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"STS-115 POST-READINESS REVIEW PRESS CONFERENCE"

SPEAKERS:
MICHAEL GRIFFIN, Administrator, NASA
BILL GERSTENMAIER, Associate Administrator for Space Operations
WAYNE HALE, Space Shuttle Program Manager
MIKE LEINBACH, Shuttle Launch Director

[Moderated by Dean Acosta, NASA Press Secretary]

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Kennedy Space Center

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P R O C E E D I N G S

MR. ACOSTA: Good afternoon, and welcome to the STS-115 Post-Flight Readiness Review press conference. I am Dean Acosta.

Joining me to my left is NASA Administrator Michael Griffin; to his left, Space Operations Associate Administrator Bill Gerstenmaier. To his left is Space Shuttle Program Manager Wayne Hale, and to his left, Launch Director Mike Leinbach.

We will have some short opening remarks, and then we will go to your questions. Please, I ask you to identify yourself and identify who your question is for, and please, if you can, turn off your BlackBerries and phones now, so we don't have that disruption.

Not you, Mike. You're all right.

[Laughter.]

MR. ACOSTA: Okay. With that, I turn to the Administrator for some opening remarks.

ADMINISTRATOR GRIFFIN: Well, thanks, Dean.

As I always say, it is a pleasure to be here. It's an honor to work with this team and a thrill to see another Flight Readiness Review. This was another great

review.

I was talking to Dean afterward, and he was saying, "Boy, now that I sit in these things, I'm getting more insight to how you engineers work, and I still can't understand it." And that's good. We still have a few secrets up our sleeves.

So this was a great review, and I am looking forward to moving toward a great launch.

MR. ACOSTA: Gerst?

MR. GERSTENMAIER: Thanks, Mike.

Again, I'd like to echo it was a great review. In my mind, a great review means we had a lot of good discussion, and we just had a tremendous amount of discussion from all the folks involved on a variety of topics. We covered many things.

If you ask me to step back and give you kind of the general impression of the FRR (Flight Readiness Review), I think the major things I would pick up that I learned from the FRR was that the challenge of the International Space Station assembly is really huge.

If you look at what we are going to do in terms of EVA's (extravehicular activities/spacewalks) and the

timelines and the activity associated with that assembly, it is a very, very busy timeline, with many, many challenging things in it, and it really impressed me with how much the teams have prepared for this.

They have spent many hours with many back-up procedures, many contingency situations they are prepared for. They have worked extremely well with the shuttle team, looking at capabilities of the shuttle and how they could maximize use of the shuttle, and we're prepared.

So it may not go exactly the way it is all scripted. The solar array deploy will be interesting, but if it doesn't, I think the teams are as prepared as any team I've ever seen to get prepared. So that was one take-away I had from the meeting.

I think the other thing that I kind of went into the FRR was this is a fairly quick turnaround from the last FRR to this FRR, and I was concerned that maybe we wouldn't have enough time to really review the subjects in detail and do the analysis that was needed to be there. The teams did just a tremendous job of being prepared.

One metric you can look at is just how long a discussion goes. The discussion went fairly long, and we

had actually, probably, slightly more charts at this FRR than we did in the last FRR. So that says the teams had enough time to get their data done, to get the analysis done, and to bring it forward.

We are not carrying very many exceptions or open work out of there. There's a few that Wayne will talk to you about in a little bit, but there are not many, considering where we are. So I think that, again, we had about the right amount of time that we were there.

One thing that was also encouraging is some of the new samples have been returned and checked out in the arcjet. That is impressive that those have come back from space, from the last flight. They have been essentially conditioned in thermal chambers down here underground and then tested, and it looks like there is some viable potential repair techniques there. So, again, the teams have done a tremendous job of pulling that together.

So those are my two impressions, one, the complexity of the challenge of assembly, and then the second one is the fact that we are really prepared to go do this flight.

The other things we have done is we set the

launch date again for the 27th, and I think it is around 4:30 on the 27th. So we are ready to go for that. We still carry some open work that needs to be looked at.

We have a KU-band bolt issue that Wayne is going to talk about with his team at the PRCB tomorrow. We laid out some general guidance for them to go into that review tomorrow, but they will do that at the PRCB (Program Requirements Control Board), and then APU (Auxiliary Power Unit) No. 3, we need to do a little bit of work there to understand the failure we had on the last flight, but those are really, probably, the two major things that sit out there that are open.

We did discuss foam, like we always do. We did the poll. All members of the board were "go" for the launch. There were no "no-go" positions. There were two dissenting opinions, one from the Johnson Space Center and one from the Marshall Space Flight Center. Their opinion was they would like to have the ice/frost ramps redesigned as soon as possible, and they made that comment to us.

Chris (Scolese) and Bryan (O'Connor) were both "go." Bryan's rationale for "go," which you will see on the statements which we will release to you, is essentially

that we had this discussion at the last FRR. The rationale still holds. He didn't see anything in this flight that negated any of the rationale for a flight that we put together for the last FRR. So Bryan didn't see any need to be "no-go" at this point, but he did want to recognize that the same kind of rationale that went into the previous launch decision still holds in his mind.

So, again, we were all essentially "go" with those couple comments, and again, I think we had a very, very good discussion about all the aspects of how people felt, what engineering needed to be done, and what was missing. So it was just an outstanding review, and we are really ready to go fly.

