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**Hubble Telescope Servicing Mission
Crew Press Conference**

SPEAKERS:

**SCOTT ALTMAN, GREG JOHNSON, JOHN GRUNSFELD,
MIKE MASSIMINO, MEGAN McARTHUR, ANDREW FEUSTEL,
and MICHAEL GOOD**

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Johnson Space Center

[TRANSCRIPT PREPARED FROM A WEBCAST RECORDING.]

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P R O C E E D I N G S

MODERATOR: Good afternoon, and welcome to today's briefing for the crew of the newly announced Hubble Space Telescope Servicing Mission.

We will begin today with short introductions and some comments, and then we will move to Q&A.

This press briefing will be about an hour, and it will be followed by a photo session with the crew here at the Johnson Space Center.

I would like to begin by introducing the commander of the mission. To my right is Scott Altman who has just recently retired from the U.S. Navy as a captain, and he is a graduate from the University of Illinois and has a master's degree from the Naval Postgraduate School. He has been a Navy pilot and test pilot and has logged over 4,000 hours in about 40 different aircraft.

He entered the Astronaut Corps in 1995 for initial training and then moved to three different Shuttle missions. The first was STS-90 in 1998 where he served as a pilot. Next was STS-106 in the year 2000 when he again served as a pilot on an early mission to the Space Station, and then in STS-109 in the year 2002, he, as well as John

1 Grunsfeld and Mike Massimino went to the Hubble Space
2 Telescope for a servicing mission.

3 And with that, I would like to hand it over to
4 Scott, so he can introduce his crew and take a few
5 comments.

6 COMMANDER ALTMAN: Thank you very much, Doug.

7 I just want to echo a comment that I heard this
8 morning at the announcement. It really is a great day for
9 discovery, for exploration, and I think for NASA, to be
10 able to go back to the Hubble Space Telescope, extend its
11 life, keep its vision out there. It is just a tremendous
12 opportunity for science and I think for the future. The
13 discoveries we don't know about yet, the observations we
14 haven't taken, it is just really thrilling for me, for all
15 of us, to be a part of the team that is going to work on
16 that, and we really are thrilled to be a part of that team
17 that has been working to keep Hubble alive, and hopefully,
18 we can extend its reach for an additional period of time.

19 I want to introduce the crew and spend a little
20 bit of time with them. We do have an extremely talented
21 group of individuals with me. I am just so proud to be a
22 part of this time, and I am looking forward to the work in

1 the future as we get ready to fly the mission.

2 To my right, we have Greg Johnson, call sign "Ray
3 Jay," fellow Naval aviator and test pilot school graduate,
4 although he went to the Air Force test pilot school. He
5 worked with me previously when I was in the Shuttle branch.
6 So we have had a great working relationship, and I know he
7 will be a phenomenal PLT on this mission.

8 I would like him to just spend a couple minutes
9 introducing himself.

10 MR. JOHNSON: Well, thanks, Scooter.

11 It is really a privilege and an honor to be here.

12 When I gave a lot of talks to kids at schools, they always
13 ask about the Hubble. So I actually put a Hubble set of
14 slides together to talk about what the Hubble does for
15 science, and to be able to be a part of the crew to extend
16 the mission for five years is really, really special for
17 me, especially on this Halloween Day.

18 I never dreamed that as a kid flying C-planes in
19 Seattle, trying to put myself through the University of
20 Washington that I would be able to fly in the Space
21 Shuttle. So it is really an honor.

22 A lot of people will say it is not really what

1 you do in life, it is who you do it with, and I can
2 honestly tell you this crew is just awesome, great to be
3 around, and to be part of the Hubble servicing mission is
4 just the best I can think of.

5 So it's been a lot of experience to get here. I
6 am proud to be here and to be a great part of the crew, and
7 I am ready to start training, so thanks.

8 COMMANDER ALTMAN: Great. Great to have you on
9 board.

10 Next to Ray Jay, of course, is an old friend of
11 Hubble's, visited it twice already and looking forward to a
12 third time, John Grunsfeld. I am just thrilled to be
13 reunited with him, looking forward to working together
14 again.

15 He is probably the most knowledgeable and
16 experienced person in our office on Hubble, also
17 experienced with spacewalking, and he will have his share
18 of that on this mission. I will turn it over to John to
19 expand on that.

20 DR. GRUNSFELD: Thank you, Scooter.

21 It is really a tremendous team that is assembled
22 here. I am very excited that we are going to go back to

1 Hubble, and I think this is a wonderful crew to go do it.
2 We have a lot of experience with you, Scooter, with Mike
3 Massimino.

4 As Barbara Mikulski said this morning, it is a
5 great day for science, it is a great day for exploration,
6 discovery, and the inspiration that Hubble provides and
7 will continue to provide with the new servicing mission.

8 People have talked about our STS-109 crew as the
9 crew that were the last folks to touch Hubble, the last
10 human beings to touch Hubble, and it is just amazing that
11 we are sitting here today, thanks really to the very hard
12 work of the people in the Shuttle program and all across
13 NASA who have put together the tools, the techniques, so
14 that we can fly back to Hubble and that we can fly to the
15 International Space Station as safely as we possibly can.

16 So it is remarkable that we are here to talk
17 about this, and thanks also, of course, to the folks at the
18 Goddard Space Flight Center and the Telescope Institute who
19 have kept the dream alive, who have kept Hubble doing great
20 science, and who will continue to keep Hubble moving
21 forward in discovery until we are able to get there,
22 sometime in 2008.

1 COMMANDER ALTMAN: Thanks, John.

2 And of course, to his right is another former
3 member of the crew, Mike Massimino, did two spacewalks on
4 STS-109, was a rookie back then, but now comes to this crew
5 as a leader and an experienced Shuttle crew member and who
6 is going to be doing a lot of the work and leadership for
7 the EVA task.

8 Mike?

9 DR. MASSIMINO: Thanks, Scooter.

10 It is a real pleasure for me to be here today
11 with my friends on this crew.

12 I was very excited when I got assigned to my
13 first flight to Hubble, and being a rookie, I was just
14 thrilled and looking forward to it, like I know Megan and
15 Mike and Drew and Ray Jay are, but I think I am more
16 excited this time. I think it is because I know what is
17 ahead of us. The opportunity to fly in space and view the
18 earth and work on the Hubble is an extraordinary privilege.
19 It is a real blessing, and a chance to be a part of the
20 Hubble team again is something I am very much looking
21 forward to.

