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NASA Press Briefing

"U.S. Human Space Flight Review Committee Report"

Speakers:

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Development Program Review Committee

Moderated by
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P R O C E E D I N G S

MODERATOR: I'd like to welcome you all to the review of Human Space Flight Committee, a roll-out of their Final Report.

As many of you know, this has been an ongoing process since May. The committee first met for the first time on the 1st of June. They posted their Summary Report on the 8th of September, and this is our opportunity for the committee to comment about the Final Report.

I'd like to introduce the chairman of the committee, Norman Augustine, on my left, and Dr. Ed Crawley on my far left who is one of the committee's sub-chairs as well.

We have copies of the report for the media. Anybody who has not gotten one can pick one up at the sign-up desk.

Norm is going to open with a few brief remarks, and then we'll move on and eventually take questions from the press.

One more time, if I could ask you to identify yourself when you ask a question and your organization, we'll go from there.

The way I normally do this, I'll start on one side of the room and go across. I think I'll have plenty of time to get as at least one question from each of the media, and please limit your questions to one question and one follow-up.

Norm?

CHAIRMAN AUGUSTINE: Well, thank you, and good afternoon, everyone.

The purpose of this discussion is, indeed, to present the Final Report of our committee, and, as you heard, there was an earlier report of a summary nature that was presented about six weeks ago. I think there are no surprises in the Final Report, but there's a great deal of substantiation for what was in the earlier and briefer report.

Just in the way of background for those of you who have not followed this closely, last spring the White House decided that it would be appropriate to conduct an independent review of the Human Space Flight Program.

Dr. John Holdren, who is the President's Science Advisor, requested that a committee of ten independent members be established to actually conduct the review.

Professor Crawley and I were on that committee, along with eight others, of rather diverse backgrounds professionally. We had astronauts, business people from large companies, small companies, scientists, engineers, former Presidential appointees, and so on.

I should say we've worked very closely with NASA throughout this effort, with Administrator Bolden, who is well aware of what we are going to be saying today, and I need to acknowledge the terrific support we've had from both NASA and from the Aerospace Corporation that the committee directly hired for independent technical analysis.

Having said that, all the findings in the report are strictly those of the members of the committee. I am happy to say that everything that is in the report has the unanimous support of the committee members.

We were not asked by the White House to present a recommendation. We were asked to present alternative, and we have done that. That gets to be a very fine line since the set of possible options that we could have identified has about 3,000 different members, and we have narrowed it down to five, but you will not find a specific

recommendation in the report from this committee, although many of the options I think speak for themselves. We've done what we believe to be a very factual analysis of the various alternatives.

What I'd like to do is run through some of the higher level conclusions of the committee rather quickly for you, and then we'll take questions.

The premier conclusion or finding of the committee is that the Human Space Flight Program that the United States is currently pursuing is one that is on an unsustainable trajectory. We say that because of a mismatch between scope of the program and the funds to support the program.

That's of great concern to us because space flight, human space flight where safety accounts for everything, is a very unforgiving sort of pursuit.

Another, the second conclusion that I'd like to mention has to do with the present program. We've reviewed the Ares I and Orion elements of that program, which are the two parts that are principally underway, Ares I being a launch vehicle and Orion being the capsule.

We found those programs to be reasonably well

managed. We found them to have technical problems of a nature that's probably not uncommon for complex undertakings of this type, and it's our belief that given ample time and funds, that the engineers at NASA and their contractors are certainly capable of solving those problems. So we think that the program within itself has a very good likelihood of succeeding.

The issue that comes up under Ares I is whether the program is useful when it has succeeded because of a mismatch of the time schedules and the costs with what will be needed for it to do. We believe that the Ares I is not likely to be available before about 2017. If, indeed, that's the case, it poses a problem with the current budget for the International Space Station, which I'll refer to as ISS, inasmuch as the Space Station is expected to be deorbited into the South Pacific at the end of its life and is currently budgeted to be deorbited at 2015. Even if it were to be extended, it poses a problem in terms of the availability of the Ares I.