MR. ACOSTA: Wayne?

MR. HALE: Well, let's see. I think we may have missed a trick by not having Mike Suffredini here to talk about all the Space Station assembly work that is going to go forward because, as Bill Gerstenmaier said, this is probably the most complicated assembly sequence that has been undertaken, and the record will not last because the next flight will be more complicated than this one. So it is a real challenge to the teams to execute the on-orbit

timeline. We talked a little bit about that about a week ago when we had a press conference down in Houston.

Talking about the FRR and the shuttle in particular, I did want to point out that this was a bit of a challenge for the team. After having a long period where we had significant time between flights to analyze problems, do lots and lots of testing, run lots and lots of analysis, and have -- I don't want to say leisurely, but let's say extended engineering reviews and meetings, we needed to turn around from a flight in about 5-1/2 weeks.

The problems that we had on the last flight, while they weren't major, there were also some non-trivial problems that had to be resolved. We have got almost all of those resolved. We have a couple that are open.

Most notably, we have a couple of thermostats and a heater line on APU No. 3 that we are still troubleshooting on Discovery to try to understand why they didn't work exactly right. We would like to not go into a flight and have problems with our heaters on those fuel lines.

Right now, we think that Atlantis has tested out just fine. So whatever problem there is on Discovery is

likely not there on Atlantis, but you would like to have a full resolution rather than going in with troubleshooting still in works. So we are going to talk about that at the L-Minus-2 (meeting that is two days before launch). We have a handful of issues like that, that are still requiring some minor clean-up.

Probably, the longest thing that we talked about today wasn't the foam. We did have a long discussion about the foam on the external tank, and while I am talking about that, I should point out that what we saw on STS-121, the last flight, is about what we expected. It was about an average-foam-loss kind of a tank, which is to say we avoided the big pieces. We avoided anything what we would call "unexpected," but we had a number of foam releases, and we know we have future work to do.

What we want to see on STS-115 is as good or better performance, and we do have a team in work that is working very hard to pull together a new design on those famous ice/frost ramps to eliminate that hazard from us starting with the tanks that we will be flying next year.

But the longest discussion we had today was about the famous bolts that we found on the KU-band antenna.

Now, this is a real success story. Steve Poulos, the manager of the orbiter project, reminds me very time we talk about it. This is an example of improving safety on board the space shuttle.

Some 25 or 30 years ago, a mistake was made in the design of this particular component, the way this antenna is bolted onto the orbiter, and for the last 25 or more years, we had been flying with these threaded fasteners and bolts that just barely have a thread or two engaged in to the nut that holds them on. That is not good engineering practice.

We had some questions about threaded fasteners and went back through an exhaustive review, which is still ongoing, of all the threaded fasteners on board the orbiter, in particular, and we found that in this particular application that bolts weren't long enough and had been that way for a number of flights. That is not where we want to be.

So, on Discovery and Endeavour, the two orbiters that we have in the maintenance facility, we immediately went to those vehicles and changed those bolts out, and that problem is resolved.

On Atlantis, unfortunately, the access is very difficult. So we are doing some more work to try to understand exactly how much risk is involved with, A, either changing those bolts out, because any time you go to do non-standard work at the launch pad -- and this is in a particularly difficult location -- you run some risk, or, B, what is the real risk for this particular flight and could we accept this less-than-perfect application of a screw-thread fastener for one more flight.

So that work is ongoing. We will be having discussions on a daily basis through the weekend probably. I think it is likely we will change those bolts out, but the analysis is still ongoing, and we want to make sure we don't sign up to do something and incur damage potentially from workmen being in there that we didn't have to. So that is why that is still under discussion.

And because it is a story still in development and the engineering analysis on both sides is not complete, we had quite an interesting discussion this afternoon at the Flight Readiness Review, and we know that is open work that we want to resolve before we go launch Atlantis.

That is kind of a normal day in the life of the

space shuttle, those kind of discussions, and I expect they will go on for as long as we fly this vehicle, and it will probably apply somewhat to future vehicles as well.

So, all in all, the team has worked very hard. We have got 17,000 people around the country working on the Space Shuttle Program. They have really turned too. We are ready to go forward with the completion of a few last items, and on August 27th, we hope to be back here and look at the skies and see if Mother Nature will cooperate with us for an on-time launch, Sunday afternoon.

MR. LEINBACH: Okay. Thanks. On the processing side, out at the launch pad, processing is going pretty well. We have had our share of challenges with our hypergolic loading, but I can tell you on behalf of Team Atlantis, they are extremely happy to be at the launch pad and to have a launch date set now by the agency.

You will recall that Atlantis has been mated twice before, and we have had to de-mate her, and so the whole team, not just here at Kennedy Space Center, but across the country that works on Atlantis for a living, they are really feeling good right now. Atlantis is at the pad, a couple of weeks away from launch, 10 days away or so

from launch. So they are really feeling good.

We have got about two days of contingency left in the schedule at the launch pad. So that is enough for us at this stage. Meanwhile, back in the orbiter processing facility, Discovery has gone through the first turnaround processing flow since the accident. She is about one month into about a three-month turnaround process, and everything has gone really well there. So, from a launch-on-need perspective, if that should be come necessary, right now Discovery is looking good for a rescue mission if that becomes necessary.