22 They are the best group of people anybody can

1 work with. The folks at the Goddard Space Flight Center,
2 the folks we have here that work with at the Johnson Space
3 Center, and the people around the country and around the
4 world that support this great project, for us to come in
5 and be a part of their team for a couple years and get
6 ready for our mission is just a real privilege.

7 So it was a highlight of my professional career
8 doing it last time, and I am just so thrilled that I am
9 going to have a chance to go back and do it again, so
10 thanks.

11 COMMANDER ALTMAN: Great, Mike. Great to be
12 working with you again.

13 Now, Megan McArthur, the next member of the crew
14 to Mike's right, joins us as a rookie from the class of
15 2000. She has a background in aeronautical engineering and
16 also oceanography. She has blended those two things in
17 undersea adventures and research, now has an opportunity to
18 apply those talents that she has accumulated into robotic
19 skills as we explore that great ocean of outer space.

20 Megan?

21 MS. McARTHUR: Thanks, Scooter.

22 Obviously, I am very happy to be here. I am

1 thrilled to be on this team. It is still sinking in, and I
2 am really looking forward to working with this crew and
3 getting to be a part of the Hubble team.

4 Hubble is a really special instrument, whose
5 science resonates with people worldwide, and it is a very
6 special opportunity for me, and I am very grateful to be
7 here. Thanks.

8 COMMANDER ALTMAN: Great, Megan.

9 Next to Megan, then, is Drew Feustel, a fellow
10 classmate from the class of 2000. He has a background in
11 geophysics and geology. He also shares my enthusiasm for
12 classic car restoration, except I think he has probably
13 more skill and experience at working on that, and we are
14 looking forward to letting him use those skills as we work
15 on the Hubble Telescope.

16 Drew?

17 DR. FEUSTEL: Thanks, Scooter.

18 I want to echo what everybody has said, that it's
19 a pleasure and honor to be here. One of the things that
20 I've told myself recently and my kids is that with
21 opportunity comes obligation. So we are all here. We have
22 a great opportunity. We are obligated to do a good job and

1 do the best that we can do.

2 And I want to take some time to thank the people
3 who got me here, my family, my wife, my kids, my parents,
4 and all the educational institutions that helped get me
5 here and the work environments as well. It has been a long
6 arduous path for me, but I am really pleased to be here,
7 and I look forward to working with all of you folks on the
8 crew. It is going to be hard to concentrate having so much
9 fun, like I am sure we will, but we are all here to do the
10 job and do it well. So thanks, Scooter and everybody else,
11 for supporting us on this mission.

12 COMMANDER ALTMAN: Great, Drew.

13 And the final member of the crew to introduce
14 this morning is Mike Good, who is an Air Force colonel,
15 aeronautical engineer, Air Force test pilot school
16 graduate, flew F-11's operationally, also helped develop
17 the B-2. So we are thrilled to have him as a member of the
18 team, bringing his operational experience to the work that
19 we are going to do on Hubble.

20 Mike?

21 COLONEL GOOD: Thanks, Scooter.

22 Well, as you have heard everyone say, flying in

1 space is a team sport, and that has never been more true
2 than on this Hubble mission.

3 I am excited to be a part of this team. I mean,
4 I don't think excited really comes close to describing it,
5 but we are all looking forward to getting started with our
6 training, getting into the training flows and working with
7 the different teams from really across NASA. All the
8 different centers are involved.

9 I know that today there are probably a lot of
10 excited and happy astronomers and astrophysicists, but
11 there are an equal number of happy students and teachers
12 out there that have used the Hubble as a training tool and
13 a learning tool.

14 So we are looking forward to going up there and
15 just making Hubble as good as we can, really optimizing its
16 performance to a new all-time high, and so we are just
17 really looking forward to that, so that Hubble can continue
18 to inspire and explore and discover the universe.

19 COMMANDER ALTMAN: You know, I find myself
20 getting all motivated and inspired just listening to the
21 comments of the crew. So I can't wait to get out there and
22 begin working and training to develop this.

1 This is the opening chapter, opening step of a
2 long journey. The flight is scheduled for May of 2008. We
3 have a lot of work to do to get ready, but this is just a
4 tremendous start. You can tell we are all thrilled to be
5 here and be a part of this team, looking forward to working
6 with the rest of the NASA family as we embark on this great
7 mission.

8 Thank you very much.

9 MODERATOR: Excellent. Okay. Thank you, Scott,
10 and we will start off with questions down here in Houston
11 and start with Mark. Please give your name and
12 affiliation, and give us your question, please.

13 QUESTIONER: Thanks. Mark Carreau from the
14 Houston Chronicle. I have a question and a follow-up.

15 My first is for Johns Grunsfeld. Can you talk a
16 little bit about how helpful it is to have the experienced
17 members on your crew go back and do this mission? There're
18 three of you that have been there before. So what I am
19 looking for is how helpful is that.

20 DR. GRUNSFELD: Sure. Hi, Mark. Thanks for
21 coming.

22 I think it is very helpful. We have a flight

1 crew that has three folks who have been to Hubble, and the
2 rest of the crew consists of rookies. So I think it is our
3 opportunity to pass on to the rookies our experience and
4 also to provide a measure of certainty that we know the
5 telescope, we know the training process, and it is a risk
6 mitigation.

7 We have demonstrated performance. Mike did an
8 awesome job on the last mission, and I think together, we
9 will be able to put together a team, as we have just
10 started today, that will get to Hubble as an experienced
11 crew. So I think it makes a big difference, and we have
12 done that since the second servicing mission, had some
13 carryover.

14 QUESTIONER: Thank you.

15 And for Captain Altman, there has been some talk,
16 of course, about how this mission differs from the other
17 missions that the Shuttle will fly before retirement and
18 that you are going to the Space Telescope, there is no safe
19 haven. What is your assessment of the risk of doing this
20 kind of mission versus one where you have the Space Station
21 to use as a safe haven if there was some difficulty that
22 couldn't be repaired?

