

NASA OFFICE OF PUBLIC AFFAIRS
WASHINGTON, D.C.

Media Teleconference

**"NASA Report Reviews Crew Safety Measures
During Columbia Accident, Recommends Improvements"**

Briefing Participants:

WAYNE HALE, Deputy Associate Administrator
for Strategic Partnerships
ASTRONAUT PAM MELROY, Deputy Project Manager
for Investigation Team
NIGEL PACKHAM, Project Manager for Investigation Team
JEFF HANLEY, Constellation Program Manager

Moderated by **JAMES HARTSFIELD**
Johnson Space Center, Houston

4:00 through 4:50 p.m., EST
Tuesday, December 30, 2008

P R O C E E D I N G S

MODERATOR: Welcome to the Spacecraft Crew Survival Integrated Investigation Team Report Telecon. With us on the line is Wayne Hale, NASA's Deputy Associate Administrator for Strategic Partnerships and former Space Shuttle Program Manager; Astronaut Pam Melroy, who served as the Deputy Project Manager for the Investigation Team; Nigel Packham, who served as the Project Manager for the Investigation Team; and Jeff Hanley, the Constellation Program Manager at NASA.

We will hear some opening remarks from Wayne, and then we will open it up for questions.

Wayne?

MR. HALE: Thanks, James.

This is Wayne Hale, and today, we are completing and publishing some work which has been in the making for some length of time. This work, we all hope will go toward making space flight safer for all those who venture into space in the future.

In the spring of 2003, the Columbia Accident Investigation Board requested that NASA form a Crew Survivability Working Group to better understand what

happened during the final stages of the Columbia accident.

In the CAIB report, you can read a very brief summary of their findings in Volume 1 on page 77 and also in Appendix G12.

At the time of the CAIB report, I was the Deputy Shuttle Program Manager. My boss, Program Manager Bill Parsons, and I were subsequently informed that there was much more information available from the Columbia accident that could be useful in the prevention of future accidents.

We then instituted a larger team called the Spacecraft Crew Survival Integrated Investigation Team -- I won't repeat that name again -- to capture the lessons learned from the loss of Columbia and her crew and develop recommendations to improve crew survival on all future human spacecraft.

We specifically asked the team to prepare a more thorough NTSB-type report that future spacecraft designers could use to protect space travelers of the future. This team performed a comprehensive multidisciplinary analysis of the accident. They investigated all the elements of crew survival, including the design features, equipment, training, and procedures intended to protect the crew.

This has taken some time to complete, but the goal was to have a complete engineering report, not to meet some arbitrary schedule.

In the interim, several recommendations have been made, many of which have been adopted and implemented to increase the safety of the Space Shuttle crews on their remaining flights. Recommendations of the team have also been provided to the Orion spacecraft designers who are preparing the next generation of NASA spacecraft.

Today, we are providing a final version of the report in a public forum, so the designers of future spacecraft, whoever they might be, can learn from the Columbia tragedy and prevent or hopefully at least mitigate future accidents.

The team's final report include 30 recommendations to improve crew safety on future space flights. The recommendations cover a broad array of subjects, ranging from crew training, procedures, restraints, and individual safety gear; the spacecraft design, methods, and recommendations regarding future crew survival investigations.

I call on the spacecraft designers from all the

other nations of the world, as well as the commercial and personal spacecraft designers here at home, to read this report and apply these hard lessons which have been paid for so dearly.

This report confirms that although the valiant Columbia crew tried every possible way to maintain control of their vehicle, the accident was not ultimately survivable. The report and this media telecon is limited only by the goal to protect the privacy interest of the surviving family members.

The Spacecraft Crew Survival Integrated Investigation Team's initial Project Manager was Dr. Gregory Hite with NASA's Johnson Space Center, who retired in December of 2007. Dr. Nigel Packham took over as Project Manager of the team. NASA Astronaut Pam Melroy served as the Deputy Project Manager. Dr. Packham and Colonel Melroy, along with Constellation Program Manager, Jeff Hanley, are here with me today to talk about the report.

With that, I think we are ready for questions.