So, from the Kennedy Space Center perspective, we are glad to have a launch date, and we are looking forward to it. Team Atlantis is feeling really good right now.

MR. ACOSTA: All right. Thanks, Mike.

That concludes opening remarks, and we now will start with questions. We will start right up front with Jay.

QUESTIONER: Wayne, I have a two-parter. First of all, just how many people vote? How many votes are there in an FRR? And secondly, what would happen if the UHF antenna, one or two bolts, gave way in orbit? I know

you have to bring it back inside, but what would be the problems you would have to deal with?

MR. HALE: Well, let's see. Voting members for the Flight Readiness board, really that's Bill Gerstenmaier's board, but whatever it is, less than a dozen. I am trying to count in my head. We can certainly give you the exact number. Voting members, the four Human Space Flight Center directors, the Space Station program manager, the Shuttle program manager, contractors --

MR. GERSTENMAIER: There's probably slightly more than 12.

MR. HALE: Yes. I'm sorry. You are right. I am adding it up. I shouldn't do this in real time. We will get you the list.

MR. GERSTENMAIER: We are going to actually post on the web the same forms we did last time with the various signatures of all the board members. So you will get a chance to see that, and you can count them up for yourself.

MR. HALE: Now, in terms of the KU-band antenna, the issue is what happens at launch. The most vibration environment occurs right at the time that the vehicle lifts off, and so that would be the time, if it were going to

come loose, that we would be worried about it, and, of course, we want to prevent that from happening, either by ensuring ourselves that we have a good positive engineering margin on the structure as it exists or by changing out the bolts and making sure we have good engagement on all the threaded fasteners. But one way or the other, we are not going to have a problem on that antenna.

QUESTIONER: Well, are you saying that you don't think it would be a problem once that you deployed the KU-band antenna?

MR. HALE: This is a problem that occurs at or near launch time, not on orbit. So, obviously, if it came off at launch time, you wouldn't have it available on orbit. We would really like to have the function of that, but the concern is what happens if it falls off and causes damage during a launch phase.

MR. ACOSTA: All right. Next question. Let's go, Mike.

QUESTIONER: Mike Schneider, Associated Press.

My question is either for Dr. Griffin or Mr. Gerstenmaier.

I guess, the two dissenters, were they the

directors of Johnson and Marshall? I assume they hadn't dissented at the last Flight Readiness Review meeting. Did they explain, if that is the case? Did they explain why their decisions had changed?

MR. GERSTENMAIER: Let me clarify. They were "go" for the launch, but they recognized from the folks that they represent that, within the organization they represent, they had some folks, that they wanted to make sure that we knew that they wanted to change the ice/frost ramps, and that is exactly what they did at the last FRR.

So all they did was they took the chance to express to the board their desire to change the ice/frost ramps as soon as we could change the ice/frost ramps.

QUESTIONER: Did they sign off on the certification?

MR. GERSTENMAIER: They signed off on the certification, and they are "go." So it is almost a nuance in a way, but they wanted us to know that there are folks within the organization that wanted us to know that we needed to make sure that the ice/frost ramps got redesigned as soon as possible, and that is what they told us. So that was their opinion that they had, that they added in,

and so that is what we recognize.

We all agree with that, and as Wayne described, we have a team off looking at redesigning ice/frost ramps.

ADMINISTRATOR GRIFFIN: And nobody was really disagreeing.

MR. GERSTENMAIER: We all agree with that. I just said that for completeness because, as part of their statement, they said, "Go, but we would like to tell you, we want you to change the ice/frost ramps as soon as we can," and we are planning on doing that, not on the next tank, the next 116, but on the flight after that, we expect to.

QUESTIONER: Just to make sure that everyone understands, could you say this was unanimous?

MR. GERSTENMAIER: That we were "go," yes. The board's position was unanimous, and we did not have to appeal above the board.

MR. ACOSTA: All right. Let's go over there against the wall. Mike?

QUESTIONER: Mike Cabbage with the Orlando Sentinel.

I guess, again, for Bill. If you could explain a

bit more about the decision of Mr. O'Connor and Mr. Scolese. It appears to me that all the factors remain pretty much the same going into this launch as far as the ice/frost ramps were concerned as they did the other one. What was it that changed their mind? What is the difference there?

Also, were there any notations on the COFR (Certificate of Flight Readiness) this time, similar to the ones that they wrote last time?

MR. GERSTENMAIER: I think you will see it on the form that Bryan wrote his statement on, an exception form which is attached to the COFR which we will provide to you, and it basically says the rationale was the same. And he understood our decision before to go fly, and he understands our decision this time, and he sees no need to go fly.

Brian also stated in the review, and the teams agree, that the performance on STS-121, there was nothing in the performance of the tank that cast any doubt on any of our rationale that we used before for STS-121. The performance was as expected, as Wayne described.

I think we need to be careful sometimes that

folks think it was better performance in some sense that we had less instances of foam loss, but we had two fairly large mass losses. So that averages out, and that says that is about average tank performance.