1 COMMANDER ALTMAN: Well, we have looked very hard
2 at the safety of this mission and evaluating that against
3 the standard really of having the Space Station there as a
4 space haven, and we have come up with a strategy that I
5 think ends up equalizing the risk as much as we can by
6 taking our own safe haven along with us, being able to
7 shelter in place until another Shuttle came up and got us
8 if that were to happen, but the first thing is making sure
9 that we have handled the risk, the source of that problem,
10 as well as possible we are collecting data from all the
11 Shuttle flights right now, and it looks like we have made a
12 great step in that direction, to limit the risk of ascent
13 debris, control that as much as possible, in order to stack
14 as many things in our favor as possible to make it very,
15 very unlikely that we would come to a Launch on Need
16 mission requirement.

17 MODERATOR: All right. Next, go ahead.

18 QUESTIONER: Robert Perlman with collectSPACE.

19 How long have you been a crew? When did you
20 learn that you were assigned to this mission, and when you
21 were told, did you have any immediate questions about it?
22 How much of the mission plan were you told about?

1 COMMANDER ALTMAN: I think we should have one of
2 our rookies answer that question. How about you start out,
3 Ray Jay?

4 MR. JOHNSON: Well, we were notified in advance,
5 not a whole long time in advance, but I had been tracking
6 the Hubble a little bit for the Space Shuttle program in
7 Astronaut Office, so was aware of what the mission was
8 about and the complexities of the mission and then also
9 discussing the Launch on Need options.

10 I talked to John Grunsfeld. John is kind of the
11 office expert in the build-up to Hubble and helped get it
12 back as a mission on the manifest. So we have talked the
13 Launch on Need.

14 But we were notified just a little in advance and
15 just enough to get prepared for this press conference.

16 COMMANDER ALTMAN: Megan, do you have anything to
17 add on that?

18 MS. McARTHUR: Well, no, just what Ray Jay said,
19 that we were just real pleased to hear the news, and a few
20 of us had been able to work as the team was investigating
21 the possibility for potentially going to do a servicing
22 mission. We had the opportunity to do some of the

1 development work earlier this year, and so learning a
2 little bit about the telescope, but obviously still have a
3 lot to learn.

4 COMMANDER ALTMAN: Yes. And I guess I will wrap
5 that up by saying I didn't fully believe it until I heard
6 the words come out of the Administrator's mouth this
7 morning at the press conference. So that is when I really
8 started getting excited.

9 MODERATOR: Next up, Gina.

10 QUESTIONER: Gina Sunseri, ABC News, for Mike.

11 Mike, talk to me a little bit about the
12 complexities from these spacewalks. I know you have done
13 some training, and we talked about the 110 teeny, tiny
14 little screws. How complex will that be for you all?

15 DR. MASSIMINO: The flight, there're some things
16 on the flight EVA-wise that have been done before. The Wide
17 Field Camera. The Cosmic Origin Spectrograph is a big
18 instrument that is similar to the ones that we changed out
19 on previous missions, but the task you are referring to is
20 the Space Telescope Imaging Spectrograph, the STIS, which
21 needs a repair done to it to remove a main electronics
22 board and put a new one in.

1 That involves removing a panel that has 110
2 non-capped or small, little fasteners that need to come
3 out, so you can remove this panel and get access to this
4 board that needs to come in and out. When we first heard
5 about this task, I think the reaction of John and I and the
6 folks up here, anyone that heard about it, said, "You have
7 to be kidding. There is no way you can do this inside of
8 Hubble, and these little fasteners, how are you going to do
9 this?," but the Hubble team that we have been referring to
10 is a pretty amazing bunch of folks and very innovative, and
11 the idea they came up with was to come up with a capture
12 plate, what we call a fastener capture plate that they will
13 be using that will attach to this panel, and then it allows
14 you through a piece of Lexan with small holes in it --
15 allows you to put a drill bit, more or less, inside of the
16 hole, undo the fastener, and as the fastener comes out, it
17 will be captured behind that Lexan. So it won't cause any
18 damage, but you can still get access to it and be able to
19 get all those done and remove the panel and have access to
20 the instrument, replace the electronics board, and put a
21 new panel on top of it.

22 So that is the new innovative task, and there are

1 new tools and new techniques that need to be developed for
2 it. So that is the one that is going to require the most
3 development.

4 QUESTIONER: Commander Altman, what is the kind
5 of "gee, whiz," "oh, boy" part of going back to Hubble for
6 you?

7 COMMANDER ALTMAN: You know, every time I talk at
8 a school or do a presentation and I show some of the
9 pictures that the instrument we put in last time made
10 possible and I look at that, I am just amazed at the
11 universe we live in and to have the opportunity to go back
12 to the instrument that makes all those observations and
13 photos possible, to expand our understanding of the
14 universe. It is just thrilling for me.

15 I know the moment as we rendezvous and close in
16 and you look out the window and you actually see Hubble up
17 there as we approach it, it is just an incredible
18 exhilaration to see it there as you close in.

19 MODERATOR: Go ahead, Jim.

20 QUESTIONER: Jim Oberg with NBC.

21 My question is you don't seem to have the
22 exclusive position of being the last visit to Hubble

1 because you are towing equipment for the next visit. Would
2 you describe the optional future visits to Hubble that
3 future vehicles, manned or unmanned, you might expect to be
4 able to get to Hubble in the next decade or so?

5 COMMANDER ALTMAN: Well, there are quite a few
6 different options. I will let John talk a little bit about
7 that.

8 Of course, the Administrator this morning pointed
9 out that this is the last Shuttle mission planned to visit
10 Hubble and will install the capability, I think, to access
11 it with other means, one of which was referred to as the
12 CEV.

13 John, you may have some more information on that.

14 DR. GRUNSFELD: All right. The first question is
15 what kind of Hubble lifetime can we expect from the Shuttle
16 servicing, and you have heard numbers like 2013. That is
17 bantered about because that is the requirement for
18 servicing mission, that after you go and repair and upgrade
19 the telescope, you get 5 years of additional life, science
20 life, out of the telescope.