We believe there are compelling reasons to extend the ISS, at least another five years, but, if we do that, we also believe it's very important that we provide

additional funds for the utilization of the Space Station. There's no benefit that we can see to having the Space Station continue in space without providing money to conduct science and engineering aboard or near the Station. There is much that we believe could be done.

The Shuttle is currently scheduled to be flown out by the end of Fiscal Year 2010. To do that will require a flight rate that is just roughly double what's been demonstrated since the loss of the Columbia, and it would seem to us to be prudent to put funds in the 2011 budget, so that there's not pressure to fly the three Shuttles out on a compressed schedule.

NASA is very well aware of that, and I'm sure won't cut any corners. On the other hand, there's no money to continue the program in the current 2011 budget, if we believe that should be addressed.

We believe that a very strong technology program is needed in support of the Human Space Flight Program. That's something that's been neglected or at least atrophied in recent years, and that's one of the reasons why the choices today are so very difficult.

We would note that we looked at excursions, if

you had more money, what could you do, and we concluded that if you could add about -- if you take, starting with the 2011 budget and gradually ramp up until 2014, to when you've added $3 billion to the current budget, budget projections starting in 2014, then preserve that, protect it against inflation, that additional $3 billion into the future, that opens the door to some very exciting possibilities in terms of space flight, human space flight in particular.

It's also important, we believe, that we continue to protect the Science and Aeronautics Program from trying to do too much in the Human Space Flight Program with the budget available.

We believe that Mars is the clearer goal of the Human Space Flight Program, but we conclude that both for safety reasons and financial reasons, the notion of going directly to Mars is not appropriate. We rule that out. We think it could be made relatively safe. Obviously, it will never be altogether safe, nor will anything else probably in this space program be in that realm.

We have offered programs that are alternatives that permit us to build a heavy-lift launch capability. We

believe that to be extremely important. It's really the gateway to beyond low-Earth orbit, and a human exploration program is a heavy-lift capability.

We think that there's a time to create a commercial market for commercial firms to transport both cargo and humans between the Earth and low-earth orbit. While that is certainly not simple, it's much easier than going to Mars or other places one might go, and we think NASA would be better served to spend its money on its ability, which is immense -- its ability is immense -- focusing on going beyond low-Earth orbit, rather than running a trucking service to low-Earth orbit.

We have identified, I think, a relatively new approach, or at least, I guess, others probably have addressed this, but an approach to conducting a space flight program somewhat different than what's in the current plan.

The current plan, as you probably know, focuses on going to the Moon, and we believe it would be appropriate to have, of course, a longer term goal of going to Mars, but that there are a lot of things one could do along the way that are very interesting and let you build

up gradually to the immense undertaking of the Mars program. And the sort of think that we're thinking of is that one could fly circum lunar missions. You can circumnavigate Mars. You could land on an asteroid, a low-Earth object. You could land on Phobos or Deimos, the Martian moons, and so some very exciting science from there, and it seems to us that is a more sensible program than to wait 15 years or so for the first really major event.

Lastly, we noted -- and we weren't asked to note this, but we felt like we should, and that is that the NASA Administrator has been told that he is to manage NASA, and we believe that he should be given the latitude to manage NASA. And by that, we mean that he should have the flexibility to tailor the workforce size to the mission of NASA and the needs of NASA. He should be able to tailor the facilities, the structure of the centers, and, in short, be given much of the authority that's given to a CEO of a company and then held responsible for their performance.

That's a quick overview. As you can see, the results are relatively contentious. This is not an easy

subject, but what you have here is the findings in this report of ten people unanimously supporting what's in the report, and we have the advantage of being independent.

That, I think, concludes my opening remarks, and we'll turn to questions.