So I caution us all as we look at this next tank that if we lose more foam, it is not that something has changed and were dramatically worse. That is just typical tank performance. There is a lot of variation from tank to tank. Essentially, these ice/frost ramps were sprayed on maybe three, four years ago. They are still the same basic ice/frost ramp designs before. So the performance could be as we saw on STS-114, as we saw in 121. We will see what we get on this next one, but we are gaining data.

The other thing that I think the board recognized was we did gain some key data from STS-121. We understand the time of release of the foam. We also understand how it comes off, and that is key data, and it is starting to put together a theory on the delamination phenomena, which I think is really good. We probably need some more flights to really nail that theory down, but it is really important data.

The other thing we had was we had some

non-destructive evaluation where we did some X-ray and terahertz investigation of the ice/frost ramps where we could see some divots, some pockets of air inside the foam. Those did not liberate. So we didn't see any correlation between our non-destructive evaluation and the performance we saw in the tank, and then that is curious to us.

So, again, this flight did exactly what it was supposed to do. It gave us some key data that is helping us to get smarter and will ultimately help us make a better redesign in the ice/frost ramp.

MR. ACOSTA: All right. Let's stay right there, second row. Bill.

QUESTIONER: Bill Harwood, CBS, with two questions.

One, for Mike Leinbach, can you maybe give us some sense if they do approve the bolt change-out, what is required to do it, and how much time it takes, and how that plays into your two days of contingency? And I guess the bottom line is can you make the twenty-seventh if you have to go do the work.

And for Wayne, we talked last week in Houston. I asked you about tanks and delivery schedules next year and

possible slips in that schedule, and you didn't want to tell me anything last week. Can you tell me anything this week about where that stuff stands?

MR. HALE: They're still working on it, Bill. That is my short answer.

[Laughter.]

MR. HALE: I haven't really had a formal review with the tank people since we talked -- we said a week ago? It must have been a week ago. And we do know that we have got a number of facility modifications that we want to make to the factory at Michoud that will help improve tank production.

One of the big problems is that big old factory down there is not air-conditioned, and we put restrictions on when we can spray foam in terms of temperature and humidity. If we can go into the areas where they do these critical foam sprays and provide air-conditioning, environmental control, we can actually allow ourselves to spray more of the time than we can now.

Right now in New Orleans, as you might imagine, it is difficult to find the right times when the humidity and temperature don't exceed some of our limits. So we are

making some investments down there and improving that facility, some additional fixtures and so on and so forth, but a really large part of the review is going in to look at all of the steps that we did coming out of the Columbia accident and say, "Okay. We really pushed the pendulum all the way to the end. We really are making sure it is absolutely done right in every area of the tank. Are there some areas on the tank, say, on the side, away from the orbiter, where maybe we don't have to go through all of these steps?" And if the foam comes off over there, it is not transported toward the orbiter, and that would allow us not to take some of these time-consuming super cautious steps that we do with foam, and those sorts of questions are under review. The tank folks are going to report back to me probably in about three weeks on their progress.

Right now we are challenged on Tank 4, well, spring tank of next year. We have had quite a few discussions about the tank for the flight that is currently scheduled in February. That will be the tank with the first ice/frost ramp modifications, we believe. So that one pretty much looks like it is coming in when we need it, but it is the tanks after that, that we are going to have to

make some improvements in the production rate to not have a problem. So that is still very much in play.

That was not the short answer. That was the long answer.

Okay. Now your part?

MR. ACOSTA: Well, now he can't say you didn't give him an answer.

MR. HALE: Right.

MR. GERSTENMAIER: That's right.

MR. ACOSTA: Go ahead, Bill.

MR. LEINBACH: To the bolt access and change-out question, Bill, we are going to be studying access over the next couple of days and, parallel with the engineering team, continuing to refine our analysis, and we are going to do that because of the pad flow for the next two days.

We still have to finish our hypergolic loading tonight. We will get into that around midnight tonight for the FRCS oxidizer side. After that is done, we will get into our ordinance operation Friday morning. So the pad will be consumed with those two activities until Friday afternoon. So Friday afternoon is the soonest we can get in there, open the payload bay doors, and actually start

putting in access if the decision is to go after these bolts. So, again, that allows us to refine our access study.

We have done some CAD modeling of access, and that is really good, but until you get the technicians out there and you build the scaffolding and the PIC boards and get a technician up there right next to the KU-band antenna to look at the nuances of this ship versus the CAD drawing, obviously, we won't know fully what is required until we get in there. Again, that picks up Friday afternoon. Probably by early Saturday morning, midday Saturday, we would be able to tell Wayne if we think we can execute this plan if the bolt change-out does become required.

The program has told us very clearly that if we get into a situation at the launch pad, that the technicians are uncomfortable proceeding on, i.e., we are about to do more collateral damage than is worth the bolt change-out in the vertical, then we are to stand down, and that is exactly what we will do.

So we typically go into this with a dedicated team. We have already identified the techs to do this job. They were the ones that went over and looked at bolts and

changed the bolts out on 103 and 105. So they have already performed that task. So we have the best folks possible doing the job, and the plan right now looks doable. We would open the doors Friday afternoon and start erecting the scaffolding.

The way we do that is there is a platform inside the payload change-out room. It is called the Clean Access Platform, and it essentially rides up and down the payload ground handling mechanism to gain access to all areas of the payload day. For cleaning purposes, it is a Clean Access Platform. It is a relatively thin platform, but it can extend out quite a ways, all the way to the keel area of the payload bay itself.