21 History has shown -- and especially with the
22 current two gyro mode that we are operating under -- we

1 should be able to even get more life out of it.

2 One of the requirements for this mission, though,
3 is to put on the capability, whether it is sensors or
4 targets or actually mechanisms, so that at some point, we
5 can deorbit the Hubble safely, and that is something that
6 is called the soft capture mechanism. So we are installing
7 that on the bottom of the telescope, and that is the device
8 that will enable other spacecraft to dock with the Hubble,
9 to deorbit or to service it, depending upon where we are in
10 space technology at the time.

11 If we don't do anything, Hubble will deorbit by
12 itself, just because of atmospheric drag, a little as it
13 is, sometime around 2025. So we have quite a bit of time
14 to be clever and to work out ways to provide a deorbit
15 capability, but also possibly to service the Hubble.

16 As we heard this morning, the Crew Exploration
17 Vehicle is not out of the question, and in fact, it is an
18 interface that is coming to the Crew Exploration Vehicle.
19 So it may be a derivative, or it may be something like
20 that.

21 QUESTIONER: A follow-up to that. For the new
22 members of the crew, you have seen the tradition of people

1 re-flying to Hubble. Are you good for one mission or two,
2 or how many? Would you like to go back to Hubble, 10 years
3 from now?

4 COMMANDER ALTMAN: Mike, do you want to take
5 that, Mike Good?

6 COLONEL GOOD: Sure. I am just, as I said
7 before, excited to be assigned to a space mission, and I
8 never dreamed it would be to Hubble, but, of course, I
9 would go back again on any future space vehicle if that
10 became a possibility.

11 MODERATOR: All right. It looks like that
12 completes the first round of questions down here at the
13 Johnson Space Center.

14 We will go to the Kennedy Space Center next where
15 I understand we have three reporters. Go ahead.

16 QUESTIONER: Can you elaborate a little more on
17 when you found out about who was going on the mission? I
18 think Greg said he just found out shortly before, I guess,
19 the announcement today, but I am assuming, Scott, John, or
20 Mike, you all might have known a little bit sooner, and I
21 was wondering what kind of training have you all been doing
22 so far, and have you been to Goddard for any of that

1 training? Just if you could answer that, and then I have a
2 follow-up, please.

3 COMMANDER ALTMAN: Mike, do you want to talk a
4 little bit about the work you have been doing on Hubble
5 preparing for this?

6 DR. MASSIMINO: Yes. As far as when you find
7 out, I guess we really knew for sure this morning when the
8 Administrator said this is what we were going to do and who
9 was going to be on it, and luckily, we are able to all get
10 into the same shirts, which is what we have really been
11 spending our time on in the last day or so since we found
12 out.

13 [Laughter.]

14 DR. MASSIMINO: What has happened since, I guess,
15 about a year or so ago when there was some discussion about
16 the possibility of going back to Hubble with a Shuttle,
17 what that servicing mission might look like, and because of
18 that, the folks at the Goddard Space Flight Center on the
19 Hubble Team started looking at what they would do if they
20 were able to have a mission because you need a couple of
21 years, really, to get ready, and they didn't want to be
22 behind if it was announced.

1 So they looked at some of the things they would
2 be doing, what the EVAs would look like. We have talked
3 about a few of the things, the STIS task, instead of
4 replacing the entire instrument doing a repair job on an
5 instrument in place and also the soft capture mechanism
6 that we have talked about that might go up there with a
7 future vehicle to rendezvous with. Things like that, that
8 would require some new development, they started looking at
9 in more depth.

10 They asked for help from the Astronaut Office and
11 from the folks here at the Johnson Space Center and other
12 places. So a few of us, a bunch of folks from our office
13 were able to participate in that, and we had a couple
14 visits up to the Goddard Space Flight Center to look at the
15 tools that were being developed and gave our opinions.
16 Being experienced Hubble crew members, we were able to give
17 them some of our experience and knowledge and worked with
18 them to develop those tools and techniques, and we have
19 also had some events down here at the Johnson Space Center,
20 but those have just been preliminary development events
21 that we had.

22 Now that there is a crew assigned, we are going

1 to get into it heavy and hit it real hard, but we laid the
2 groundwork. Chuck Shaw has led a team down here at the
3 Johnson Space Center, looking into the Hubble mission, and
4 we have been a part of that in any way we could.

5 It has been preliminary stuff, but now we are
6 ready to go full blast.

7 QUESTIONER: As a follow-up, could you talk about
8 how the training would progress over the next 18 months and
9 what the different stages of the training will be?

10 COMMANDER ALTMAN: John, you probably have the
11 best handle on that right now.

12 DR. GRUNSFELD: Sure.

13 As Mike said, the workup to this point has been
14 developmental over engineering work, and we have had a
15 number of folks from the Astronaut Office involved in that.

16 Now that we have a crew, we can go forward with
17 the actual crew training part of the EVA task of the
18 Shuttle tasks.

19 Because we have been to Hubble several times
20 before, the template is somewhat well understood. There're
21 still some complexities, and the Space Telescope Imaging
22 Spectrograph task is one of them, that there are still some

1 details to be worked out, but we will start in earnest, as
2 soon as we can get everything organized, training for the
3 NBL, training in 1G situations for some of the hard stuff,
4 and that will involve a crew being in the NBL almost every
5 month from now until flight.

6 We have at least 12, roughly, sessions of five
7 NBL runs each which is in the large pool in the space
8 suits. So that is going to occupy a lot of time. A number
9 of trips up to Goddard to work with the real hardware, down
10 to KSC as we get close to flight, and, of course, all the
11 Shuttle mission training in the simulators here at the
12 Johnson Space Center flying the Shuttle training aircraft,
13 and it will be a full plate.

14 QUESTIONER: This is Steven Young with
15 SpaceFlightNow.com for John Grunsfeld.

16 When Sean O'Keefe took the decision to cancel the
17 servicing mission, you were one of the most vocal
18 supporters of that decision. I am just wondering what has
19 changed in your mind personally since that time for you to
20 not only, I presume, change your mind and also be part of
21 this mission.