MODERATOR: Okay. Thank you, Wayne.

I have a list of all the media that are on the

line, and I will call on you each for questions. When you ask your question, please state your name and affiliation, and if possible, address your question to the person you would like to have respond.

I will preface everything with the fact that we have a limited amount of time available with the folks on the line. So please limit yourself at this first go-around to a single question, and if time permits, we will go around to everyone again for a follow-up.

So, with that, Gina Sunceri with ABC, do you have a question?

[No response.]

MODERATOR: Gina Sunceri, are you on?

MEDIA QUESTIONER: What is the delay? Why has this report taken so long to come out?

MR. HALE: Gina, let me address that, and perhaps Colonel Melroy or Dr. Packham can elaborate.

First of all, we did not set an arbitrary time deadline. All the people working on this report have other jobs, and they are taking time from those other jobs to participate in this investigation. We wanted to make sure we had a thorough and complete engineering report, and

frankly, it did take longer than at least I initially envisioned, but here it is. It is complete, and we think it is a very good report.

COLONEL MELROY: This is Pam Melroy speaking.

I would just like to add that as we identified key findings, we transmitted that information to both the Shuttle and the Constellation programs to make sure that there was no delay in understanding those findings and applying them where they could.

MODERATOR: Okay. Next question. Mark Carreau?

MEDIA QUESTIONER: Thank you. Mark Carreau, Houston Chronicle.

I am not sure who this might go to best, but could you describe some of the things that you really have kind of high-balled into the Orion program and the development that are really going to make a difference, do you think? Is it a series of small things or anything large? How are you attacking that?

DR. HANLEY: This is Jim Hanley. I will comment briefly and then ask Pam and Nigel to perhaps comment because they have been much closer to the Orion design activity and can comment further and have helped on the

Orion team with incorporating many of these findings.

The one example, Mark, is the loop, the air revitalization loop that is provided to the crew's suits. They required manual activation during STS-107. On Orion, that is something we are going to have them already plugged in and ready to go and pressurized. So, as an example, that is one that I would point to.

Pam?

COLONEL MELROY: This is Pam Melroy.

I would like to add that, in addition, the seat design, we spent a considerable amount of time talking to the suit and the seat design folks for Orion, and they have really embraced the findings of the report and are working very hard to come up with an integrated design that integrates the seats and the suits into the spacecraft in more ways, including the restraint system, as well as the suit loop that Jeff mentioned, to make it more part of an integrated package, and we are really pleased with the work that they are doing.

MODERATOR: Okay. Next question will be from Irene Klotz.

MEDIA QUESTIONER: Thanks very much. It is good

to hear your voice, Wayne.

I have two quick questions. One, is this NASA's last word on the accident, and second is, when did the team start its work? Thanks.

MR. HALE: Well, let's see. The team started its work, Irene, in the fall of 2003 -- I'm sorry -- 2004, and as far as I'm concerned, this is the last word. I don't know of anything else that is in work at this time.

MODERATOR: Okay. Next question is from Frank Morring with Aviation Week.

[No response.]

MODERATOR: Frank Morring with Av Week. Are you on, Frank?

TELECONFERENCE OPERATOR: Sir, it looks like he has disconnected.

MODERATOR: Okay. We will go on with Seth Borenstein, AP.

MEDIA QUESTIONER: The issue of the crew members, one wasn't completely seated, the others with issues of the restraints, helmets, glove, if you look at the big picture -- I guess this is for Pam or Wayne or Nigel, whichever -- is this more of a problem with timing and suit design? Is

this more of a problem with crew, crew timing issues, or is this just an issue -- you know, does it really matter if they had been fully suited, seated, and restrained? They would have still not survived. Why does that matter?

MR. HALE: Well, in this particular accident, Seth -- this is Wayne Hale again. In this particular accident, none of those actions would have ultimately made any difference.

It is an unfortunate feature of the Shuttle crew escape suits, that you cannot have the visors down during the entire entry phase because the atmosphere is not a closed atmosphere, and pure oxygen bleeds out of those suits into the cabin, and you exceed the O2 flammability limits in the crew cabin.