So we would use that platform, insert that platform between the top of the payload and the hatch itself, the airlock hatch itself, and then build the scaffolding up off of that to get to the KU band in the upper right-hand corner of the payload bay.

So it all looks good on paper in the CAD modeling, and once we get into the job, if we get scared by something and we shouldn't proceed on, we are going to stand down and recommend that we don't do that change on

the vertical. So that will be sometime Saturday, Sunday.

That would use up Sunday as one day of contingency. So that would use up that day, and then we are carrying one more day mid next week, prior to launch countdown, for any other things that may come up.

So it is not a long job. It is probably two days total to do this, and out of those two days, probably 44 hours of the 48 is the access installation and removal. The bolt change-out itself is probably going to be very straightforward, assuming we don't get into any "gotchas" when we get out there.

MR. ACOSTA: All right. Let's stay in that row with Irene.

QUESTIONER: Irene Klotz with Reuters for Wayne.

A couple of bolt questions. Given the processing schedule, are you expecting a decision about whether to proceed with this will be made tomorrow? And if so, would the strategy include the options of what you would do if technically it becomes difficult? At that point, would you be able to say, well, we are okay to fly as is if we can't do the bolt change-out, but we would rather try and do it, or if you make a decision that you want to change out the

bolts, are we talking scrub and return to the OPF (Orbiter Processing Facility) if they can't be changed out?

And then if you could just describe a little bit about -- I think you said there was one or two threads left. How many should it be? I guess maybe in terms of the length or diameter or some way to couch the size of the bolt.

Thanks.

MR. HALE: Okay. Well, let me start with the easy one. I think in this particular application, it is like a minimum of six and preferably eight plus through threads engaged, and we pulled one of the bolts off, and it had two-thirds of a screw thread engaged. Some of the other orbiter bolts had one and a half screw threads engaged. So what we have got here is we don't have as many screw threads engaged as you would like to have.

There are four bolts, and we are talking about -- the aft two, the forward two are in good shape. So part of the analysis that the engineers are going to run, will the antenna stay safely on if we have nothing contributing from the two screws that don't have enough threads engaged and it's all carried by the two that are properly bolted in.

So we have all that engineering analysis ahead of us, and rather than speculate on all of the possible permutations and combinations of what might happen, we want to let the engineers go off and do their work, come back with their analysis. We want to let the Cape folks here go off and look at the access, and then we can make an informed decision. We will make what I trust will be a well-discussed and widely talked about decision, and I expect that it will probably be more like Saturday than tomorrow because, frankly, we need to give the engineers a couple of days to do their work, and we don't get access in the area until late Friday or early Saturday.

So tomorrow is not decision day.

QUESTIONER: If you were able to change out Discovery and Endeavour's, how did Atlantis' get skipped?

MR. HALE: Well, this was just found.

I mean, the joke that I had -- and it is not really very funny -- is I wish we found this three weeks earlier when Atlantis was still in the orbiter processing facility when you have good access.

The reason that Discovery and Endeavor's were changed is they were in the orbiter processing facility,

and they have excellent access, and that is where they normally do this kind of work.

The problem that we have now is Atlantis -- and we just found this problem -- Atlantis is in the vertical on a launch pad, and we just don't have very good access, and if we had found it three weeks later, of course, we would have flown and probably everything would have been okay. I mean, we have flown 26 times, and everything has been okay. So there is a school of thought that says it is probably okay to fly one more time, but I would rather have good engineering rationale demonstrating that it is acceptable. So that is what the folks are off generating.

If they do find out we can really live almost literally without these two bolts engaged, then we won't go to the bother of changing them out.

Mike, I am not sure I did it great justice. You understand the payload change-out room is six-stories high. The guys are operating up at the top of this. So imagine operating on a surfboard that is tied down at one end, sticking out over a six-story balcony. I mean, you know, this has got all kinds of implications that you just really would rather not do because of the location and access.

And if we have to do it, it will be done safely, and it will be done properly, but if you don't have to do it, that would just be great too.

So we are going to see how the analysis comes out over the next couple of days and then make a decision when we have all the information in front of us.

MR. ACOSTA: All right. A good description there.

We are going to go to Todd, and then we have a couple of journalists standing by in Washington, D.C., and in Houston. We will go to them next, but we will start off with Todd.

QUESTIONER: Todd Halvorson of Florida Today with one for Wayne and one for -- I guess two for Wayne.

You have described the amount of foam loss on the 121 mission as average, and I think some people might interpret that as no improvement since the Columbia accident, and I don't think you think that is the case. Could you characterize what improvement you think you guys have gained?

Also, I am wondering what you have determined since 121 on the APU signature or failure that you saw,

whether you have been able to nail down what actually happened, and if not, how do you exonerate that APU issue before L-Minus-2?

MR. HALE: There were two APU issues. There was the heater thermostat issue that I was talking about earlier, which is still in troubleshooting, although every indication is that Atlantis is okay, and there may have been some electrical fault due to workmanship or aging parts of something on Discovery. That is what is still in work.

