for 35 years, primarily in
14 research and development, including penetrant
15 materials.

16 MR. HAUETER: Mr. Gattolin?

17 MR. GATTOLIN: Thank you.

18 Good afternoon, Mr. Grainger.

19 THE WITNESS: Good afternoon.

20 MR. GATTOLIN: We'll start off with some
21 questions that may be redundant in the minds of many,
22 but I'd like to have some answers, if I could, then
23 we'll go into some other areas.

24 THE WITNESS: Sure.

1 MR. GATTOLIN: Does your company, Turco,
2 provide any hardware, or offer hardware to the users of
3 your chemicals for cleaning and FPI process?

4 THE WITNESS: Not for FPI processing.

5 MR. GATTOLIN: Not for the FPI process or the
6 cleaning?

7 THE WITNESS: No.

8 MR. GATTOLIN: When the Turco set up the
9 process that Delta, or participated in setting this
10 process up, did you also work with Pratt & Whitney to
11 meet the specifications that they had stated?

12 THE WITNESS: We'd had our products qualified
13 by Pratt & Whitney.

14 MR. GATTOLIN: Pardon me, sir?

15 THE WITNESS: We'd had our products qualified
16 by Pratt and Whitney.

17 MR. GATTOLIN: Does that mean a special,
18 specific mil spec, is that what you're saying?

19 THE WITNESS: Both the mil spec and Pratt &
20 Whitney qualification also.

21 MR. GATTOLIN: And is that as far as it went?

22 THE WITNESS: That's as far as it went.

23 MR. GATTOLIN: Okay, thank you. Do you, did
24 you assist Delta in setting up the cleaning and

1 inspection process? Did you have representatives down
2 there assisting them with the quality controls and
3 making sure things were proper, relative to your
4 products and to what Pratt and Whitney wanted?

5 THE WITNESS: I'm not aware of any particular
6 assistance we gave them. That happened quite a long
7 time ago.

8 MR. GATTOLIN: Okay. Do you work with new
9 companies in this manner, i.e., do you go and help them
10 set them up now, as things change since you started?

11 THE WITNESS: Our customers are entirely
12 aircraft, aerospace customers, and they tend to be very
13 sophisticated about what they're doing. They generally
14 require no assistance.

15 MR. GATTOLIN: Okay, so basically you're a
16 seller or purveyor of the chemicals and that would be
17 it?

18 THE WITNESS: Well, we provide assistance in
19 their other processes, but not their FPI processing.
20 They're more likely to require assistance in the
21 cleaning end of the process, for example.

22 MR. GATTOLIN: What types of interactions has
23 Turco had with Delta over the years, relative to shop
24 visits and audits, things of this nature? Have these

1 been done on a consistent basis, whether it's one year,
2 two years, six months, whatever?

3 THE WITNESS: We have a representative in
4 Atlanta that calls on them on a regular basis every
5 couple of weeks or so.

6 MR. GATTOLIN: He's called in by Delta?

7 THE WITNESS: No, he makes routine calls on
8 them.

9 MR. GATTOLIN: Okay.

10 THE WITNESS: Takesamples of their tanks,
11 brings it back for analysis, gives them whatever
12 assistance they may need with the other chemicals
13 they're using of ours.

14 MR. GATTOLIN: Does he report basic, does he
15 report back to you with the results of his visits, or
16 is it just something that he does as part of the weekly
17 routine?

18 THE WITNESS: It's something he does on a
19 routine basis, if he runs into any difficulties or any
20 technical problems, he would contact me.

21 MR. GATTOLIN: Okay. We've heard the other
22 gentleman discuss what they feel would be the
23 responsibilities relative to the cleaning and FPI shop
24 foreman. Do you care to add anything to this, or do

1 you concur with what they stated? How do you feel what
2 knowledge level should be for the other discipline?

3 THE WITNESS: I think it is most useful if
4 everybody involved in the process has some
5 understanding of the whole process rather than just his
6 own particular part of it. So if you're referring back
7 to the question about whether the people in the FPI
8 process should understand the cleaning process and vice
9 versa, I would concur with that.

10 MR. GATTOLIN: And why do you feel it's
11 necessary? We've had the others answer, I'd like to
12 have your feelings. Why would you feel it's important?

13 THE WITNESS: Just as a general rule, the
14 more your employees know about the whole process, the
15 better job they can do for you, I think.

16 MR. GATTOLIN: In the process of the FPI
17 where the application of developer is put onto the part
18 to be inspected, if the dwell time is shortened up, and
19 I can't recall, and that's why I'm asking you again, so
20 it will get planted in my brain, if the dwell time is
21 less than what's prescribed using your products, what
22 is the result when the inspector begins to look at the
23 part? What will happen?

24 THE WITNESS: You're referring to the dwell

1 time of the penetrant or the emulsifier?

2 MR. GATTOLIN: No, the time of the, the time
3 the developer stays on.

4 THE WITNESS: The shorter the time, the less
5 chance you will have to find an indication, the less
6 time there will be for the capillary action to pull the
7 penetrant out of the defect.

8 MR. GATTOLIN: Okay. What are some of the
9 problems you have seen with inspector handling? What
10 are some things that have been a problem for you or the
11 process?

12 THE WITNESS: The primary problems you're
13 liable to have with the inspector handling a part would
14 be either smearing an indication around or
15 contaminating the part with penetrant and getting false
16 indications.

17 MR. GATTOLIN: False indications. All right.
18 I've asked this question before, but what's the
19 largest crack that this FPI process can miss? What
20 type of crack could it miss, and why?

21 THE WITNESS: In order for it to detect a
22 crack to begin with, a crack has to be open to the
23 surface. If there's any foreign material in the crack,
24 he would be liable to miss it.

1 As far as the largest crack he could miss,
2 it's impossible to say. It depends on the condition of
3 the crack.

4 MR. GATTOLIN: Foreign material would be
5 what?

6 THE WITNESS: Water, soil, anything that may
7 find its way into a crack.

8 MR. GATTOLIN: Okay. In the cleaning
9 process, we're talking your products now and also in
10 general, what are some of the product errors or
11 problems with products that would compromise cleaning?

12 We have your 5948, I believe it is, which is the
13 alkaline cleaner?

14 THE WITNESS: 5948R is the alkaline cleaner
15 they use.

16 MR. GATTOLIN: Right. What would be some of
17 the problems that would keep it from performing its
18 task?

19 THE WITNESS: If the concentration were too
20 high enough or if it were too high, if the temperature
21 were too low, if it were heavily contaminated with soil
22 from just being old.

23 MR. GATTOLIN: When you say what is the
24 temperature, usually what temperature should that

1 product be?

2 THE WITNESS: I believe they run it about
3 140.

4 MR. GATTOLIN: And if it's too high, what
5 happens?

6 THE WITNESS: Nothing really happens if it's
7 too high. You get better cleaning. Nothing
8 detrimental happens.

9 MR. GATTOLIN: Oh, I thought you said if it
10 was too high, or too low.

11 THE WITNESS: If it's too low, your cleaning
12 efficiency drops off with temperature.

13 MR. GATTOLIN: Okay, very good. So it sounds
14 as though the things that are most important in the
15 cleaning aspect would be the temperature of the liquid
16 and the cleanliness of this liquid.

17 THE WITNESS: And the concentration.

18 MR. GATTOLIN: And the concentration of the
19 liquid. How do you recommend that they go about
20 checking for the concentration of the liquid or the
21 cleanliness of it?

22 THE WITNESS: There's a saturation procedure
23 to use to determine the concentration of the liquid.
24 For the cleanliness, you generally begin to see a

1 decrease in your cleaning efficiency when the cleaning
2 bath becomes contaminated.

3 MR. GATTOLIN: Okay. How do you determine if
4 it's at that point, once again?

5 THE WITNESS: You get products coming out
6 that are not clean. Or it takes longer to clean them.

7 MR. GATTOLIN: Okay, very good. Would you
8 give me, could you give us a summary of the industry
9 specifications that relate to the FPI process that
10 you're familiar with and believe are important to
11 observe?

12 THE WITNESS: The specifications?

13 MR. GATTOLIN: Yes, sir, the industry specs.

14 THE WITNESS: The mil I25135 is the
15 controlling spec for all of these penetrant inspection
16 materials. In addition to that, there are ASTM
17 specifications, I don't recall the numbers of them off-
18 hand. And the OEMs have specifications of their own
19 that they refer to.

20 MR. GATTOLIN: Okay. When you work with, or
21 I should say, do you work with Pratt & Whitney in the
22 use of your products using their procedures?

23 THE WITNESS: You're referring strictly to --

24 MR. GATTOLIN: FPI only, cleaning and FPI.

1 THE WITNESS: We generally do very little
2 with them in that regard. There's, these products are
3 well established and well known. There's generally not
4 much in the way of problems to work with on.