There are always constraints, and one of the things I think you heard Jeff Hanley say was the new suits that are going to be in the Orion spacecraft that are under design right now will not have that problem. So the crew can be completely encapsulated at all the critical times.

So it was not a problem with the crew. It is a basic problem of suit design, and that is one that we intend to fix in the future, future spacecraft.

MODERATOR: Okay. Next question from John Schwartz.

MEDIA QUESTIONER: Hi there, folks. I guess this is for Pam Melroy, though I would invite Wayne Hale to speak up as well.

These folks were -- these seven astronauts were, Pam -- these folks were your -- your colleagues and your friends, and I am just trying to get a sense of what it was like to work on such emotionally close material at such a deep technical level. Just talk, please, about what it was like to work through all that and whether it helped to be doing it in some way.

COLONEL MELROY: This is Pam Melroy.

I think I would certainly be far from the only person who felt that learning the lessons of Columbia was a way for all of us to work through our grief at the accident. I think that was a very important thing. In fact, it is something that NASA is really good at, is literally wringing every piece of data that we can out of the things that we do, both right and wrong, and that was very much an important part of it.

I would say this is one of the hardest things I

have ever done, technically and emotionally, but it was so important, and I felt so sure that the crew -- that we needed to make the best and all the knowledge that we could get out of the accident, that I think for all of us, we knew we were doing the right thing, and that was extremely important.

MODERATOR: Okay. Next question, Tracy Watson, USA Today.

MEDIA QUESTIONER: Hi. Thanks for taking my question. I guess this is for Pam Melroy and Wayne Hale.

You say in one of the sections of the report that the crew probably never realized that the loss of control situation was unrecoverable. I am wondering if you could elaborate on that a little bit because, certainly, the folks on the flight deck would have seen -- you know, they would have noticed that they were -- they were tumbling, and they noticed that they had, you know, hydraulic APU problems. Thanks.

MR. HALE: Well, let me start. This is Wayne. I will start and see if I can give you some thoughts here, Tracy.

It was a very short time. We know it was a very

disorienting motion that was going on. There were a number of alarms that went off simultaneously, and the crews, of course, are trained to maintain or regain control in a number of different ways, and we have evidence from some of the switch positions that the crew was trying very hard to regain control. So, you know, we are talking about a very brief time in a crisis situation, and I would hate to go any farther than that.

COLONEL MELROY: This is Pam Melroy.

I would just like to add that we found that those actions that Wayne referred to really showed that the crew was relying on their training in problem-solving and problem resolution, and that they were focused on attempting to recover the vehicle when they did detect that there was something off nominal, and so we think that they showed remarkable systems knowledge and problem resolution techniques.

Unfortunately, of course, there was no way for them to know, with the information that they had, that they were -- that that was going to be impossible, but we were impressed with the training, certainly, and the crew.

MODERATOR: Okay. Next question from Bill

Harwood.

[No response.]

MODERATOR: Bill Harwood, do you have a question?

TELECONFERENCE OPERATOR: Sir, he is not online.

MODERATOR: Okay. We will move on. Todd

Halvorson, Florida Today.

MEDIA QUESTIONER: Thanks, James. I guess this is for Wayne and/or Pam or maybe Nigel. I don't know.

I am trying to respect the privacy of the families. I am wondering if you could give us an inclination on when the families might have been informed about the release of this report and what you all were able to, I guess, pass onto them and any reaction they might have had.

MR. HALE: Todd, this is Wayne Hale, and I will start.

First of all, we informed the family sometime ago that this report was in work. So they have known it's coming, and we are -- I would like to emphasize this is an engineering report. This is not a, per se, medical report or any other kind of report. We are trying to find engineering solutions to the types of problems and

situations that were encountered with the hope that in some perhaps less severe circumstances in the future, lives can be saved by improved designs.

I know that we did, in fact, coordinate with the families who got Janet Kavandi from the Astronaut Office who can say a couple of words about that.

MS. KAVANDI: Hi. This is Janet Kavandi, Deputy Director, Flight Crew Operations.