22 DR. GRUNSFELD: Sure. Well, I think your opening

1 statement was incorrect. I supported Sean O'Keefe's
2 decision as the Administrator of NASA, and whether I agreed
3 or disagreed with the decision was really irrelevant.

4 There is a big difference between a risk-taker,
5 and quite honestly, you are looking at seven risk-takers up
6 here on the stage and risk managers who are responsible for
7 undertaking risk on behalf of the astronauts, on behalf of
8 NASA, on behalf of the country, and in the case of Hubble,
9 on behalf of people all around the world.

10 Mr. O'Keefe made the decision as NASA
11 Administrator as the chief risk manager for the agency at a
12 time when he had data in front of him that led him to that
13 decision, and when the Administrator makes a decision like
14 that, it is up to the team to support that decision and
15 make the best out of it.

16 What we did as a team was to make sure that the
17 Hubble science was supported, that we had a plan going
18 forward that at least in principle would allow us to keep
19 Hubble producing science as long as possible, and that
20 would not prevent us or preclude us at some future time in
21 going back with the Shuttle pending the data that was
22 available to either the current Administrator or future

1 Administrator.

2 What we saw this morning was that Mike Griffin
3 reviewed all of that data as the current risk manager for
4 the agency and made the decision that given the tremendous
5 progress that we have made on the Shuttle program side in
6 terms of safety and in terms of understanding the risks for
7 ascent debris, for what we can do in terms of safe haven on
8 the Shuttle, for inspection and repair, on the basis of all
9 those considerations, he reinstated the mission, and it is
10 because we were able as a team, starting with Mr. O'Keefe
11 leading to Administrator Griffin, to keep the program alive
12 and keep the science going.

13 I think it was Mr. O'Keefe who said it best when
14 he made the decision, and I was sitting next to him at one
15 of the press conferences. He said, "This is a difficult
16 decision," and he said it is not one that everybody is
17 going to agree with, and in fact, he said there are plenty
18 of astronauts -- and he pointed to me. He said there are
19 plenty of astronauts, including John Grunsfeld, who if
20 given the opportunity would be first in line volunteering
21 to go on such a mission. I can't necessarily say I am
22 first in line. I would say it is a seven-way tie, and we

1 are all just thrilled to be here today.

2 QUESTIONER: Todd Halvorson of Florida Today,
3 also for John Grunsfeld.

4 Given what you have seen on the first three
5 post-Columbia missions and the safety enhancements that you
6 were just discussing, I am wondering if you can give me an
7 idea of what your own personal assessment of the risk of
8 this particular mission is and whether you think it is
9 safer or more dangerous than previous Hubble servicing
10 missions, given the fact that you guys would not be able to
11 seek safe haven on the Space Station.

12 DR. GRUNSFELD: That is a wonderful question. In
13 fact, that is one Scott Altman and I were discussing this
14 morning.

15 I think we both agree that a mission in 2008 will
16 be much safer than the STS-109 mission to Hubble that we
17 flew in 2002.

18 The tragic loss of Columbia is one that hits us
19 all very hard, and I know from some members of the folks
20 sitting up here who were involved and I am sure for
21 everybody, but involved in the Columbia recovery effort,
22 this is still a very tough time.

1 The lessons that we have learned from that and
2 all of the incredibly hard work from the best and brightest
3 of NASA is what allows us to fly missions like STS-114,
4 STS-121, and STS-115, the three missions we have flown so
5 far with ever-increasing safety, and we are going to keep
6 watching that.

7 We definitely did learn from Columbia, and we are
8 changing our culture. We are going to keep watching safety
9 every single mission, including Hubble and including the
10 missions after that.

11 You have all heard me say this before, but I feel
12 like a mission to Hubble is worth risking my life for,
13 something I discussed with my family. It is something that
14 is really important for our country, and I firmly believe
15 that the next mission to Hubble will be much safer than the
16 missions that we have flown before.

17 COMMANDER ALTMAN: John, I would just like to
18 kind of follow on to that because I think the same thing.

19 Looking back at when we launched on STS-109, we
20 had our understanding of the risk. Maybe we didn't know as
21 much as we thought we did then, but now as I look back on
22 what we have learned from then to now, the improvements

1 that we have made, there is no doubt in my mind at all that
2 the next time we go to Hubble, it will be significantly
3 safer than when we launched on STS-109, and I am prepared
4 to do it, and I know the whole crew is ready to go.

5 QUESTIONER: Just a quick follow from Mike Good.

6 I am wondering how you as a rookie feel about the risk
7 involved with this mission from where you sit as a
8 first-timer.

9 COLONEL GOOD: We talked about that at home, my
10 family and I, already, and as you have heard, yeah, there's
11 a risk, and we all feel like it's worth the risk. The
12 reward is worth the risk to go to Hubble, and as I said
13 before, to really optimize its performance and to bring it
14 into its best capabilities.

15 As you have already heard from these guys, we
16 have done a lot. We have come a long way since Columbia,
17 and I feel good about that. We have inspection capability.
18 We have repair capability, and we have a Launch on Need
19 Mission that is going to be on the pad, waiting if we do
20 need it.

21 So this mission that we are going to go on is
22 going to be the safest of all the Shuttle missions up to

1 that point. I think each mission just keeps getting safer
2 and safer.

3 QUESTIONER: Dan Billow at WESH TV for Commander
4 Altman.

5 You have touched on it a little bit, but let me
6 ask you to kind of go over it again or elaborate. What
7 steps are you going to take? And Mike just mentioned one
8 of them, but what steps are you going to take on this
9 flight to kind of minimize the risk or minimize the fact
10 that you don't have a safe haven up there?

11 COMMANDER ALTMAN: Well, probably the biggest one
12 is that we are flying this time with an on-orbit inspection
13 capability, just like the Return to Flight missions have
14 all had. We will be able to inspect the vehicle, determine
15 its condition.

16 Of course, we are EVA-capable with all the EVAs
17 that are planned for Hubble. So, if we do find any damage,
18 we will attempt to repair it.