5 MR. GATTOLIN: All right, thank you.

6 The limitations, we've heard descriptions on
7 that of flash drying and some of the limitations.
8 Would you have anything you'd care to add to the flash
9 drying limitations or problems with flash drying or
10 purposes or whatever?

11 THE WITNESS: I'd be a little less skeptical
12 about how completely flash drying dries a part. I've
13 got no data to back it up, but my experience and just
14 observations, a part removed from a hot water tank
15 dries very quickly. Unless there's puddling, or
16 collection of water in some recesses or things like
17 that. But a thin film of surface water on a part would
18 dry very quickly.

19 MR. GATTOLIN: And flash drying is
20 essentially for surface drying, correct?

21 THE WITNESS: Right.

22 MR. GATTOLIN: What method is available, to
23 your knowledge, to ensure that water from cracks, other
24 than perhaps just surface cracks, is available to

1 people to get this water out of the cracks? What are
2 some of the methods you're familiar with?

3 THE WITNESS: I'm not familiar with any test
4 method to ensure that you've driven all the water out
5 of a crack.

6 MR. GATTOLIN: Is there another method
7 besides flash drying that may have a greater potential
8 for success?

9 THE WITNESS: Generally, the longer you dry a
10 part, and the higher temperature you dry it at, gives
11 you a better chance of success. So if you really want
12 to be completely sure that you're drying all the water
13 out of all the possible defects or cracks that might be
14 there, you'd have to have it in an oven at a high
15 temperature for a long time.

16 MR. GATTOLIN: Okay. Now, if the water's not
17 removed from the crack during this flash drying, or
18 some of it's not removed, how will that affect the
19 inspection down the line? Say that some of it did
20 manage to perk out during the flash drying process.
21 What can take place, once this object is placed into
22 the dye and goes through the rinsing and emulsion?
23 What problems would we encounter?

24 THE WITNESS: I believe that if you got some

1 of the water or most of the water out of the crack but
2 there was still some left in the bottom of the crack,
3 you would still see an indication of the crack. If you
4 left all the water in there, of course, you wouldn't
5 see it. But I don't believe you'd leave all the water
6 in.

7 MR. GATTOLIN: Pardon me, sir?

8 THE WITNESS: I don't believe you would leave
9 all the water in the crack.

10 MR. GATTOLIN: Okay. How does the
11 emulsification process affect the amount of dye that
12 would get into this crack with some water? Would that
13 penetrate that and also leach it out, or what, when you
14 rinse it?

15 THE WITNESS: The emulsification step I don't
16 believe would have any effect on how much dye got into
17 the crack. It would have an effect on how much dye you
18 may remove from the crack.

19 MR. GATTOLIN: That's what I mean, yes.

20 THE WITNESS: I believe the presence of water
21 in the bottom of the crack would have no effect on
22 that.

23 MR. GATTOLIN: Okay. The plastic bead,
24 plastic medium blasting, I'm sorry, is used to clean

1 the part. What are the problems that you're aware of
2 that are associated with plastic medium blasting on
3 parts, that are about to be put into the dye penetrant
4 immersion?

5 THE WITNESS: At the pressures and the
6 impingement angles they're using I think it's very
7 unlikely you're going to drive any plastic particles
8 into any cracks other than the most gross cracks. I
9 think the fine cracks would be very resistant to
10 particle penetration, especially if you're impinging at
11 an angle other than 90 degrees.

12 MR. GATTOLIN: So in other words, if you were
13 to spray the surface area with this medium at, say, a
14 70 degree angle, there would be less likelihood to get
15 anything into that crack?

16 THE WITNESS: I believe so.

17 MR. GATTOLIN: What is that based on? Have
18 you done anything with this, or just your opinion?

19 THE WITNESS: Just my opinion.

20 MR. GATTOLIN: All right. Have you been able
21 to, you've heard the others talk about the methods to
22 double check the cracks and to ensure a better
23 inspection. What is your feeling toward that?

24 THE WITNESS: Redundancy, especially if

1 you're using a different method for the second
2 inspection rather than another penetrant inspection, I
3 think would give you a much higher chance of catching
4 whatever defects might be there.

5 MR. GATTOLIN: Okay, on a type of thing like
6 the hub, an object like the hub, what would you say
7 would be a good redundancy to inspect this hub?

8 THE WITNESS: Eddy current seems like a
9 pretty good choice.

10 MR. GATTOLIN: Eddy current? Okay, very
11 good.

12 All right, Mr. Chairman, I have finished with
13 the questions of this gentleman.

14 CHAIRMAN GOGLIA: Are there any further
15 questions from the technical panel?

16 MR. CONROY: Yes, sir, one or two.

17 CHAIRMAN GOGLIA: Mr. Conroy.

18 MR. CONROY: Thank you.

19 Mr. Grainger, do you work with Delta Air
20 Lines in the use of your product?

21 THE WITNESS: With the use of the penetrant
22 material?

23 MR. CONROY: Yes.

24 THE WITNESS: No. Not that we don't -- we're

1 not asked to work with them. If they had a problem
2 with the use of our product and they asked us to work
3 with them, we'd be happy to work with them. But they
4 so far have not seen a problem they couldn't handle
5 themselves.

6 MR. CONROY: With your materials, using their
7 FPI process, is that correct?

8 THE WITNESS: Right.

9 MR. CONROY: And by your first answer to my
10 first question, then, do you visit them at all
11 regarding how they're doing?

12 THE WITNESS: Penetrant inspection, no.

13 MR. CONROY: Inspection or friendly visit or
14 whatever?

15 THE WITNESS: I have called on Delta in the
16 past to help them with their paint stripping, with
17 their cleaning, with other aspects of their operation,
18 but not their penetration inspection line.

19 MR. CONROY: But you have helped them with
20 cleaning?

21 THE WITNESS: Yes.

22 MR. CONROY: Have they asked you to help them
23 with their procedures in the FPI process, the entire
24 process?

1 THE WITNESS: No, they have not.

2 MR. CONROY: And you said in answer to Mr.
3 Gattolin, you worked with Pratt & Whitney also?

4 THE WITNESS: We work with Pratt & Whitney on
5 other aspects of their business, other than their
6 penetrant inspection.

7 MR. CONROY: I see.

8 THE WITNESS: Again, if they asked us to help
9 them, we'd be happy to help them. But they don't seem
10 to need any help with that.

11 MR. CONROY: I'm almost through. You
12 mentioned that you provide the liquid for the cleaning
13 product. And the FPI product. Did you mention
14 hardware? I'm sorry, I forgot your answer.

15 THE WITNESS: We do not supply hardware.

16 MR. CONROY: Do you supply procedures to
17 companies that use your product?

18 THE WITNESS: The procedures are specified by
19 the OEMs. We have nothing to add to that.

20 MR. CONROY: Do you provide them with a
21 manual of any sort with your product?

22 THE WITNESS: A leaflet describing the
23 properties of the product.

24 MR. CONROY: I see. I thank you very much.

1 Thank you, Mr. Chairman.

2 CHAIRMAN GOGLIA: Anybody else on the
3 technical panel?

4 MR. EINDLER: No questions, Mr. Chairman.

5 CHAIRMAN GOGLIA: We will go the parties,
6 starting with the Federal Aviation Administration.

7 MR. DONNER: We have no questions, Mr.
8 Chairman.

9 CHAIRMAN GOGLIA: Pratt & Whitney?

10 MR. YOUNG: No questions, Mr. Chairman.

11 CHAIRMAN GOGLIA: ALPA?

12 MR. MC CARTHY: No questions, thank you.

13 CHAIRMAN GOGLIA: Volvo?

14 MR. THOREN: No questions, Mr. Chairman.

15 CHAIRMAN GOGLIA: Delta?

16 MR. VALEIKA: No questions, Mr. Chairman.

17 MR. STEELHAMMER: No questions, Mr. Chairman.

18 CHAIRMAN GOGLIA: Dr. Ellingstad?

19 MR. ELLINGSTAD: No questions.

20 CHAIRMAN GOGLIA: Mr. Haueter?

21 MR. HAUETER: I have two.

22 Just to clarify the record, you mentioned
23 that your product was qualified by Pratt & Whitney. Is
24 it also qualified by Rolls Royce and General Electric?

1 THE WITNESS: Yes.

2 MR. HAUETER: And to kind of reverse the
3 question Mr. Gattolin asked, what's the smallest crack
4 you believe can be detected with your product?

5 THE WITNESS: On a practical basis, I believe
6 around 10,000ths of an inch or so. Under special
7 conditions with very careful attention to detail, you
8 can probably go much lower than that. But on a
9 practical, everyday, routine inspection, I think about
10 10,000ths.