The families were notified several years ago about the investigation, and when we were nearing completion of the report, the families were given copies, preliminary copies of the report, so that they could understand what would be released and so that they would not be surprised. So they have been involved for quite sometime.

MODERATOR: Okay. Next question from Jay Barbree with NBC.

[No response.]

MODERATOR: Jay Barbree, are you on?

[No response.]

MODERATOR: Okay. We will skip to Tariq Malik.

MEDIA QUESTIONER: Tariq Malik from Space.Com and

SpaceNews. I think my question is for Wayne and Pam.

It has been, I guess, five years since the Columbia accident. There is at least nine more Shuttle flights on the manifest now.

Wayne, you mentioned modifications for Orion, but I am just curious how reentry procedures have been altered maybe in the last few flights and in the next nine coming up. Based on the report and the information that was gathered here, if you could touch on that, that would be great. Thanks.

MR. HALE: Tariq, I will start. This is Wayne again.

We did, I think, post on the website a list of some of the improvements that have been implemented. There are a number of things that have been done on board the Shuttle, both in terms of hardware and procedures that were implemented and some more that are even now being implemented.

I would like to stress, Tariq, that there were more things that I would have liked to have done when I was Shuttle Program Manager, but they were not practical to be completed by the retirement date of the Shuttle. So some

things that we would have done if the Shuttle were to fly longer have not been implemented.

Pam, did you want to add anything to that?

COLONEL MELROY: This is Pam Melroy.

I will just add some comments about the changes in training. We have instituted additional elements to the loss of control and crew escape briefings, to incorporate the information learned from this report. I had made a point actually, personally, of tagging up with every Shuttle commander since Return to Flight to go over some of the findings, because they weren't generally available until now, to make sure that they understood the implications, and the Astronaut Office has also placed increased emphasis on the training and the preparation for deorbit prep with regard to the suits and the timing and the way to arrange the duties, to make that work a little better.

So I think we have really got a lot of comprehensive areas in training where we have been trying to tackle this.

MEDIA QUESTIONER: Thank you.

MODERATOR: Okay. Mark Mathews, Orlando

Sentinel?

MEDIA QUESTIONER: Thanks. I guess a follow-up to that question.

I know, Wayne, you said that you had a number of the changes to the Shuttle posted on the website, but I wanted to see maybe if you could pick out one or two that you think that have been implemented that are most vitally important or the biggest changes that you have seen to the Shuttle operations. Thanks.

MR. HALE: Well, in terms of hardware -- and we have got a long list of these -- I think the most important thing that was done was the inertia reel change. If you drive a car and wear a seat belt, you are familiar with an inertia reel that locks down when you have an impact, or a "rapid deceleration," I think is the term people like to use. The inertial reels, quite frankly, did not perform as we would have liked during the Columbia accident, and we have now new and improved inertia reels on all crew seats for all the Shuttle flights, and that is a huge, I think, safe improvement, again, one that would not have made any ultimate difference in the Columbia accident, but one that in a less severe circumstance could save lives. And there

is just a long list, but I would start with the inertia
reels.

MODERATOR: Okay. Next up, Alan Scaia with KTRH
Radio.

[No response.]

MODERATOR: Alan Scaia?

TELECONFERENCE OPERATOR: He has disconnected,
sir.

MODERATOR: Okay. And Liz Turrell with ABC
Radio?

[No response.]

MODERATOR: Okay. Dave Mosher --

TELECONFERENCE OPERATOR: Excuse me. Ms.
Turrell, your line is open.

MODERATOR: Liz Turrell, do you have a question?

[No response.]

MODERATOR: Okay. We will go ahead and go with
Dave Mosher, Discovery Channel.

MEDIA QUESTIONER: Yeah. Hi. This is Dave
Mosher. Can you guys hear me?

MODERATOR: Yeah, we can hear you, Dave.

MEDIA QUESTIONER: Hello? Okay, great.

I guess this question is perhaps for Wayne, maybe anybody who can take it.

I noticed a lot of redactions in the crew section in the Chapter 3. I'm just curious. What was the nature of those redactions? Why was that material edited out?

COLONEL MELROY: Dave, this is Pam Melroy.