19 If it turns out that that is unsuccessful, as
20 Mike alluded to, the plan is to have a Shuttle on the
21 launch pad, ready to go. We will kind of shelter in place
22 by reducing the power load, extending up to 25 days on

1 orbit while we wait for Shuttle to come and be our ride
2 back home, just the way the Station crews do when they
3 shelter on board the ISS and wait for a Shuttle to come up
4 and pick them up to bring them home.

5 MODERATOR: All right. That completes the
6 questions coming out of Kennedy Space Center, and now we
7 will go up to NASA Headquarters. We have one journalist
8 there I think that has one question.

9 QUESTIONER: Traci Watson, USA Today, for Dr.
10 Grunsfeld.

11 I wanted to follow up on Steven Young's question.
12 You had the unenviable position a couple years ago of
13 having to participate in the news conferences about the
14 cancellation of SM-4, and I am wondering if you can give us
15 a little more insight into your opinions at the time. Did
16 you think it was an inadvisable thing to do, despite your
17 own willingness to go?

18 DR. GRUNSFELD: That is a tough question to
19 answer, and in order to understand the environment, you
20 have to kind of rewind the movie to 2004, shortly after the
21 Columbia accident, and understand the mind-set of everybody
22 in management. We were still reeling from the loss of

1 Columbia and the tragic loss of the crew.

2 I had to reconcile in my own brain my feelings
3 about my love for the Hubble program, all the people who
4 have spent their lives working on generating the great
5 science, and the reality of what we could actually do with
6 the Shuttle program.

7 Where I put myself was trying to project back to
8 a previous tragedy which was Challenger. So the mind frame
9 that I put myself in was to ask what did people do after
10 Challenger, and I read a lot, and I talked to other
11 astronauts who were around and went through that, and the
12 answer was actually a pretty simple one.

13 What Mr. O'Keefe said as NASA Administrator is
14 that we are not going back to Hubble with the Space
15 Shuttle, and so I asked myself the simple question. That's
16 a decision. It is really important that our leaders make
17 decisions and that we follow them, but what is also
18 interesting is and happened in Challenger, there were
19 payloads that we had on the books that were also very
20 important payloads. After the loss of Challenger, people
21 said, well, if we can't launch them on the Space Shuttle,
22 how can we launch them, and we came up with alternate means

1 of getting payloads to space that were very important,
2 national security payloads, and also experiments.

3 Some experiments that were going up on the
4 Shuttle went up on expendable launch vehicles. So I asked
5 this question, if we can't service Hubble using the
6 Shuttle, how can we service Hubble, and out of those simple
7 questions in discussions with Goddard and other folks came
8 the concept or potential for doing robotic servicing.

9 The robotic servicing was actually a very useful
10 exercise. You heard Mike Griffin this morning say that he
11 thought it was not a viable alternative, and while that may
12 be well true, what it did allow us to do is to continue
13 working on the Hubble program and continuing to develop the
14 instruments and the techniques that we might use for
15 servicing.

16 A little bit earlier, you heard Mike Massimino
17 talk about the Space Telescope Imaging Spectrograph repair
18 and the 110 tiny screws. The way that we are planning to
19 service the STIS instrument now was actually borne by the
20 requirement of doing that same repair using robots, and
21 that is a totally crazy idea. We never could have done it
22 using robots, but the essential idea of how we are going to

1 handle all of that came out of the robotic servicing
2 program.

3 So, to answer your question, the way I was able
4 to reconcile my own feelings about the decision was to push
5 forward and try to figure out a way that we could service
6 Hubble.

7 MODERATOR: Okay. I believe we have a follow-up
8 question coming out of Headquarters.

9 QUESTIONER: Can you tell us a little bit about
10 doing the inspection without this ISS there for the crew to
11 take photos from will entail?

12 COMMANDER ALTMAN: I think that was directed to
13 Megan as the arm operator.

14 MS. McARTHUR: You were interested in learning
15 about inspection, the inspection capabilities that we will
16 have when we are not at the Space Station. We will carry
17 the orbiter boom sensor system, which has a package on it
18 that we will use to inspect the various areas on the
19 orbiter that we would be concerned about. We will carry
20 that capability with us, and it is not a requirement to be
21 at the Space Station in order to do that type of
22 inspection.

1 MODERATOR: Thank you, Megan.

2 Now we are going to go to the Goddard Space
3 Flight Center for a single reporter there.

4 QUESTIONER: This is Alan Boyle with MSNBC.com.

5 I just wanted to get straight in my own mind how
6 the spacewalks were going to be organized. I assume there
7 are two teams of spacewalkers, and are they going to have
8 the experienced folks divvied up, so that they are on the
9 two teams, or have you gotten that far?

10 COMMANDER ALTMAN: I think you have basically
11 just encapsulated about the point that we are at, at the
12 moment. You can make those assumptions. There will be two
13 teams, and we will split the experience, and we will figure
14 out which will go to which team and who exactly is on each
15 team. Anything more than that, I will defer to my EVA
16 leads.

17 DR. GRUNSFELD: Scooter, you hit it exactly. I
18 think the bigger perspective is we have five EVAs on this
19 flight that are planned. Each one is currently full of
20 tasks. I am sure you had a good briefing from the folks
21 there at Goddard, but we are going to put in three new rate
22 sensor units which have six gyros total. We are going to

1 change out the batteries. We are going to put a new Wide
2 Field Camera in, which is the camera that really -- this
3 new Wide Field Camera is going to be incredible. It can
4 see in colors that the human eye can't see, and it is
5 really going to be the tool that allows us to see deeper
6 into the universe than Hubble has ever been able to see
7 before.

8 We are putting in, as you know, the Cosmic Origin
9 Spectrograph which, as Mike said, is one of these large
10 refrigerator-size instruments, and then we are going to
11 replace a fine guidance sensor, which is one of the things
12 that makes Hubble so good, that it can point so great and
13 then repair the Space Telescope Imaging Spectrograph.

14 There are a few other tasks in terms of the outer
15 insulation on the telescope that will give it a little bit
16 longer life, but that is a lot of stuff to put on the
17 plate, and we will do that with five EVAs.

18 Mike and I will be split on different teams, so
19 that the experience is spread out, and as Scooter said,
20 that is about as far as we have gotten.