11 MR. HAUETER: Okay, thank you very much, sir.

12 CHAIRMAN GOGLIA: I have no questions. Thank
13 you very much for your testimony, and you're released.

14 THE WITNESS: Thank you.

15 (Witness excused.)

16 CHAIRMAN GOGLIA: Our next and final witness
17 for the day will be Mr. Stevens.

18 (Witness testimony continues on the next
19 page.)

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JEFFREY STEVENS, SENIOR MAINTENANCE
DEVELOPMENT ENGINEER, MAINTENANCE DEVELOPMENT,
PRATT & WHITNEY, EAST HARTFORD, CONNECTICUT

Whereupon,

JEFFREY STEVENS

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

MR. HAUETER: And Mr. Stevens, if you would
provide your full name and place of employment for the
record.

THE WITNESS: My name is Jeff Stevens, I'm
employed by Pratt Whitney in East Hartford, for the
past 24 years.

1 MR. HAUETER: And what's your position with
2 Pratt Whitney?

3 THE WITNESS: Senior maintenance development
4 engineer.

5 MR. HAUETER: And could you provide a brief
6 history of your background in aviation?

7 THE WITNESS: I started my career as a
8 draftsman in Pratt Whitney. I've moved into many other
9 areas over the years, such as an inspector in
10 manufacturing, and then into overhaul inspection for a
11 JT9 tear-down and bench inspection.

12 Then I moved into JT8D process planning for a
13 number of years, setting up complete process sheets for
14 the overhaul of the 8D. And then for the past 13 years,
15 I've been responsible for the Pratt Whitney standard
16 practices manual, specifically the SPOPs, which are the
17 service process operating procedures, the standardized
18 procedures that the airlines use around the world.

19 My specialty is chemical cleaning, abrasive
20 blasting, FPI, NPI, and plating. And the qualification
21 of the materials or consumables that are used in those
22 processes.

23 I spend the majority of my time answering
24 wires that come in from the field, averaging over 400

1 responses a year from airlines around the world
2 concerning questions, problems, ideas.

3 And I periodically go ~~ut~~ on shop reviews
4 around the world to review these processes. Within the
5 past eight years, I've reviewed some 28 engine overhaul
6 shops around the world, including a few of those shops
7 twice.

8 MR. HAUETER: Do you have any FAA
9 certificates or ratings?

10 THE WITNESS: No, sir.

11 MR. HAUETER: Thank you.

12 Mr. Gattolin?

13 MR. GATTOLIN: Thank you. Good afternoon,
14 Mr. Stevens.

15 I'd like to start off by asking you what
16 regulations do you have to comply with when you develop
17 the FPI procedures for inclusion in the Pratt Whitney
18 engine manuals?

19 THE WITNESS: The Pratt Whitney procedures,
20 or the SPOPs that are used for FPI have been developed
21 and based on Pratt Whitney manufacturing procedures.
22 It's our Pratt Whitney manufacturing NDT lab that
23 qualifies the materials, actually does the testing and
24 qualifies the product and the process.

1 We've over the years simply have taken the
2 process and put it into SOPs for the last 35 years
3 now. And we maintain those processes based on any
4 changes or new data that they receive in testing new
5 products or ideas that come up to modify the products.

6 I also work with them closely as far as the
7 information that I receive or learn from doing shop
8 reviews around the worked as far as some gray areas or
9 shortfalls that could exist in the process, how we can
10 better address those concerns.

11 MR. GATTOLIN: Okay. Standards basically
12 then are, what standards do you include in these
13 procedures? Are there any specific industry standards,
14 or are these things that you folks develop primarily?

15 THE WITNESS: They developed them over the
16 years, they do have basic, as far as the consumable
17 materials they have to meet, there is a mil spec for
18 these that they have to meet. But then Pratt Whitney
19 Manufacturing has their own specification that they
20 test these materials to.

21 MR. GATTOLIN: Okay. And so it's basically
22 again Pratt Whitney standards?

23 THE WITNESS: That's correct. I don't get
24 into that type of testing, but they do issue the PNC

1 number to the product process material control number.

2 And then I would simply use that number added into my
3 overhaul process. Or the PS number for a process
4 solution.

5 MR. GATTOLIN: How many folks at your
6 company, or Pratt Whitney, work in the FPI area for
7 development, and from your manual composition or your
8 SPOPs, why don't you define what those are once again
9 for everybody, the SPOPs.

10 THE WITNESS: SPOP is service process
11 operating procedure.

12 MR. GATTOLIN: Okay, thank you. How many
13 people do you have working in the development of those
14 as well as in the lab and doing FPI?

15 THE WITNESS: It's difficult to give an exact
16 number. I am responsible for the overall technical
17 coordination that goes into the two volumes which are
18 approximately four inches, five inches thick of the
19 standard practices manual. I work with the appropriate
20 groups, whether it be the electrochemistry lab, I would
21 work with them on cleaning, stripping, plating
22 processes.

23 Or I would work with our failure analysis NDT
24 lab on the FPI or manufacturing lab on the materials or

1 even the process. So there's a variety of people. And
2 then I also interface with other groups such as
3 structures, for example, when we get involved with
4 abrasive blasting or materials engineering lab. So
5 there's a variety of groups. It's difficult to say
6 what the numbers are.

7 MR. GATTOLIN: Cast of thousands. All right.

8 I wasn't too sure, would you tell me again what your
9 academic background is that qualifies you for the
10 position that you presently hold?

11 THE WITNESS: My college education is in
12 business. I have taken a Pratt Whitney course in FPI
13 and FMPI.

14 MR. GATTOLIN: Is that the only training
15 you've had? I don't mean to demean that, but have you
16 had other training in FPI processes and NDT?

17 THE WITNESS: No.

18 MR. GATTOLIN: Just the, and would you repeat
19 those courses again, please?

20 THE WITNESS: FPI and FMPI.

21 MR. GATTOLIN: Why don't you tell me what
22 FMPI is?

23 THE WITNESS: It's fluorescent magnetic
24 particle inspection, formerly known as magnetic

1 particle inspection.

2 MR. GATTOLIN: Thank you. I'd like you to
3 kind of describe the differences between vapor
4 degreasing and aqueous cleaning in the preparation for
5 the FPI. What chemicals are used in vapor degreasing,
6 why did we switch away from those, how did that work,
7 and what's different?

8 THE WITNESS: Okay. Essentially vapor
9 degreasing is an old process that goes back to the
10 piston era days. It may have existed well before then,
11 I'm not sure of the exact start. But basically, you
12 use a solvent and you heat it until it boils and
13 creates a vapor.

14 To keep the vapor from escaping from the
15 tank, they have condensing coils, with coolant running
16 through, which has the vapor, the vapor condenses on
17 the tank and then drips back down, so the vapor doesn't
18 escape.

19 There's basically three solvents that have
20 been used over the years, trichlorethylene, which is
21 the most toxic of the three, which was I believe the
22 first solvent that has been used, years ago. Then came
23 perchlorethylene, which is traditionally used in the
24 dry cleaning business.

1 And then later on, in the 1960s to 1970s, 111
2 inhibited trichlorethane. And people moved to the
3 trichlorethane because it had a lower exposure limit,
4 it wasn't as toxic as the other two materials.

5 However, that has since changed over the
6 years, since the Montreal Protocol, because the 111
7 trichlorethane is an upper ozone depleter. This is,
8 that escaping into the atmosphere is what's dissolving
9 the ozone layer.

10 The other two solvents are not upper ozone
11 depleters, but rather they're lower ozone formers. And
12 that is, when they evaporate, and these things do
13 evaporate quickly, when the combine with sunlight,
14 there's a chemical reaction, and they create
15 photochemical smog.

16 So that's a concern in areas where cities
17 that may be entrapped in a valley, local regulations
18 are regulating the use of those materials.

19 So as people moved away from the upper ozone
20 depleting solvents, they faced these other restrictions
21 because these other products had more of a tendency to
22 create smog. And they were also more toxic than the
23 trichlorethane.

24 MR. GATTOLIN: Okay.

1 THE WITNESS: Then there is aqueous
2 degreasing. Aqueous degreasing really started becoming
3 used more widely in the late 1980s. It was around 1988
4 that we created SPOP 209 for the use of it as an
5 alternative to vapor degreasing. And that's its
6 primary purpose, to degrease a part. It doesn't remove
7 rust, scale, or wax.

8 But neither does vapor degreasing. Vapor
9 degreasing will remove wax during the plating process.
10 But it doesn't do anything other than grease and oil.
11 It does not remove carbon. So it does have its
12 limitations.