This is an engineering document, and as such, it was important to us to include a full description of the analysis and the basis for our conclusions. However, the surviving family members have a protectable privacy interest, and NASA will protect their rights. So that was the basis for the redaction.

MODERATOR: Okay. And next, Keith Cowing with NASA Watch.

MEDIA QUESTIONER: This is Keith Cowing. Can you hear me?

MODERATOR: Yeah, we hear you, Keith.

MEDIA QUESTIONER: Wayne Hale, question. Both the Challenger and Columbia accidents happened with millions of people watching. Challenger was marked by NASA not responding quickly. However, with Columbia, it was virtually real time.

How did this crowd sourcing, almost, with people with their video cameras -- how did it help you? How was it a hindrance, and as you design new systems, how are you going to incorporate this nearly virtual sensory web that seems to be developing into the spacecraft, such that, God forbid, something like this happened again, you would be able to further understand the anomaly?

MR. HALE: You know, Keith, I think that the folks that had video camera recordings of the Columbia reentry were a vital part of the investigation, and the fact that people came forward and allowed us to use their material off their personal cameras provided a huge input, particularly in the early stages where we really didn't understand what had happened.

In the future, of course, we hope that we don't have such an incident again. In the future, however, we know that there is a network of amateur astronomers around the world, people that are interested in using personal cameras and video devices to track satellites and spacecraft, and we have made a number of contacts with that network of people, and so should we -- and again, I hope not -- have to call on those resources in the future, it

will go much faster and I think much smoother. We have learned how to do that.

DR. PACKHAM: Keith, this is Nigel Packham.

Let me add that I think the video analysis became vitally important, especially after we lost telemetry from the vehicle. That was one of our major sources of input into the findings and recommendations.

MODERATOR: Okay. Next question from Roxanne Martinez with Univision.

TELECONFERENCE OPERATOR: She is not online, sir.

MODERATOR: Okay. Then Shelby Spires with the Huntsville Times?

MEDIA QUESTIONER: Shelby Spires with the Huntsville Times.

Wayne, or Pam, maybe you can answer this. I see some similarities here of some of the same lessons that have been learned and relearned over and over again. Is there a fear that in 10 or 15 years, Columbia will be forgotten, and how are you preserving this for future generations?

MR. HALE: Well, you know, I think that what we are trying to do is have a report that is out there that

people can have as they design their spacecraft. The intent is exactly as you say, to make sure the lessons aren't forgotten.

If you look back in the history of spaceflight, one of the early accidents that happened in the Soviet space program was a cosmonaut in a ground test was severely injured in a pure oxygen fire, which was never published to the world because, in those days, they didn't share those kinds of things, and when the Apollo 1 fire happened in a pure oxygen environment, there were many people that said had we had that experience from some years earlier, we might have done better and prevented that.

So here we are. We have had this accident. It is unique. Hopefully, nothing like this will ever happen again, but we ought to learn the lessons from the Apollo 1 fire, from the Soyuz 1 parachute tangle, reentry from Soyuz 11 where the crew came back without pressure suits and killed during depressurization, and Challenger and Columbia. We need to learn all these lessons and not repeat the mistakes of the past. It is an extraordinarily hazardous thing to go into space, and we need to not forget these hard-paid-for lessons.

MODERATOR: Okay. I would remind everybody to please mute your phone. We can hear some talking on the line. I don't want to drown out anything.

Next question, Keith Landry with Fox Orlando.

[No response.]

MODERATOR: Okay. Moving on. Damien McLean with Bloomberg News.

TELECONFERENCE OPERATOR: He's not online, sir.

MODERATOR: Okay. Sandra Frederick with Daytona Beach News Journal?

MEDIA QUESTIONER: Yes. My question is about the two objects that peeled away simultaneously, exposing the entire crew module pressure vessel to the thermal effects of entry. What was learned about that in the report?

COLONEL MELROY: This is Pam Melroy.

I guess what you are referring to was the combined assessment of the four-body breakup, and based on video and the analysis of the debris field, two objects separated, and it was believed, based on the analysis, that those were the surrounding parts of the forward fuselage that surround the crew module, and so that was determined, again, through ballistics. Video was probably the most

significant, but then also the debris field on the ground.