21 MODERATOR: All right. That will complete the
22 questions from outside JSC. We will come back here to

1 Gina.

2 QUESTIONER: Gina Sunseri, ABC News, for Drew.

3 You have got kind of a long history of tinkering
4 in your garage. So I think you are going to give a lot of
5 hope to every other kid who is out there tinkering in their
6 garage that this too could be a career path for them.

7 So tell me how that tinkering will translate into
8 working on Hubble. Is there a lot of difference between a
9 Jaguar and a Hubble?

10 DR. FEUSTEL: Yeah. There is a tremendous amount
11 of difference, but for me, the key is just familiarity with
12 tools and working with tools, and I think that for all the
13 folks that do EVAs and work on EVAs on Space Station or
14 Hubble, what is critical to performing those successfully
15 is having that experience and some of that background, some
16 familiarity to work with those tools.

17 Much of what we do is like working in the garage,
18 at least that is the way I see it. In fact, every time I
19 am in the garage, I think of it as currency training. We
20 do a lot of training in sims here at JSC and everywhere
21 else, flying and whatnot, but when I am in the garage, that
22 is my currency training. So it is a good excuse that I can

1 provide to my family for a reason to go into the garage and
2 work, but other than that, that is really the key.

3 All the folks that are on this mission are very
4 skilled at EVA type of work, and I think it is going to be
5 an outstanding opportunity for all of us to do some great
6 things to Hubble. So I am looking forward to that.

7 DR. GRUNSFELD: On every Hubble servicing
8 mission, the tool development is really crucial because
9 when we are up there, we can't exactly call down and say,
10 "Hey, can you send a new tool? This one doesn't work." So
11 the tool development is really crucial.

12 At least on the last couple of flights, one of
13 the best sources of inspiration for new tools is to go to
14 the hardware store and see what's current. So I have used
15 that as an opportunity to stock my garage, and I am sure
16 Drew will do the same on this mission.

17 [Laughter.]

18 MODERATOR: Go ahead, Mark.

19 QUESTIONER: Mark Carreau from the Houston
20 Chronicle. I have a couple.

21 I guess for Scott Altman, I am visualizing the
22 inside of the Shuttle crew cabin. There's seven of you,

1 and you have to plan for the possibility of almost a month.

2 Where are you going to put all of the tools that you are
3 going to bring on this mission versus the supplies you
4 might need to stay that long?

5 COMMANDER ALTMAN: It is a challenge, the
6 packaging challenge.

7 I look back at the last mission on Columbia
8 servicing Hubble and how packed the mid deck would get from
9 time to time. We actually on the flight deck looked
10 forward to the spacewalks because that meant two people
11 were outside and not taking up so much space, and it was
12 always with a little bit of reluctance that we opened a
13 hatch to let them back in, but we did every time, Mike and
14 John.

15 [Laughter.]

16 MR. MASSIMINO: I think I knew that.

17 COMMANDER ALTMAN: So on this flight, though, you
18 are right. There is an additional challenge we didn't have
19 before with the additional supplies, LiOH to scrub the
20 atmosphere, food for us to survive on, but we also have the
21 benefit of now having an external airlock, which gives us a
22 little bit more internal room. Some of the supplies, we

1 can put out in the payload bay because we know if we will
2 need them later, we will be able to use one of our EVAs to
3 go get them.

4 So I think we have a lot of work ahead of us on
5 the final packaging, but it looks like it is all doable to
6 keep us up for nearly a month.

7 QUESTIONER: Thank you.

8 I had a question for anybody that this might
9 grab, but I am wondering how this mission and the mission
10 of Hubble overall, how you all might see that fitting into
11 NASA's new exploration mission. Is there a bridge there?
12 Is there something that your mission and the role of the
13 Hubble Space Telescope in studying the universe sort of tie
14 that together? Does that grab anybody for something?

15 COMMANDER ALTMAN: Well, I would like to get that
16 from a couple of folks.

17 Drew, you have been working exploration for quite
18 a while now at different things, the desert rats and
19 different suit things, NEEMO. I would be interesting in
20 hearing your thoughts, and, John, I am sure you have some
21 comments as well.

22 DR. FEUSTEL: I guess I can just start by saying

1 what interested me this morning when we heard the briefings
2 at Goddard was what Ed Weiler talked about Hubble bridging
3 the gap looking out into the beyond, and as he said, you
4 know, the Moon is very close, Mars is a bit farther away,
5 but it is that beyond stuff that I think Hubble really
6 gives us.

7 In my mind, in considering all of this and
8 thinking about Hubble over the last few months with the
9 development work that we did originally, what has impressed
10 me the most about Hubble is all of the information that is
11 returned to us about the universe, and it is the one piece
12 of scientific instrumentation that we have that really
13 provides some key insight into what is really out there,
14 what is out in the beyond.

15 In that sense, I think that is where we get the
16 biggest return from it and will continue to until its
17 eventual retirement.

18 DR. GRUNSFELD: In the original vision that the
19 President elucidated for NASA, the beyond played a big
20 role, and in part, it was to search for Earth-like planets
21 outside our solar system that is part of the really big
22 question of are we alone, and Hubble is a part of that.

1 Hubble, I think is a part of returning to flight,
2 as Mike Griffin announced today. Hubble is about returning
3 the Shuttle to flight. It is one of the best marriages of
4 human space flight and the science program, but Hubble is
5 just one of the constellation of NASA satellites and
6 spacecraft that is dedicated to science.

7 What is so remarkable about Hubble is it makes
8 discoveries on its own, but it also makes discovery in
9 concert with the Spitzer Observatory, the Chandra
10 Observatory. Hubble is continuing to make discoveries in
11 concert with our constellation of spacecraft around Mars,
12 and the story on Mars just keeps getting better and better,
13 with Mars Reconnaissance Orbiter now just about to enter
14 its science phase from its engineering phase. I think we
15 are going to see the Hubble and Mars Reconnaissance Orbiter
16 partnership really explode.

17 I think the other area is, believe it or not, the
18 Moon. For many years, we thought that the Moon was too
19 close for Hubble to observe. If Hubble tries to look at
20 the Moon, the Moon is moving really fast.