13 It does have its advantages, and that is that
14 basically the part flash dries. It's a rather fast
15 process.

16 MR. GATTOLIN: It evaporates, you mean?

17 THE WITNESS: That's correct. But to clarify
18 some of the statements that were made by other
19 speakers, Pratt Whitney has never allowed vapor
20 degreasing on titanium alloy parts. And this goes back
21 to the early 1960s, because of the problem with stress
22 corrosion on titanium.

23 All these titanium parts have always been
24 alkaline cleaned, and that is, they've been cleaned in

1 an alkaline rust remover solution. That's our SPOP 18.

2 That process will remove oil, not as
3 effectively as aqueous degreasing. However, titanium
4 parts generally are not very oily. They're not in an
5 oily environment. But they do get a carbon or soot or
6 they will get a carbon on them in a bearing
7 compartment, which is effectively removed by alkaline
8 cleaning. And that is the overhaul cleaning process
9 standard that we always have mandated.

10 MR. GATTOLIN: Okay. So this, it's, the
11 titanium parts have always been aqueously cleaned, or
12 degreased, as you say, and we realize that. And who
13 designed this process, and what evidences were given
14 for success on the drying process, if you will?

15 THE WITNESS: Which one?

16 MR. GATTOLIN: The aqueous degreasing and the
17 subsequent flash drying. What evidences were there or
18 tests that produced evidence that it functioned as it
19 should for the surface, as well as cracks that are
20 visible at the surface going in?

21 THE WITNESS: There was a program in the late
22 1980s that our manufacturing group was working with the
23 Air Force as far as trying to reduce environmental
24 hazards. And one of them was aqueous degreasing. And

1 they did numerous testing of various aqueous degreasing
2 solutions, as far as how effective they were in
3 removing various soils, as well as did they have any
4 effect on the masking or hiding of cracks on parts.

5 And they did not find it to be a problem when
6 used in a controlled fashion, and using the cleaners
7 that we have approved.

8 MR. GATTOLIN: And was this, I'm talking now
9 of the 219 or the series 200 hubs.

10 THE WITNESS: Right.

11 MR. GATTOLIN: Are you just taking that
12 information that was produced a period of time ago and
13 applying it to the cleaning process in 219 as well as
14 the flash drying process?

15 THE WITNESS: Yes. We have approved that
16 process for all parts, titanium and non-titanium parts.

17 MR. GATTOLIN: But has it ever been tested on
18 a 219 to see if it actually works?

19 THE WITNESS: Not specifically. Not
20 specifically on the 219 hub. However, any of the
21 aqueous degreasing processes, because I work with the
22 chemical companies as far as qualifying new aqueous
23 cleaners. All these products are tested for
24 compatibility with engine materials from a stock loss

1 standpoint.

2 But we also require service evaluation of the
3 product for a period of months to see how effectively
4 they clean. And also, is there any problem as far as
5 masking parts, cracks, I'm sorry.

6 MR. GATTOLIN: In the flash drying process,
7 and we'll focus on this a bit if we could, what can
8 compromise its success to get water out of, not just
9 the surface, but out of the cracks that may exist?

10 THE WITNESS: We have not seen a problem as
11 far as water getting into cracks. Because we have
12 processed parts with, titanium parts, sections of
13 parts, with known cracks. And we've repeated those
14 cracks again. And cracks have been found and pointed
15 out to us by our customers, you know, older parts. And
16 these parts have been aqueous degreased.

17 Again, alkaline cleaning has been the
18 standard since the early 1960s, since titanium found
19 its way into the jet engine. And when these parts were
20 evaluated by our lab, again aqueous degreasing was the
21 standard or the process that was used on them.

22 MR. GATTOLIN: Fine. We know that's the
23 standard. My question is, what would compromise the
24 successful flash drying of a crack? What would prevent

1 the water from being dried within that crack, or
2 removed?

3 THE WITNESS: if the, obviously if the water
4 temperature isn't high enough to heat the part
5 sufficiently, or the part isn't left in the water long
6 enough, because it depends on basically the volume of
7 parts that you have in that tank or the mass of the
8 part.

9 But it's easy to see whether or not that part
10 will flash dry. Because when you heat it, our
11 recommended temperature is 150 to 200 degrees. When
12 that part comes out, you will see the water flash dry
13 right off that part.

14 The only area you may see the water remain is
15 in a radius, because of the geometry or pocket. And
16 that would either be suctioned off or blown off or
17 blotted off. And again, you would see that area flash
18 dry.

19 MR. GATTOLIN: Okay, you're talking in
20 surface now?

21 THE WITNESS: That's correct.

22 MR. GATTOLIN: You can see it off the
23 surface?

24 THE WITNESS: That's correct.

1 MR. GATTOLIN: Now, if you had it within the
2 crack at this temperature, how does the person know
3 that this part is up to the same temperature of the
4 water? How do you, how does Pratt Whitney advise or
5 tell the people to know when this part is up to the
6 temperature of the water?

7 THE WITNESS: By the water flash drying off
8 the part.

9 MR. GATTOLIN: So how long should it stay in
10 there? Let me put it this way. When would the
11 operator or the cleaner know to take that part out?

12 THE WITNESS: He would know from experience
13 on how long it would take to heat up a large volume of
14 parts or just one large part, what it takes to get that
15 part to flash dry off.

16 MR. GATTOLIN: So that's basically a
17 perception on his part, correct?

18 THE WITNESS: Yes. Basically, you know, if
19 you leave it in there at least a minute, it's going to
20 heat it up. But if you come out and the water remains
21 on the part, obviously it's not hot enough.

22 And I know there's been some concerns ~~is~~
23 about a humid environment. But I've also been in
24 tropical places around the world where you have high

1 humidity, you can have a thunderstorm and the streets
2 do dry. They don't remain wet.

3 MR. GATTOLIN: Okay, that's fine. All right,
4 the temperature of the water, this is checked on I
5 believe a weekly basis, or do they have, how does an
6 individual know the water temperature?

7 THE WITNESS: We require, in our general
8 section of our standard practices manual, that
9 temperature gauges be used on all heated tanks, whether
10 they be chemical or hot water. And the temperature for
11 all heated tanks in any processes is clearly specified.

12 MR. GATTOLIN: Okay. Now, let's talk about
13 the 219 hub. It goes into a degreaser I believe at 150
14 degrees.

15 THE WITNESS: Somewhere in that area.

16 MR. GATTOLIN: It comes out of that.

17 THE WITNESS: If required. That's an
18 optional process depending on what parts.

19 MR. GATTOLIN: Okay, well, why don't you tell
20 me what process is supposed to be used with the 219
21 temperature wise for each time it's being used, i.e.,
22 it goes into the cleaner, gets out of the cleaner, it's
23 hose rinsed or how is it rinsed, it's dipped in, give
24 me the temperatures, if you would, please.

1 THE WITNESS: Okay. Basically the hub would
2 go into an aqueous degreasing solution tank. These
3 solutions are typically used around between 15 and 25
4 percent concentration. The time on that tank is
5 generally between 5 and 15 minutes, depending on the
6 soil of the part.

7 When it is removed, and again the temperature
8 does vary, depending on the manufacturer's
9 recommendation. Some have a range of 140 to 150,
10 generally in that range.

11 MR. GATTOLIN: Excuse me for one moment, I
12 don't like to do this, to interrupt you. But you said
13 it depends on how dirty the part is is how long you
14 leave it in there.

15 THE WITNESS: That's correct.

16 MR. GATTOLIN: So there's no specific time
17 that that part should soak in the degreasing solution,
18 the Turco solution, it's the first one it goes into?

19 THE WITNESS: Basically a minimum of five
20 minutes.

21 MR. GATTOLIN: And is there a maximum? Until
22 all the junk falls off?

23 THE WITNESS: Between, our range is typically
24 5 and 15 minutes, some of them up to 30 minutes. It

1 depends on what the stock loss testing has been done.
2 We allow one recycle through the solution. So
3 typically, if it was a 5 to 15 minute soak, you can
4 soak it up to 30 minutes no problem.

5 MR. GATTOLIN: So after it comes out of this
6 degreasing solution, what happens next?

7 THE WITNESS: You would power spray rinse, an
8 air assisted rinse, over the aqueous solution tank.
9 And that is to reduce your drag-out of the aqueous
10 solution into your cold water, to reduce the
11 contamination.

12 And also, this serves as a method of
13 replenishing the water into the alkaline tank, because
14 you are constantly losing water through evaporation.

15 Once you power spray rinse off that hub or
16 part, you would go into a cold water agitated rinse
17 tank. And that could be agitated by -- by the way, the
18 alkaline tank should be agitated by mechanical means,
19 whether up and down agitation, solution mixer or a
20 circulation pump.

21 Basically it works on the concept of a
22 dishwasher. The more agitation you have, the more
23 effective cleaning you're going to have.