So I think, really, the purpose of this engineering report was to understand occupant protection and crew survival. In order to do that, we needed to systematically approach what happened to the structures, and so that was simply a part of that structural assessment.

MODERATOR: Okay. Next, Jim Lesher with NPR, if you have a question.

[No response.]

MODERATOR: Jim Lesher with NPR?

[No response.]

MODERATOR: Okay. I see that I have completed the list of media. So I want to make sure I haven't missed anybody. Is there any media person online that I have not called on once so far?

[No response.]

MODERATOR: Okay. Then I will go through again from the top for follow-ups, if you have any, and we will check for those.

Gina, do you have a follow-up question?

MEDIA QUESTIONER: It's been answered. Thank

you.

MODERATOR: Okay. Mark Carreau, any follow-up?

MEDIA QUESTIONER: I do. Mark Carreau, Houston Chronicle.

I believe early in the report writing, you mention that this is sort of a first of its kind in space history, the sort of attempt to look into what happened in this kind of detail, and I wonder if any of you, Nigel or Pam or Wayne, would wish to give a bit of a testimonial on whether when this happens again, either in this country or some other country, the value of making an effort to do this.

I think I am kind of asking this in light of, you know, we are still competing, but we are also cooperating a lot more than we used to, and this may be a part of that spirit, if you will.

DR. PACKHAM: Mark, this is Nigel Packham.

First, let me point you back to the answer that Wayne Hale brought up in terms of learning the lessons and capturing all that data which I think, in essence, this engineering report was meant to do, and I hope does.

But I think in parallel, an analogy here may be

the main, the vast knowledge of information we have in the field of aviation, what we are trying to do here is get that knowledge out to any spacecraft designer, wherever they might be, around the world.

MODERATOR: Okay. Irene Klotz, do you have another question?

MEDIA QUESTIONER: I do, just another quick one.

I was just curious when you all decided that today was a good day to release this report. It just seems a little odd to do it between Christmas and New Year's holidays. Thanks.

COLONEL MELROY: Irene, this is Pam Melroy.

The report was actually just completed this month. We finally got all the process done, and it was ready to be released, but out of respect to the Columbia crew families and at their request, we released it after Christmas, but while the children were still out of school and home with their family members, so that they could discuss the findings and the elements of the report with some privacy. So that is what drive the timing of today.

MODERATOR: Okay. Seth Borenstein, do you have a question, follow-up?

MEDIA QUESTIONER: Seth Borenstein at AP, for Pam.

Would it be unfair -- can you explain, would it be unfair, and if so why, to say that some of the crew weren't quite ready, given that their suits -- you know, their suits weren't fully on and the belts weren't on and the helmet wasn't on, one wasn't seated -- does it show that they weren't quite ready to do this, you know, because the timeline hadn't given them time, or can you just tell me how would you characterize that, the fact that so many of them didn't have their stuff, you know, their suits fully donned?

COLONEL MELROY: This is Pam Melroy.

On the contrary, I think the crew was following both procedures and standard accepted operational practices. The emphasis in deorbit prep has always been on preparing the vehicle because there are certain key moments.

For example, you have to have the payload bay door closed at a certain time in order to have -- you know, you want to wait until you have the adequate amount of cooling for entry, and so there are these vehicle-driven

milestones, and so that has always been the focus of deorbit prep.

And I know this is old news, and it doesn't come as a surprise. We have already brought it up before that the suits and the helmets themselves and that particular aspect of the crew equipment was not part of the original vehicle design, and so integrating that into the operational timeline has some limitations, and in addition, we have always structured it, so that there were some duties post-deorbit burn.

So I think the way we have tackled that now is that there is an increased recognition of the importance, the equal importance of configuring the crew equipment for entry, and we have moved some of those milestones back from the standard operational practices that we have had in the past, and so we do think that that is an improvement in training, but the crew was doing everything that they had been trained to do, and they were doing everything right.

MEDIA QUESTIONER: Thank you.