The other APU problem that we probably talked about a lot more, both in the MMT and at the press conferences, was the potential of a leak from APU No. 1. We have run that to ground. We now believe that there was what they call a quick disconnect cover on the gaseous nitrogen side that had a very small Teflon seal that was deformed, and that probably was the source of that very, very slow leak, although folks are off doing the final tests to wrap that up. So we had a couple of issues.

Let's go back and talk about the tank for a minute. When we historically look at all the photography that has been taken after external tank separation, we only

have about half of the tanks that we can look at. The other half, either the cameras didn't work or we were in darkness or other things prevented us from getting good imagery, but of the tanks that we saw, about half that we have good imagery of, we have now meticulously gone back and looked at those photographs and done a count of all the areas of foam loss. And you can see they show up quite well because foam loss looks white against the orange kind of basic of the tank.

The folks in the three imagery labs that we have around the country have really done a huge amount of work to plot up statistics -- my goodness, we have statistics on foam loss -- statistics on how big, where they were, how many on every flight, were they associated with the ice/frost ramps, were they associated with other things, and so we have a huge number of statistics.

When I talk about an average foam loss, I mean number of areas that we see that foam came off the tank. They have an average number. What we have avoided was the large mass releases, and so the improvements that we made is okay. We eliminated the bipod ramp, which was the cause of the 107 accident. It is a piece of foam that is no

longer in the vehicle. So you cannot lose that in flight because it is not on the vehicle.

The PAL (Protuberance Air Load) ramp, we lost another large piece, as you will recall on STS-114, Eileen Collins' flight, and we have eliminated that PAL ramp off all future tanks. So, again, foam that is not on the tank can't fall off on flight.

We have improved our processes in an area where the external tank is really two tanks on top of each other, the hydrogen tank on the bottom, the oxygen tank on the top, and an inner-tank region, a structural region. Where that hydrogen tank meets the inner tank, there is a natural area where we have lost a number of pieces of foam off of what we called a hydrogen inner-tank flange, where it meets up. We have done a number of changes to the way the foam is applied in that area, and we are not seeing any significant foam losses off that area.

So, yes, we have improved the situation. We have also made a number of improvements on areas where we have put manual -- what we call "manual sprays" on the vehicle.

Now, the area that we know that is next on our list that we are working very hard to fix is the ice/frost

ramp which poses the next level of hazard to us, and the biggest piece of foam historically that we have seen come off an ice/frost ramp is about .085 pounds, less than .09 pounds. Statistically, we know we haven't seen what could happen. So we give ourselves what they call a three sigma analysis that says we could lose up to a quarter pound, .25, piece of foam, and we did a risk analysis on that. All the discussion you hear about is it an acceptable risk or not an acceptable risk seems to center on that quarter-pound piece of foam which hypothetically could come off, which is three times larger than we have ever seen come off of the ice/frost ramps, which, by the way, is one-fourth or one-eighth the size of the large pieces of foam that really caused us concern before.

So we have made improvements to the tank. We are releasing fewer numbers in a strict sense, but more importantly, the pieces that we are releasing are smaller. We have an average number of losses on 121 tank, and our goal is to avoid the big pieces, quite frankly, and we did on the last flight. That is an improvement that we continue to carry on with in the future.

MR. ACOSTA: Did that answer all the questions,

Todd?

QUESTIONER: Yes.

MR. ACOSTA: All right. Let's go to Washington, D.C. I think we have a couple of reporters that are standing by. Please identify yourself and the organization and the question, who you are posing your question to, please.

QUESTIONER: Traci Watson, USA Today, for Wayne Hale.

First, a clarification. When you talked about the bolts that had only two-thirds of the thread or one-and-a-half threads engaged, was that on the KU antenna, or was that somewhere else? I missed that.

MR. HALE: Tracy, I could just barely hear your question.

The discussion of the bolt thread engagement -- and I think that is the gist of your question -- there are four bolts that hold this antenna onto the vehicle. Two of them are very well engaged, and two of them are not, and the two that aren't, when we took those bolts off the other two orbiters, we saw as little as, say, two-thirds of a thread engaged and as much as one-and-a-half threads

engaged. Neither one of those are good numbers. So we would really like to have more engagement of a screw-thread fastener.

We will get through Machine Design 101 before we are done with this press conference.

But the engineers, as I said, are off doing the analysis to say, okay, if those two bolts that have the small number of threads engaged were to provide no real attach function for us at all, say they were removed, would the remaining two bolts hold us adequately.

In a lot of areas, we over-designed the structure of the vehicle because we designed really before we knew where it was going to fly in terms of structural vibrations and so forth. Now that we know more and we apply what we know, is it possible that we really don't need those extra two bolts? And that is part of the analysis that they are off working on.

I hope that answered your question because it was really pretty hard to hear.

MR. ACOSTA: Yes. You are better than me, Wayne. I thought it was Charlie Brown's teacher asking a question there.

All right. Traci, hopefully, that covered it. Is there somebody else at Headquarters?

QUESTIONER: I am going to try again, although Wayne did answer my question. This is Tracy Watson again.

If that antenna fell off, can you give me a sense of where it would go and how much damage it would do?

MR. HALE: It would go down, and the damage would not be good. That is about all I want to say about that.

We don't want it to come off. That is not a good thing.

ADMINISTRATOR GRIFFIN: We are not going to fly if we think there is a possibility that the antenna could come off.