24 MR. GATTOLIN: Right.

1 THE WITNESS: Then you go, after the rinsing
2 over that tank, you would go into the cold water rinse
3 tank, as we call it, for a cold water immersion.

4 The purpose of this step is to flood all
5 passages, areas of the part, neutralize any alkaline
6 that is on the part, and the air agitation, you can use
7 air agitation, and it should be used on the cold water,
8 to more or less scrub the contaminants from the part.

9 Afterwards, you would come out of that tank
10 and power spray rinse over the cold water tank again to
11 remove this water, so basically you have just a clean,
12 cold, wet part. From there, you would go into the hot
13 water immersion tank. And the purpose of that tank is
14 for flash drying the part.

15 MR. GATTOLIN: Okay, if I may~~s~~ you, the
16 power rinse after it's removed from the cleaner, that
17 is done with basically just city water, cold city
18 water?

19 THE WITNESS: That's correct, with an
20 assisted air, they have air assisted nozzles. This
21 would provide you with a more effective scrubbing.

22 MR. GATTOLIN: With the pressure, like
23 pressure washing a car?

24 THE WITNESS: Correct.

1 MR. GATTOLIN: If this is the hub, then it's
2 sitting, how is it held and how is it rinsed off?

3 THE WITNESS: The hub can be held by a
4 variety of means. You can use like a plastic coated
5 hook through the bore. Or you can lay the hub the rear
6 side down in the basket, or some people have used nylon
7 straps and held the hub.

8 So you would come out and basically you can
9 rotate that basket around or the hook or the strap on a
10 swivel. So you can effectively rinse all sides of the
11 part.

12 MR. GATTOLIN: Okay, then it goes into a cold
13 water rinse tank after that. What's the temperature of
14 that? And how long does it stay in there, usually?

15 THE WITNESS: Ambient temperature. There's
16 no minimum or maximum. Basically just immerse it.
17 It's when it's bubbling away vigorously you're getting
18 a good scrubbing.

19 MR. GATTOLIN: Well, how long does it stay in
20 there?

21 THE WITNESS: You can leave it in there as
22 little as 30 seconds or so.

23 MR. GATTOLIN: And what is normally, how long
24 is it normally left in there?

1 THE WITNESS: Typically 30 seconds or so. In
2 other words, the hoist slowly goes down, it doesn't
3 drop it in fast, and they'll bring it down to
4 completely immerse it. They'll leave it in there 30
5 seconds or longer, and then they'll come out and do the
6 power spraying.

7 MR. GATTOLIN: How long does the power spray
8 take after it's pulled out of the cleaning solution,
9 usually? How long is that power spray?

10 THE WITNESS: It depends on the number of
11 parts, or the --

12 MR. GATTOLIN: We're just talking the hub.

13 THE WITNESS: All right, guesstimating
14 probably 15 seconds, 30 seconds or so.

15 MR. GATTOLIN: Okay. And it goes back into
16 the cold water, as you said, comes out in the power
17 rinse, and it's another 30, 60 second rinse on that?

18 THE WITNESS: The power rinse?

19 MR. GATTOLIN: Yes, after it comes out of the
20 cold water.

21 THE WITNESS: Probably not that long; 30
22 seconds at the most. It doesn't take much to hit all
23 the surfaces of a part effectively.

24 MR. GATTOLIN: So then what happens next is

1 it goes into this, I'm just trying to get the concept
2 down. It goes into the hot water immersion for about a
3 minute or two, right?

4 THE WITNESS: Okay, if you were going to end
5 with the aqueous degrease step, it would go into the
6 hot water for the final flash dry. And I say if. It
7 depends on this part, if it's coming in right off the
8 engine for the very first time, coming from
9 disassembly, it would go into the degrease, and then it
10 would go into our SPOP 18 alkaline clean, which is a
11 rust remover.

12 If the part is coming back from some type of
13 repair, where it was exposed to a coolant cutting oil
14 or machining operation, it would just simply go through
15 the aqueous degreasing step and then the flash drying
16 there. But for the full overhaul cleaning, the next
17 step would be our SPOP 18, where it's immersed in
18 alkaline rust remover, which is a high PH solution.

19 We have two methods in there. We have a one
20 to four minute soak, and the method B is an option
21 which is 15 to 30 minute soak. And there's two
22 different concentrations. The one for four minutes is
23 a strong concentration, and the method B is a weaker
24 concentration at a bit lower temperature.

1 Some customers prefer the 15 to 30 minute
2 soak, which is based on the GE process, and some
3 customers prefer the 1 to 4 minutes soak. Basically,
4 the titanium parts in this hub are not that dirty that
5 you can easily clean this part within one to two
6 minutes.

7 MR. GATTOLIN: Is that the solution that I
8 think has been referred to in the past, if my recall is
9 correct, as the 4181?

10 THE WITNESS: Yes, that's correct, or 4181L
11 is the liquid version. You can buy it as a powder, put
12 it in the water, or you buy it premixed with water and
13 you dilute it.

14 MR. GATTOLIN: So now if I can retrace, I'm
15 getting a little bit fuzzy here, you get the part
16 coming off the engine. Hasn't been to the shop, no
17 one's touched it except the fellows out by the engine.
18 It comes in and gets cleaned in this alkaline solution
19 of 5948, whatever it is. Then it gets a power rinse.

20 THE WITNESS: Correct.

21 MR. GATTOLIN: After the power rinse, it goes
22 into a cold water rinse. Is that correct?

23 THE WITNESS: No. After the 5948R immersion,
24 it's rinsed above that tank, then it goes into the cold

1 water immersion. It comes out of the cold water
2 immersion and it's power sprayed rinsed over the cold
3 water tank. And then from there it would go into the
4 Turco 4181 alkaline rinse.

5 MR. GATTOLIN: And what temperature is that
6 usually? A temperature range for that, for the 219,
7 what would that be?

8 THE WITNESS: It depends on, again, method A
9 or B.

10 MR. GATTOLIN: Well, if it sounds like method
11 A, the one to four minute soak is what would work,
12 because it's not very dirty, as you said earlier. So
13 let's just say the four minute soak.

14 THE WITNESS: Okay, the range on that is 180
15 degrees out to 200 degrees F. But there is a lower
16 temperature on the longer range, longer time soak,
17 depending on the product. I believe it's around 160
18 degrees, 170.

19 MR. GATTOLIN: Okay, I think it might be
20 around 150, I'll have to look at your SPOP.

21 THE WITNESS: Yes.

22 MR. GATTOLIN: What happens after it's pulled
23 out of the alkaline?

24 THE WITNESS: Same basic rinsing process.

1 And that is, it is power sprayed rinsed above the
2 alkaline rust remover solution tank.

3 MR. GATTOLIN: Is it put into a cold water
4 bath?

5 THE WITNESS: It's immersed into cold water,
6 agitated tank.

7 MR. GATTOLIN: Then it goes to the hot water?

8 THE WITNESS: No. Then it comes out above
9 that cold water tank and again, it's power sprayed off.

10 MR. GATTOLIN: Then we go into the hot water
11 tank?

12 THE WITNESS: That's correct. Because these,
13 you don't want to contaminate your hot water tank.
14 Again, that's the dryer. And the cold water tank,
15 which is air agitated in most shops, will eventually
16 start to fill up with alkaline and contaminated.

17 We recommend that you have a purging system
18 where you're adding water from one side approximately
19 one to three gallons a minute, and it's constantly
20 overflowing to the back end, so you're purging that
21 tank of contaminants and the alkaline, so it doesn't
22 become highly alkaline and then start leaving a residue
23 on the part, which then would contaminate the hot water
24 tank.

1 MR. GATTOLIN: Right.

2 We've heard about oven drying here today, and
3 hot air, circulating drying for parts, to ensure that
4 water would get out of the crack. Now, you've stated
5 that this flash drying has worked, and I have not, I
6 have no information to refute that. I wouldn't know
7 where to find it, and I don't know what information you
8 have that would refute that or even suggest that it
9 wouldn't function properly.

10 But would oven drying, in your mind, be a
11 method to use to ensure that one out of a thousand, or
12 whatever ratio you'd want to apply to it, that the
13 water would get out of that crack, let's say someone
14 didn't have the temperature up correct on that hot
15 water rinse, the final rinse?

16 THE WITNESS: Sure, it's not going to hurt
17 anything.

18 MR. GATTOLIN: Now, going into plastic bead
19 or plastic medium blasting, would you explain to me why
20 this process is performed before the penetrant
21 immersion of that part?

22 THE WITNESS: The purpose of the blast
23 procedure is to supplement the chemical cleaning. For
24 example, on this particular part, there is anti-

1 gallant, which is a paint that is applied to the
2 dovetail slots. And there may even be some RTV, which
3 is a silicone-like rubber material applied as a sealant
4 to the roots of the fan blades.