MODERATOR: Okay. Next, John Schwartz, do you have a follow-up question?

MEDIA QUESTIONER: I do. I don't think this has

been asked.

I have been hearing from some folks in the families and stuff that there was some resistance within NASA to making this report public, find a use of the data to get improvements in future spacecraft design and Shuttle safety, but don't let it out there.

Can you give me a sense of what has been described to me as a kind of tug-of-war and the arguments on either side? Thanks.

MR. HALE: You know, John, I wouldn't characterize -- this is Wayne Hale. I wouldn't characterize it that way at all.

There is, I think, quite a bit of concern about the families and their feelings and their status, as you might expect in a situation like this, but I have not once heard from anybody that we should not write this report from a technical or administrative or logistical or any other standpoint.

The only concerns that I have ever heard had been regarding the crew family sensitivities, and certainly, there hasn't been anybody that has slowed us down or stopped us or anything of that nature. We have proceeded

along just as promptly as circumstances would allow.

MODERATOR: Okay. Tracy Watson, do you have another question?

MEDIA QUESTIONER: I do. Thanks, James.

I guess this is for Pam Melroy and Wayne Hale again.

Kind of a ticklish subject, but I am wondering if there was any relief for you in some ways to firmly nail down that the crew was not really aware of how much danger they were in, and that they -- that there was -- it sounds like there was very little suffering on their part involved. Was that -- did that come as a relief to you at all?

COLONEL MELROY: This is Pam Melroy.

I think on behalf of certainly my colleagues -- and I know the families feel this way too -- that, of course, we were relieved that we discovered this, and that it is a very small blessing, but we will take them where we can find them.

MODERATOR: Okay. Todd Halvorson, do you have a follow-up question?

MEDIA QUESTIONER: Yeah, real quick, if I could,

James.

I understood that Jon Clark was a part of this investigation, and I was wondering what role he played and how having a family member on board might have colored to not the investigation.

COLONEL MELROY: This is Pam Melroy.

Yes, we are very proud, actually, to call Jon a part of our team.

Jon has a very diverse background, and he has experience with accident investigation through the military, and so he had a very strong profound personal belief in the importance of this investigation, and so his role was to actually encourage us, but I would let you talk to him directly. He should speak for himself, but we were very proud to have him as a part of the team, and we appreciated his background in accident investigation and his deep determination to understand what happened. And I think that was very motivational for all of us.

MODERATOR: Okay. Tariq Malik, do you have another question?

MEDIA QUESTIONER: Maybe a quick one for Wayne and Pam.

You had mentioned, Wayne, about this being the last expected report on the accident and whatnot, and Pam, you mentioned, I guess, some of the relief that you had felt. I was just curious from a personal standpoint if there was a sense of closure while working on the report, to kind of build on that, that you felt, and if so, I guess what the feeling is now moving forward towards Shuttle retirement and the start of a new vehicle. Thanks.

COLONEL MELROY: This is Pam Melroy.

Yes, I have been working on this report for a while, and I think most definitely, this is a great day for the whole investigative team. On their behalf, I think I can say that we all feel the same way, that we are very proud of this work, and we really hope that it will be used to improve safety throughout the world and the entire community of human spaceflight, and so this is a very special day, and there is closure in it for us.

MR. HALE: Tariq, I will give you my impressions.

This is Wayne Hale. I would say that in my personal circumstance, "closure" is not the operative word because spaceflight takes eternal vigilance, and there isn't a day that I go through that I don't think about the Columbia

crew, Rick, Willie, K.C., or even the Challenge crew, Judy, Dick Scobee, El Onizuka. You know, I knew all these people, some of crew's members better than others.

And we know when we come into this business that it is a risky business, that accidents can happen, and certainly, if you want to talk about regrets, that's a whole other discussion, but our goal here is to do our best to prevent accidents in the future, and that is not a subject that is ever going to be closed. So I would take it a little bit different tact, maybe, than Pam did.

MODERATOR: Mark Mathews, Orlando Sentinel, do you have another question, Mark?

MEDIA QUESTIONER: I do. Thank you very much.