MR. HALE: Right.

MR. ACOSTA: All right. Next question from Headquarters.

PARTICIPANT: There are no more questions from Headquarters.

MR. ACOSTA: All right. Let's go to Johnson Space Center.

QUESTIONER: Gina Sunseri, ABC News, for Wayne.

I am a little baffled at how to characterize this

"no-go vote" that wasn't really a "no-go" vote. Was it just more of a philosophical statement? What exactly what the intent on that on the ice/frost ramps from JSC (Johnson Space Center) and Marshall?

MR. GERSTENMAIER: There was no "no-go" votes. The board's position was we are "go" for STS-115, and then we now give them the luxury of adding any other words that they want beyond "go," which we did last time, and they both, Marshall and JSC, emphasized to us that they would like to have the ice/frost ramps redesigned, and that is all they said.

So, essentially, it was a unanimous decision by the board that we were "Go," and that is where we stand.

Then Bryan referenced back to the previous Flight Readiness Review in his discussion he had there, but, again, ultimately he was "go" for flight.

MR. ACOSTA: All right. So, to be clear, unanimous vote to "go." There were no "no-go" votes, so in case -- hopefully that didn't confuse anybody.

All right. I think we have one more question from Johnson.

QUESTIONER: Mark Carreau from the Houston

Chronicle. Thanks for that clarification.

I have sort of an esoteric question for Wayne Hale on the antenna, and that is if you have flown all these times on all the orbiters and the antenna never came off or you didn't see any indication of less than a secure antenna, why is it now that you need to nail this down and not fly further with that condition?

MR. HALE: Mark, you are a great candidate for program management, and I would tell you that that is exactly the question I have been asking.

The real answer -- and I will be serious about it -- is that when an engineer does a design that involves threaded fasteners, having that small number of threads engaged in the nut or bolt on the back side is just not good practice, and there are circumstances in which those thread fasteners can come out. So that is a poor design or a poor application, and we need to rectify it. It is something that you really don't want to have. Just good engineering practice.

I don't know. Mike, this is probably an opening for you. Do you want to help here with the engineering?

ADMINISTRATOR GRIFFIN: Sure.

To pick up on what Wayne said, engineering is in part about process and in part about outcome. We embrace good process with the hope that that yields good outcome.

This is a case where the process failed. It failed 25 years ago. So the question before us now is can we fly anyway, will there be a good outcome with the bolts we have in place.

Obviously, Mark, your question is exactly on point. If the design is all that weak, how could you fly 60, 70 times on these three orbiters alone and not have something break? And, of course, the analysts are now off busily assessing the answers to exactly that question.

The follow-up question is how strong is the attachment with the two bolts that are known to be good and then whatever help you might have from the other bolts, and they are off assessing that.

When the original design was done, very conservative assumptions were made about the vibration loading that would be imparted to the high-gain antenna from the acoustics generated by the shuttle main engines. The assumptions on the loading were very conservative, and now the guys have got to sharpen their pencils and go back

and say, "Okay. What are the real loads?" and we suspect that the real loads are somewhat less than the conservative design assumptions.

So, as Wayne, I think, or Bill Gerstenmaier characterized it earlier, the engineers have been given some homework assignments, and we will wait with bated breath to see how that turns out.

In the meantime, the ground ops folks that Mike Leinbach heads up here will be worrying the issues of how you get access to the particular fasteners the most easily and with the least possibility of any collateral damage in case we need to do that.

And I think if we say any more about that, we are going to be repeating ourselves.

[Laughter.]

MR. ACOSTA: Irene had her hand up first. So let's start there.

QUESTIONER: Maybe, Mike Griffin, if you could take this. I think we all understand that there were no "no-go" votes, but you kind of characterized the last FRR with the two people who said that they had some objections to launches, were all "go" for launch, but these people had

a couple of issues with the ice/frost ramps.

So this is going to sound a little weird, but is this launch decision less contested -- and I know you don't like that word -- than the 121 launch decision? Are people now just enjoying writing in the margins and stuff? It is a little confusing when you are explaining that people are expressing issues and opinions in these official documents and then saying, "Well, everybody is go for launch."

ADMINISTRATOR GRIFFIN: I get the question, and we ourselves actually have asked ourselves the question of whether our polling and our documentation process is as crisp as we would like it to be, and in fact, we are working on it because although in the end, a decision must be made by NASA management to launch or not launch -- and that obviously is a binary decision -- I personally have never been involved in any spacecraft project where one didn't have concerns or reservations about something.

I mean, you decide to go, but by no means, do we think it's a slam-dunk, and I have made that quite clear on many occasions.

So we are looking at what we call our COFR, our Certification of Flight Readiness, and the whole process

that leads to that to provide essentially the opportunity for people to note their concerns or reservations even while they say, "Yeah, I am go for launch."

I don't mind using the word "contested." I didn't mind it that the STS-121 review was a contentious review. I think that is how we get truth out on the table.

I would say that this review was less contentious, maybe not a lot less. I don't want them to be, but with regard to the ice/frost ramp foam, it is only fair to note that the analysts have now had two more months to work those issues, and they had produced a more refined set of numbers which were, in fact, better.

So the numbers were both more refined. They are still quite conservative, but they were more refined, and they are better, which gave everyone a good feeling.