5 What happens in the SPOP 18 alkaline tank,
6 even though it wasn't designed for this, is it actually
7 causes 60 to 75 percent of the anti-gallant to blister
8 or bubble. But it doesn't remove it 100 percent.

9 Also, the temperature of the alkaline rust
10 remover causes the RTV or the rubber to swell and start
11 to debond, which will facilitate the removal now of the
12 anti-gallant and the RTV.

13 So basically, the plastic blast process
14 supplements the removal. Again, the SPOP 18 was never
15 intended or designated to completely remove those types
16 of coatings.

17 Years ago, shell blasting was typically used,
18 as well as there were chlorinated RTV strippers, but
19 environmental regulations have, most airlines have
20 phased that out. And it was not a quick process.

21 There are also methylene chloride based
22 anti-gallant strippers, which I don't believe anybody
23 is using any more, again because of the health and
24 environmental hazards. There was an anti-gallant

1 stripper, Turco 5363, I'm not sure of the exact number,
2 that we have in our SPOP 257, which Delta was using to
3 strip the anti-gallant.

4 But even that, it doesn't remove 100 percent
5 of the anti-gallant. And therefore, it has to be
6 supplemented by either shell blasting or plastic
7 blasting.

8 MR. GATTOLIN: Okay. What are some of the
9 anomalies that can take place with the plastic medium
10 blasting that would perhaps compromise the FPI
11 inspection? What would the operator have to do to
12 create a problem?

13 THE WITNESS: He would have to really go out
14 of his way, we feel.

15 MR. GATTOLIN: What do you mean by that, now?
16 Sit there and just blast it away?

17 THE WITNESS: Blast all day and all night in
18 one area, and perhaps he can remove, smear over a
19 crack. We did the testing for various parts, basic
20 parts, aluminum, magnesium, nickel, cobalt, titanium,
21 steel. We took sections of parts with known cracks on
22 them and we blasted them for an extended period of time
23 with the plastic blast, when we were qualifying it, and
24 then FPI'd it afterwards.

1 On the titanium, there was no evidence of any
2 type of masking or filling of cracks.

3 MR. GATTOLIN: Okay. The medium itself, if
4 there is an operator problem, and I realize you used
5 some exaggeration here about keeping the thing all day
6 and all night, blasting it, but how can the inspector
7 or the processor tell if there's any of that medium
8 that might be in or on this object that is being
9 checked, or about to be dipped into the dye? Let's
10 just say the 219 hub. What would he do, or she do?
11 What would they do?

12 THE WITNESS: They would typically reject the
13 part based on the physical appearance of it as far as
14 being dusty.

15 MR. GATTOLIN: Dusty? Let's say they used an
16 air hose to blow it off, as your SPOP suggests, or
17 recommends, I believe it says. How would we know, or
18 how would the operator, processor, pardon me, know in
19 his mind that that does not have anything in the
20 cracks? Or if there's a crack there, assuming there's
21 a crack there, how would he know it really was not
22 there?

23 THE WITNESS: We've not seen any evidence of
24 filling the cracks, nor has there been any papers that

1 I'm aware of nor have any airlines relayed such a
2 phenomenon from happening. Because in a plastic
3 blasting booth, you're constantly recirculating the
4 plastic media, and you have a filtering system that is
5 taking the very fine dust out of it.

6 The plastic media itself, the media is a
7 large grit, typically 30,000ths to 60,000ths in
8 diameter. So as it breaks down, the dust is getting
9 thrown out overboard. And there have been parts that
10 have been plastic blasted with very small cracks that
11 have been found and reported.

12 And again, we did the testing, and we didn't
13 see any evidence of that.

14 MR. HAUETER: How much testing did you do on
15 this? Do you recall?

16 THE WITNESS: No.

17 MR. HAUETER: How many times was this tested
18 to see, and in what way was it tested?

19 THE WITNESS: I remember two occasions, this
20 was again about nine years ago, ten years ago. But
21 again, it was done on different parts with known
22 cracks, measured cracks, it was blasted and then FPI'd
23 again.

24 MR. GATTOLIN: What's the potential for the

1 plastic medium to peen a crack shut?

2 THE WITNESS: On titanium?

3 MR. GATTOLIN: I'm just asking that question
4 on titanium, yes.

5 THE WITNESS: I'm not aware of it being a
6 problem. We have not seen the evidence.

7 MR. GATTOLIN: Okay. Shortly after the
8 accident, I believe you folks told or advised Pratt &
9 Whitney, or I should say Delta, to use the ultra high
10 sensitivity penetrant, instead of the high sensitivity
11 penetrant.

12 THE WITNESS: Can you repeat that again,
13 please?

14 MR. GATTOLIN: Shortly after the accident,
15 it's my understanding that you folks discussed the
16 different type of dye to be used by Delta in their FPI
17 process. And you went from the high sensitivity, level
18 one to level two, which is the ultra high sensitivity.

19 What is the reason for going to that higher
20 sensitivity dye?

21 THE WITNESS: First of all, the
22 recommendation was made before the accident, back in
23 March of 1996. We issued an all operator's, an all
24 reps wire to the field, as well as a Pratt Whitney

1 field memo to say that we were changing our policy.

2 MR. GATTOLIN: Why was that being changed,
3 sir?

4 THE WITNESS: Okay, the other thing I wanted
5 to correct was, it wasn't a level one. It was to go
6 from a level three to a level four. It was SPOP 82,
7 which is our high sensitivity, is a level three. SPOP
8 84 is ultra high, that's a level four.

9 MR. GATTOLIN: We were told it was basically
10 from a level one type of dye to level two. So that's
11 why --

12 THE WITNESS: No, it's --

13 MR. GATTOLIN: Okay, well semantics. Go
14 ahead, why did we change from one to the other?

15 THE WITNESS: There were four basic reasons.
16 First of all, the AMS spec 2647, which we were a part,
17 our NDT manufacturing lab was instrumental in the
18 development of that spec, and we had worked with
19 General Electric, Rolls Royce and I believe Allison on
20 that, and also all the air framers.

21 The recommendations that went into that spec
22 were, and that was in the November 1995 revision to it,
23 A revision, was that ultra high sensitivity was
24 recommended for most rotating, would be recommended for

1 most rotating parts.

2 There were some specific exceptions to
3 rotating parts, but in the area of titanium, yes, it
4 would be across the board. Basically, the reason for
5 that is, the SPOP 80, or the ultra high sensitivity is
6 slightly more sensitive to finding cracks over the high
7 sensitivity level three. I'm told they're roughly
8 about 10 percent more sensitive.

9 Secondly, the SPOP 84 ultra high sensitivity,
10 we only approve the ultra high sensitivity pulse
11 emulsified system. And with the pulse emulsified
12 system, it is a little less sensitive to operator
13 errors, such as over-rinsing a part, compared to a
14 water wash system.

15 Thirdly, the quality of penetrants has
16 improved over the years. There were some problems that
17 we experienced years ago with the early ultra high
18 penetrants, as far as giving excessive background and
19 rinsing problems, and the concern was that people may
20 start over-emulsifying the part, or reporting a lot of
21 indications that were really nothing, or making it
22 difficult to find relevant indications if you have
23 excessive background.

24 And fourthly, the cleaning processes have

1 improved over the years.

2 MR. GATTOLIN: Okay. I have one or two more
3 questions here.

4 During your visits with operators or to
5 operators, you looked at their processes. How did your
6 folks follow up if you found, shall we say,
7 inconsistencies with what you recommend in your SPOPs?

8 THE WITNESS: We provided at the last day of
9 the shop review a written list of one-liners which we
10 presented to the management of the airlines.
11 Typically, you get anywhere from 10 to sometimes 20
12 people attending this meeting, it would be the foreman,
13 the process engineers, the managers of the departments.

14 So we would provide a one liner
15 recommendation list to them as far as what changes we
16 would recommend to either improve the quality or reduce
17 the turn time of the engine through the shop, resolve
18 any particular overhaul problems they were having.

19 And then we would follow up ~~the~~ list with a
20 thorough report approximately a month later, which
21 specifies in detail the exact findings, what we saw
22 going on in the shop, and the details of why the change
23 was recommended.

24 MR. GATTOLIN: Okay. The fracture face of

1 the accident hub did not have the dye penetrant residue
2 on it, from what we understand. What explanation would
3 you care to bring to the table as to why that dye
4 penetrant was not on the face of that hub?