I guess with the question of space suits being revised after the 1986 Challenger accident, were those changes enough, and have some of these concerns about the space suits not being adequate enough been in NASA for a while?

MR. HALE: Well, you know, this is an interesting question, Mark. In most things, there is a tradeoff. One of the things that we probably should have learned from the Soyuz 11 accident is that you must wear pressure suits

during launch and landing, and that was a real problem during Challenger.

After Challenger, we added the pressure suits, the launch escape suits. They were good suits at the time, but one of the things that we were very concerned about was bailing out in the North Atlantic in cold weather and cold water.

There was an advanced crew space suit that was developed from some military applications -- the ACES suit, we call it -- which is a much better survival suit in cold water situations. It is what we thought we would be facing during a launch abort scenario.

Unfortunately, the ACES suit is not as good a pressure suit. So there is a tradeoff that was made to increase our potential to survive a bailout into the North Atlantic, which frankly was not useful in this accident, but I would go back again, these pressure suits have limited capability, and in any event, this accident was not ultimately survivable, no matter what kind of pressure suit the crew would have worn.

MODERATOR: Dave Mosher, Discovery Channel, do you have a follow-up?

MEDIA QUESTIONER: Yeah. I just have one last question. Someone actually stole my last question, but I do have another.

Previously, someone asked about a fear of forgetting lessons of Columbia. I'm not sure who that was, but I wonder about the next generation of people, you know, younger kids today who probably won't remember Columbia.

Pam, Wayne, anyone who wants to take it, is there any sort of concern that there will be no permanence about Columbia in the minds of kids today, and if so, why?

MR. HALE: Well, no. I think that what we are trying to do here is make sure that the lessons learned are preserved and are available to be taught to the spacecraft designers of the future who are children today, and even as I was in engineering school, we studied engineering failures of the past, to learn from them, so that we would not repeat them in the future, bridges, pressure vessels, all those kinds of things that had big problems in the 19th century. Now in the 20th century, we studied aircraft accidents and looked at the causes for early aircraft to fail and have made improvements, to the point where today, aviation safety is unparalleled in the history of the world

in terms of commercial passenger safety.

Still, we are in the infancy of space travel, and these hard lessons need to be preserved. We have done that with this report, and we will certainly do our level best to teach it to the new generation of engineers as they come forward to design the future spacecraft.

MODERATOR: Okay. Keith Cowing, do you have another question, Keith?

[No response.]

MODERATOR: Keith Cowing, do you have --

MEDIA QUESTIONER: Hello? Can you hear me?

MODERATOR: Yes.

MEDIA QUESTIONER: This is Keith Cowing for Wayne Hale.

Just a philosophical question here. It's been sort of dickering around in my mind as to how to ask it. America's new spacecraft will be a capsule, sort of "Back to the Future." It has some benefits and some fallbacks.

If you look at a lot of the private spacecraft that are being built, they have big glorious wings. Is there anything to be distilled out of this, that you might say would guide future designers in terms of tried and true

versus pushing the envelope, and that maybe you might want to defer on caution to something that has worked before, or do you still think it is worth trying to push the envelope with spacecraft to try things new?

MR. HALE: Well, let me see, Keith. Let me start where I left of the last question. We are still in the infancy of space travel.

Now, I had a discussion with Mike Griffin some years ago when we talked about being at the Viking longboat stage of exploration. We have got a long way to go to design spacecraft that are as safe as current aircraft are, for example. Whether capsules or wings are safer, there's pros, and there's cons. What you have to have in either event is good engineering. You have to learn the lessons of the past, apply the right factors of safety to the future design, and improve in incremental ways with every new design that comes off the drawing boards, or I should say off the CAD/CAM design panels of the future.

MODERATOR: Okay. Shelby Spires, Huntsville Times, do you have another question?

[No response.]

TELECONFERENCE OPERATOR: She is no longer

online, sir.

MODERATOR: Okay. And Sandra Frederick, Daytona Beach, do you have a question?

MEDIA QUESTIONER: No, I don't.

MODERATOR: Okay. I think with that, we have reached our limit on time for folks here at the telecon. So we will conclude. Thank you very much.

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