21 Well, last year, we showed that Hubble is really
22 a great telescope and unique in its capability, especially

1 looking in the far ultraviolet and the ultraviolet where
2 our eyes can't see, to look at the Moon. So we may have
3 opportunities there again.

4 In particular, with the Lunar Reconnaissance
5 Orbiter and the LCROSS Mission, we are going to have two
6 spacecraft that are going to go into Shackleton Crater, we
7 think Shackleton Crater, and it is going to send up a plume
8 of material. Much like Shoemaker-Levy 9, we are going to
9 see this plume of material, and hopefully, it will leverage
10 the Hubble Space Telescope to look in that plume because,
11 again, it will be uniquely able to understand what is
12 there. One of the big questions surprisingly is, is there
13 water on the Moon, and that is one of the objectives of
14 that probe.

15 So Hubble can play some really key roles in the
16 science areas, but also in just inspiring kids to go into
17 science and engineering. Hubble has done that for the 16
18 years it has been producing wonderful science, and it is
19 those young kids who go into science and technology that
20 are the ones who are going to carry the vision of
21 exploration forward. Somebody who is maybe in high school
22 now or maybe in grade school might be the person who is

1 inspired by some Hubble science who goes on to be a member
2 of the first crew to step on Mars. I think that would be
3 pretty exciting.

4 QUESTIONER: Robert Perlman with collectSPACE.com
5 for Commander Altman.

6 In the remote possibility that you would need the
7 Launch on Need Shuttle to come up, how exactly would that
8 unfold? If it is known, are there going to be EVAs between
9 the two Shuttles? Do they dock? How does that work?

10 COMMANDER ALTMAN: Actually, there is no way for
11 the two Shuttles to dock to each other, but the next best
12 thing is to basically be berthed together using the robotic
13 arm to latch onto a grapple fixture and provide basically a
14 stiff path between the two vehicles, so that you could move
15 the crew on a spacewalk from the stricken Shuttle onto the
16 rescue Shuttle and then bring them home like that. It
17 would take basically the bulk of a day to make that
18 transfer, after a few days for the other Shuttle to get
19 there and rendezvous with you. With one sitting on the
20 pad, we are trying to minimize the time it takes from
21 determination of the need to getting the crew up there and
22 bringing them home.

1 So there is a technical solution that looks like
2 it will work to provide us that Launch on Need capability
3 for that remote opportunity.

4 MODERATOR: That's it there.

5 Jim, go ahead, if you have one.

6 QUESTIONER: Jim Oberg, NBC.

7 John, can you comment on the -- there was some
8 pressure early on to fly this mission as soon as 12 months
9 went out, and some people wanted to fly it October,
10 November of '07, and that has clearly not been decided on.

11 Can you summarize the arguments for flying it
12 even sooner and perhaps the reasons why they didn't win the
13 argument?

14 DR. GRUNSFELD: Well, the argument is really,
15 simply a technical one, and there're two sides to it, one
16 of which is how soon can a crew get ready, how soon can we
17 get ready, and the other side is how long will Hubble last.

18 When we started having this discussion about
19 servicing Hubble, the big issue was -- well, there are two
20 issues actually, but the big issue was the batteries. The
21 belief was that by sometime in the end of 2008, some people
22 said as early as the end of 2007, that Hubble's batteries

1 would go bad, and that would be the end of Hubble.

2 Well, again, the really creative folks who
3 operate the Hubble figured out what the best
4 charging/discharge algorithm is, the best method of
5 charging the batteries, and then also they recently
6 finished an assessment last August of what the current
7 battery charge is and have determined that, in fact, 2008
8 looks very favorable and that maybe 2009 is the time at
9 which we start to become more concerned about the
10 batteries.

11 I think the battery story in itself is a
12 remarkable story. Those batteries were produced around a
13 year before the launch of the Hubble. So we are talking
14 about more than 16 years ago, and these batteries are fleet
15 leaders in space.

16 I don't know how many people trust they have any
17 batteries that even come close to lasting that long.
18 Usually, we are thinking about laptop batteries lasting
19 only a few hours and for a year or so of cycle discharge,
20 and these batteries are in space, a tough environment, and
21 going on 16 years, and it looks like they should last
22 another couple of years. So that pressure has been taken

1 off.

2 But nevertheless, the gyros are still a story,
3 the fine guidance sensors are still a story, and that is
4 more related to how long does Hubble produce productive
5 science, and in the science community, there is always a
6 worry that once Hubble can't produce good science, that, of
7 course, their work stops, but also when you look towards
8 the end of Hubble's life, whenever that may be, you know,
9 2013 or 2015, that the sooner we get these new scientific
10 instruments up, the Cosmic Origin Spectrograph and the Wide
11 Field Camera 3, the sooner we start producing that science
12 and the more science we will get out of it.

13 I think that is an important point, but certainly
14 a second-order point. The real question is how long can
15 Hubble go before it can't be serviced.

16 Related to the science instruments going up
17 there, though, is something that we heard every time a crew
18 is named and every time a mission is put on a manifest,
19 that the biggest discovery that Hubble will make is the
20 next one, and a lot of folks don't believe that. But from
21 the last mission, we were told that, and there was a small
22 discussion about something called "dark energy," which we

1 now know is about 75 percent of the total energy content of
2 the universe. Prior to the previous Hubble missions,
3 nobody even knew it existed. So I think that is pretty
4 big. I don't know how we can top that, but I imagine there
5 will be something.

6 QUESTIONER: That's the money quote. Thank you.

7 MODERATOR: All right. Thank you.

8 That looks like that will wrap up our questions,
9 and to close it out here, I would like to turn it over to
10 Commander Altman for a final statement.

11 COMMANDER ALTMAN: Thanks, Doug.

12 I just wanted to close by thanking everybody for
13 the interest, support, and attention. It is a huge team
14 effort, and as I have been sitting here listening to the
15 comments, the questions, and the answers, I remembered a
16 night when I was 10 years old and I went outside on a
17 summer evening and looked up at the moon and realized that
18 a person from this planet was now standing on that moon,
19 and I also looked out at the stars that night, and I
20 wondered what was out there, how could I go out there, and
21 I know we are all thrilled now to be a part of the Hubble
22 team that really does take us out to those stars and bring