5 THE WITNESS: I don't know. I don't
6 specialize in failure analysis. That would have to
7 come from our lab.

8 MR. GATTOLIN: Okay, so if the penetrant had
9 gone into that crack, then --

10 THE WITNESS: That hub could have been
11 processed through other operations. And mostly likely
12 did afterward, such as additional aqueous degreasing.
13 Or even solvent wiping. Because you had to reapply the
14 anti-gallant to that area of the dovetail. And they
15 may have wiped down the entire part.

16 Some operators, another typical procedure
17 would be to solvent wipe the mating faces of parts
18 before they're assembled, so you get a good, tight
19 flush fit. And the crack indication was on the rear
20 face where there was a mating area.

21 So that could have been wiped down.

22 MR. GATTOLIN: Well, there was not enough, I
23 guess, conclusive evidence to show that the dye was on
24 that.

1 THE WITNESS: Okay.

2 MR. GATTOLIN: Thank you very much.

3 Mr. Chairman, I'm finished with my
4 questioning.

5 CHAIRMAN GOGLIA: Any questions from the rest
6 of the technical panel?

7 MR. CONROY: Yes, sir, Mr. Chairman, two or
8 three, please.

9 Mr. Stevens, just to go back over some of Mr.
10 Gattolin's questions and clarify a couple of them, your
11 full title again, please?

12 THE WITNESS: Senior maintenance development
13 engineer. I know it's a mouthful.

14 MR. CONROY: And the department reports to
15 you? Or do people report to you?

16 THE WITNESS: Nobody reports to me.

17 MR. CONROY: Nobody does? Okay. And your
18 background, you mentioned a couple of technical courses
19 regarding inspection procedures at Pratt. And you
20 mentioned, I believe, that you had a business degree,
21 is that correct?

22 THE WITNESS: No, I did not. I said my
23 college education was in business.

24 MR. CONROY: Do you have a degree in anything

1 at all?

2 THE WITNESS: No, I do not.

3 MR. CONROY: Do you have any other technical
4 or engineering courses other than the two you
5 mentioned?

6 THE WITNESS: I've taken numerous jet engine
7 courses over the years at Pratt Whitney's training
8 school.

9 MR. CONROY: Okay.

10 THE WITNESS: In virtually all models,
11 because I cover all models from JT3D, JT12, to the
12 current 4000 engines.

13 MR. CONROY: Okay. And you do see 200 series
14 hubs coming through your shop, is that correct?

15 THE WITNESS: We don't overhaul in East
16 Hartford or in our Cheshire facility JT8D200s any more.
17 We got out of that business approximately 8 to 10
18 years ago.

19 However, we've gotten back into that business
20 in our new overhaul shop that opened up in Columbus,
21 Georgia, last October, which I've been involved with
22 the startup operations of that shop.

23 MR. CONROY: You've been involved with that?

24 THE WITNESS: Correct.

1 MR. CONROY: And the 200 series hubs are
2 coming through there?

3 THE WITNESS: I don't know if they've
4 actually received a 200 series hub yet, but they are
5 supposedly going to be doing 200 series engines.

6 MR. CONROY: And then you would perform the
7 standard maintenance operations of the inspections and
8 reinstallation, reassembly of the parts, reinstallation
9 on an airplane?

10 THE WITNESS: Correct.

11 MR. CONROY: Are you contracted with
12 operators in that regard?

13 THE WITNESS: What do you mean by that,
14 please?

15 MR. CONROY: At the shop in Georgia you
16 mentioned, what happens to the engine after you --

17 THE WITNESS: It's going to be completely
18 disassembled, cleaned, NDT inspected, dimensionally
19 inspected, there will be minor repairs made, major
20 repairs will either be sent up to our North Berwick
21 facility in Maine, or our Connecticut facilities,
22 depending on the type of repairs or out to independent
23 vendors for rework. And then the engine would be
24 reassembled again. Then they would be sending out,

1 they have a contract either with Northwest or Delta for
2 the test of the engine.

3 MR. CONROY: Where is the engine reassembled
4 after the --

5 THE WITNESS: In the Columbus, Georgia
6 facility.

7 MR. CONROY: So is that the same facility you
8 just mentioned regarding the hubs coming through for
9 inspection?

10 THE WITNESS: Yes.

11 MR. CONROY: Okay. Are you involved in
12 record keeping regarding any problems that might be
13 involved in the inspection, inspections of hubs or
14 parts of this type?

15 THE WITNESS: No.

16 MR. CONROY: And who would be? Is it someone
17 you report to?

18 THE WITNESS: The tech support groups, the
19 individual group, whether it be 8D or 9D, and the
20 project group, typically would keep those type of
21 records.

22 MR. CONROY: Do you visit operators that have
23 licensed overhaul facilities that inspect this hub?

24 THE WITNESS: Yes.

1 MR. CONROY: Do they communicate any problems
2 with you regarding it in general, either formally or
3 informally?

4 THE WITNESS: No.

5 MR. CONROY: All right. Would they, or would
6 they go to someone else at Pratt Whitney regarding any
7 problems they may have?

8 THE WITNESS: If it's a process problem with
9 over 400 responses I'm sending out a year, they come to
10 me.

11 MR. CONROY: All right. Has anyone mentioned
12 finding a crack in a similar hub?

13 THE WITNESS: No. However, crack indications
14 would be reported to our tech support groups. Because
15 again, on process related inspection requirements were
16 no cracks are allowed on this particular hub, it would
17 be reported to our technical support group.

18 MR. CONROY: I take it from what you just
19 said then, is it fair to say that they would more or
20 less informally tell you, but formally tell the tech
21 support group?

22 THE WITNESS: That's correct. And the tech
23 support group doesn't sit far from me. So I'm
24 constantly interfacing with the various groups.

1 MR. CONROY: Do you know if there's a system
2 of keeping, record keeping of these problems, if there
3 are any that come in?

4 THE WITNESS: There is a system, but I don't
5 know exactly how it works. I know they do track.

6 MR. CONROY: Is it fair to ask you, do you
7 know anything, do you have a knowledge of the follow-up
8 to that system?

9 THE WITNESS: No, I don't know.

10 MR. CONROY: And again, that's the tech
11 support group you just mentioned?

12 THE WITNESS: That's correct.

13 MR. CONROY: All right. Thank you, Mr.
14 Chairman.

15 CHAIRMAN GOGLIA: Any questions from other
16 members of the technical panel?

17 (No response.)

18 CHAIRMAN GOGLIA: Then we will go to the
19 parties. Federal Aviation Administration?

20 MR. DONNER: No questions.

21 CHAIRMAN GOGLIA: ALPA?

22 MR. MC CARTHY: Yes, Mr. Chairman.

23 Mr. Stevens, you've heard probably some other
24 witnesses advance the opinion that it would be very

1 useful to have a covert actual part with a known crack
2 run through the process as validation of the entire
3 process from time to time as a quality measure. Would
4 you agree with that as being a good idea?

5 THE WITNESS: Yes, providing it is a typical
6 part with the same type of crack. Obviously, we
7 wouldn't want to use for a standard a section of a
8 magnesium gear box or an aluminum starter with a wide
9 open crack. That would not be a good way to monitor a
10 system when you're looking for small cracks.

11 MR. MC CARTHY: Well, to follow up on that,
12 given the fact that there may be some concern about
13 such a test article finding its way into inventory
14 inadvertently, would it be possible for a manufacturer
15 such as Pratt & Whitney to procure parts from, say, out
16 of production engines, that would not fit into current
17 engines now being utilized by an operator, and then use
18 that part as a test article?

19 Given the number of parts that we've heard
20 have run through a normal airline's line from time to
21 time. Would something like that be possible?

22 THE WITNESS: I would imagine so. But it
23 wouldn't be for me to decide. We use as our crack
24 standard the tam panel.

1 MR. MC CARTHY: Well, I would like to ask one
2 more question, because it seems to me, I got the idea
3 that, and I think you commented on it, that you
4 validate the process to a degree by the fact that,
5 well, the process must work because they discovered
6 cracks.

7 I think you said something like that. And
8 that is that crack discovery is a primary validation.
9 And that the lack of cracks is arguably either a real
10 endorsement of the quality of the product, or a
11 condemnation of the process using that logic.

12 So it seems to me to make sense for the
13 manufacturer to try to come up with this kind of covert
14 part to do this kind of quality assurance for the line.

15 And I juste put that out as a suggestion.

16 CHAIRMAN GOGLIA: Thank you.

17 Volvo?

18 MR. THOREN: No, thank you.

19 CHAIRMAN GOGLIA: Delta?

20 MR. VALEIKA: Nothing, Mr. Chairman.

21 CHAIRMAN GOGLIA: McDonnell Douglas?

22 MR. STEELHAMMER: No questions, Mr. Chairman.

23 CHAIRMAN GOGLIA: Dr. Ellingstad?

24 MR. ELLINGSTAD: I'd just like to clarify my

1 understanding of the service process operating
2 procedure. What official status does that document
3 have? That is, your recommendation to the --

4 THE WITNESS: That's correct, it's contained
5 in our standard practices manual. And those processes
6 are referenced in the engine overhaul manual as the
7 process to use for a particular part.