Also, we flew, and flew quite well, last time. One flight is one flight, but it certainly goes in the right direction.

The station (International Space Station) is in excellent position for the CSCS, the Crew Survival on Orbit Option, while we wait for the shuttle to launch on need, if we need it, and so, again, I would remind you that what is

at issue here is the programmatic risk of how we go about completing the station and which is the greater risk for the program, a lengthy delay or a concern about possibly a foam strike on the orbiter, and that is a decision that we have answered in the way that we have answered it, but the point is we don't feel we are risking crew, and no one in the room felt that we were risking crew.

Our decisions might be different if we thought we were risking crew, but we are not, and so the review was active. It was participatory. I was really, really, really proud of the team and proud to be working with these people, and in the end, everybody said, "Let's go."

People, as Gerst said earlier, want to get on record that although the answer is "go," we really need to redesign these ice/frost ramps, and as I said earlier, nobody disagrees. This is not an argument we are having.

So have I answered that as fully and thoroughly as can be done?

MR. ACOSTA: A good explanation.

Okay. A couple more before we wrap up. Let's go with Bill Harwood, right there.

QUESTIONER: You had until the very last thing,

which prompted this question. Is it still technically red? Is it still in the probable category?

And for Mike, a sharp-eyed reader, I call this an unprecedented repair if you did it, and the reader sent me a note saying that he worked on the orbiter back in the '80s and the '90s, and that he recalled changing out an entire KU at the pad versus a roll-back in the past, and I don't remember that, but is that true?

ADMINISTRATOR GRIFFIN: I can't remember that myself.

MR. LEINBACH: I don't remember that one, no.

We have done some other unusual jobs at the launch pad, but I don't recall doing that particular job before.

MR. ACOSTA: All right. Stay along the wall. Mike Cabbage.

QUESTIONER: Mike Cabbage. Again for Wayne.

Could you talk a bit about what some of your candidates are with the APU issue? Is that considered an unexplained anomaly right now, and if so, would you guys go ahead and fly with it like that?

MR. HALE: Yes. It is considered an unexplained

anomaly, "UA" as it gets in NASA parlance, and that is one of the things that we really like to avoid if at all possible.

What we are doing, the first anomaly that we really tried to resolve with the APU was this potential of a leak on APU-1 because that has somewhat more serious consequences. So we spent quite a bit of time troubleshooting this leak on APU-1, and because that involves hazardous or toxic chemicals, hydrazine, and there it gets right next to the other APU, that means it is a serious operation to the troubleshooting. So we actually came to troubleshoot the thermostat problem later in this sequential nature of that troubleshooting. That has put us a little bit further behind.

We have an indication that perhaps one of the wires has been damaged potentially due to some work that was done in the turnaround flow between flights. So we would like to get in there and understand that a little bit better.

There are a number of potential causes we would like to rule out, things like are thermostats just getting old and failing. That would not be a good thing. We would

also like to make sure that if it was a collateral damage or workmanship issue on Discovery, that we don't have that same kind of problem on Atlantis. So those are the kinds of areas where we are continuing to do work.

It is not unprecedented and, as a matter of fact, it is quite usual for us to launch with some unexplained anomalies.

The consequences of this unexplained anomaly, if you had this same thing happen on the next flight -- by the way, we were able to muddle through that situation on the last flight. Given exactly the same circumstances, we would be perfectly fine through the next flight. It would take something worse to get us into trouble, and at that point, the worse thing that could happen to you is you would have one hydraulic system not available for entry, which is certainly undesirable, but we have redundancy in the system, and that provides us fully certified entry capability.

So, while I would like to see this driven as far as we can before launch, it is possible that we could launch with an unexplained anomaly and wrap up after Atlantis is off the pad.

MR. ACOSTA: All right. We have time for one more question, and we will wrap up the press conference. Let's go with Mike.

QUESTIONER: Mike Schneider, Associated Press. Question for Wayne.

You said you are still doing a review of the bolt issue, and I was wondering if you expected that it could show up on any other hardware on Atlantis.

MR. HALE: A really good question, Mike. You know, we are still going through all the threaded fasteners on board the orbiter. We have a number. As you know, there are a lot. So there could be another one found, and we have given quite a bit of thought to should we continue to do this. Well, yes, we should continue to do this because if there are deficiencies, we would rather find them and deal with them than be ignorant and have an accident caused out of ignorance. So we want to keep on improving our safety record.

I guess the real story I would tell you about, the bolts is -- I was reminded today that the aerodynamists have conclusively proven that bumblebees can't fly. Now, we all know that they can. So what does that mean? It

means that the analysis is not accurate.

So I am going back to maybe the question Mark Carreau said. If we kept these bolts on for many, many flights, does that mean it is unsafe? Well, probably what it means is that our analysis is lacking somewhere. So that is why we have sent the engineers off to do their homework.

MR. ACOSTA: All right. That will be the last word. We will wrap up today's press conference.

As mentioned earlier, the COFR statements, the Certificate of Flight Readiness, are already posted on our website, www.nasa.gov. You can go there to find out more information.

All right. That will wrap us up. We will see everybody back here in two weeks. Have a great afternoon and evening.

[End of STS-115 Post-Readiness Review press conference.]

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