8 MR. ELLINGSTAD: And the airline or other
9 repair shop is obligated to abide by that standard?

10 THE WITNESS: That is our recommendation,
11 yes.

12 MR. ELLINGSTAD: Okay. You had indicated,
13 and I probably didn't follow this carefully enough,
14 something about your reviews of airlines of their
15 practices. And indicating that you would have some
16 observations about how they followed these procedures?

17 THE WITNESS: Um-hmm.

18 MR. ELLINGSTAD: How often is this done with
19 respect to --

20 THE WITNESS: There's no routine that we
21 routinely review every airline around the world, or
22 every independent overhaul shop around the world.
23 There just isn't enough of us to go around.

24 MR. ELLINGSTAD: Are these visits initiated

1 by the airlines? You're invited or do you drop in?

2 THE WITNESS: We always must be invited,
3 obviously. It's done as a free customer service to the
4 airline. It's offered to the airlines as a customer
5 service, but also airlines have requested us to come in
6 just as a quality control review of their processes, or
7 to go out for a particular problem, such as maybe an
8 airline is having problems with vibration in building
9 compressors or turbines or so forth.

10 And we would send people in various areas of
11 expertise, such as turbines, oil systems or myself
12 covering processes. So we would have a complete team.

13 But I have also gone out by myself
14 specifically to look at these particular processes, in
15 particular the FPI and the cleaning, because they do go
16 hand in hand.

17 MR. ELLINGSTAD: Okay. I'm just trying to
18 get a sense of how often this kind of a visit would be
19 expected.

20 THE WITNESS: There's no way you could really
21 put it an expected visit. It's not mandatory that we
22 do it.

23 MR. ELLINGSTAD: We've also heard that there
24 is an obligation on the part of the airline or the

1 repair shop to ask some kind of concurrence or
2 exceptions from these procedures. How is that handled?

3 THE WITNESS: Typically we would get a
4 request through our electronic communications system
5 with our reps, our Pratt Whitney representatives
6 office. We have approximately 150 reps around the
7 world. Sometimes they're covering six airlines. Other
8 airlines, we may have four reps.

9 The process engineers, the power plant
10 groups, would determine what the problem is or what the
11 question would be. They would go through our rep's
12 office. From there they would generate a wire, send it
13 electronically to the appropriate people in East
14 Hartford for that area of responsibility.

15 If it has to do with processes, the wire
16 would come to me. Sometimes wires are sent to me that
17 are out of my area, we just change the action to the
18 appropriate person or another person gets it, he
19 changes it to me.

20 From there, we research the wires. If I need
21 to get other groups involved, such as our
22 electrochemistry lab, or NDT lab or our structures
23 people, I would do that, or I would confer with our
24 tech support groups on various issues.

1 So it's an integrated system of working
2 together back in East Hartford. From there we would
3 respond by a wire back.

4 MR. ELLINGSTAD: And this would be then a
5 response to that shop?

6 THE WITNESS: Yes.

7 MR. ELLINGSTAD: So the responsibility for
8 maintaining the, essentially the authentication of that
9 exception, would be theirs, or do you also maintain a
10 record of --

11 THE WITNESS: We don't maintain a written
12 record of all the communications.

13 MR. ELLINGSTAD: Is this a fairly frequent
14 activity with respect to non-destructive inspection
15 procedures?

16 THE WITNESS: No. Of all the processes I
17 cover, I mainly spend maybe 25 percent of my time on
18 FPI questions.

19 MR. ELLINGSTAD: Let me try to focus even
20 more. With respect to FPI, how many of these kinds of
21 exceptions have, would you guesstimate have been --

22 THE WITNESS: Very rarely do we get requests
23 from customers asking modification of an FPI process.
24 They may come across some FPI penetrant or developer on

1 the market, an old material that we don't have in our
2 book, and ask, can we use it, why can't we use it.

3 Or they may have problems with perhaps
4 excessive background on the part. They would report
5 that.

6 But to ask for deviations of the process,
7 that very rarely happens.

8 MR. ELLINGSTAD: Finally, in your opinion, is
9 FPI sufficient for the inspection of parts like hubs,
10 particularly with deep holes?

11 THE WITNESS: For the overall inspection of
12 the part, yes. For the deep holes, we are now going to
13 require eddy current of these parts, and also, a high
14 intensity liquid light guide for holes where their
15 diameter is, where their depth is greater than three
16 times their diameter, in the May 1997 revision to the
17 standard practices manual.

18 And our structures group are reviewing all
19 holes as far as anything being highly stressed, on all
20 engines.

21 MR. ELLINGSTAD: Thank you.

22 CHAIRMAN GOGLIA: Mr. Haueter?

23 MR. HAUETER: No questions, Mr. Chairman.

24 CHAIRMAN GOGLIA: Pratt & Whitney?

1 MR. YOUNG: No questions, Mr. Chairman.

2 CHAIRMAN GOGLIA: The Chairman has no
3 questions.

4 Anyone else? We have one. Frank.

5 MR. GATTOLIN: I just have a few questions,
6 yes.

7 THE WITNESS: Sure, Frank.

8 MR. GATTOLIN: They've come to mind as you're
9 talking.

10 I don't recall from our conversation, I don't
11 have my notes here, but you said that the, and I'm
12 going to go back to the flash drying process, because I
13 need to have this clear in my mind as well as perhaps
14 other people.

15 THE WITNESS: Sure.

16 MR. GATTOLIN: The tests on flash drying were
17 conducted well before your arrival at Pratt & Whitney,
18 is that correct?

19 THE WITNESS: Yes.

20 MR. GATTOLIN: And have tests been run since
21 then to reaffirm that it is a process that will work on
22 the 219 hub or other different, other components? In
23 other words, what were they run on initially?

24 THE WITNESS: I don't know.

1 MR. GATTOLIN: Okay.

2 THE WITNESS: I mean, it's just been
3 experience with cracked parts and the repeatability to
4 find them after running through.

5 MR. GATTOLIN: Okay, thank you.

6 You mentioned here just a short while ago
7 that now Pratt & Whitney's going to require eddy
8 current for identification or checking the bolt holes,
9 or the tie rod bolt holes on that hub. You're going to
10 do that now. Why wasn't this thought of? That's not a
11 good question perhaps. But what kept individuals from
12 thinking about this before? I mean, if you've done all
13 these tests on FPI and it's been done, it's confirmed
14 these things, why wasn't this thought of as a method to
15 check it?

16 THE WITNESS: I can't answer that question.
17 Eddy current is not my area of responsibility.

18 MR. GATTOLIN: FPI is, through, correct?

19 THE WITNESS: FPI is.

20 MR. GATTOLIN: Okay. Do you have evidence
21 that FPI works in deep holes such as the tie rod holes?

22 THE WITNESS: It's difficult, but you can see
23 in there. The experience from our failure analysis
24 group is, historically cracks on a hole typically

1 emerged from the corner of the hole, and promulgated
2 outward, not from the center of a hub or very deep
3 hole. It just didn't start right there in the deep
4 hole. They were always on the edge cracks.

5 So there was no historical concern generated
6 that there would be a problem from these areas.

7 MR. GATTOLIN: Basically it's an assumption
8 that it will always be on the corner working down
9 instead of down working itself up, as in this case?

10 THE WITNESS: Right.

11 MR. GATTOLIN: So therefore, FPI should be
12 able to catch the ones on the corner, but there was no
13 real evidence to your knowledge that it would work
14 inside the holes?

15 THE WITNESS: I'm not aware of any.

16 MR. GATTOLIN: Pardon me?

17 THE WITNESS: I'm not aware of it.

18 MR. GATTOLIN: Okay. And the last one is,
19 have you ever used the oven drying method on parts to
20 compare the results with the flash drying?

21 THE WITNESS: I personally have not.

22 MR. GATTOLIN: Okay. Have you had any
23 experience at all with oven drying?

24 THE WITNESS: No.

1 MR. GATTOLIN: Okay. Thank you very much.

2 Thank you, Mr. Chairman.

3 CHAIRMAN GOGLIA: Mr. Stevens, thank you very
4 much for your cooperation. You are released.

5 (Witness excused.)

6 CHAIRMAN GOGLIA: And we will adjourn this
7 meeting until tomorrow morning at 8:30, since we're now
8 to the final four.

9 (Whereupon, at 4:50 p.m., the meeting was adjourned, to
10 reconvene the following day at 8:30 a.m.)