MODERATOR: Okay. Thank you. Let's start off with Seth, please. Wait for the microphone, please.

MEDIA QUESTIONER: Seth Borenstein, the Associated Press, with a question and a follow-up.

First, you've got Ares I-X on the pad at Cape Canaveral. You say on page 60 that it's sort of a mismatch with the program that it is intended to serve, especially if ISS is deorbited in 2015, and only two of your options include Ares I-X.

Is it just are you -- I know you are letting them make the decision, but do you feel it's time just to kill the Ares I program and go on?

CHAIRMAN AUGUSTINE: Again, we're not asked to make that kind of a finding.

We do think it's appropriate to fly the Ares I-X. We think there's important things to be learned that will help the program.

Ed, let me turn to you, perhaps, to talk about what we mean specifically by the fact that it doesn't seem to support the overall Space Exploration Program.

DR. CRAWLEY: Thanks, Norm.

First, you'll note in the report that we specifically say that we do not think there are any technical programs with the Ares I that NASA cannot overcome with time and budget. So we actually plan and expect the Ares I-X flight to go off and be successful. That's really not the central question.

The central question is not whether can NASA build the Ares I. Really, the question is should NASA build the Ares I.

I believe that in the time of the ESAS study in 2005, it was a sound decision. That was a clever architecture combining the Ares I and Ares V, and under the cost assumptions and the correct perspective that crew safety in launch to orbit was the premier criteria for design, it was a wise choice at the time, but times have changed.

The budgetary environment has become much more tight, and the understanding of the cost and schedule to

develop the Ares I has been short.

Under the best of circumstances, the Ares I and Orion would be available in 2017. If we extend -- late for the support of the ISS. If the ISS is extended until roughly 2020, the extra funds to extend the ISS will come out of the budget, further delaying the development of the Ares I and Orion to probably 2018 or '19. So, in the best of circumstances, it will be available to service the last few years of the ISS.

It's a very capable vehicle, arguably too capable for use as a crew taxi to low-Earth orbit, and, really, the question before NASA and as framed by the committee is are there alternatives that would deliver a capability earlier and at a lower cost but with the same criteria for safety.

MODERATOR: You had a follow-up?

MEDIA QUESTIONER: Yes.

To follow up, given that and what Mr. Augustine's discussion about how it seems the flexible path is more sensible, are you essentially saying yes, the program, you know, technically is right, but it's just not -- it's not the right ship and not going to the right place? Is that about what you're saying?

CHAIRMAN AUGUSTINE: I would say that's a fair portrayal.

MODERATOR: Okay. Let me shift over here on the aisle. Frank? Please wait for the microphone.

MEDIA QUESTIONER: Frank Morring with Aviation Week.

Maybe just to follow up on what Professor Crawley just said, if Ares I is underfunded and will take too long, could you tell us about alternatives that might cost less and could be done more quickly and how that would work?

And I do have a follow-up.

CHAIRMAN AUGUSTINE: Go ahead.

DR. CRAWLEY: The committee actually investigated a series of alternatives, including continued reliance on international crews, international crew services, using the heavy-launch vehicle immediately as the NASA crew launch vehicle, and we concluded that the most likely alternative that would work would be to form a partnership between NASA and the commercial industry to lead to the provision of commercial crew transport to orbit.

This has the potential for producing a safe

vehicle, a high-reliability vehicle. It has the potential for significant cost savings and delivery of the crew transport service by, we think, around 2016.

The key factor is, as I started to allude to in the last question, the sophistication and the capability of the Orion, which when used to get to low-Earth orbit, in some sense, is a too-capable vehicle. That you could build, we think, a significantly simpler capsule and use an existing or derivative rocket to deliver the services of essentially a modern-day Gemini with three seats, a relatively simple crew taxi.

This would have the additional advantage that, in addition to the simplicity, relative simplicity to Orion and Ares I, that there would be risk capital invested in this, so the government would not carry all of the development costs. At the time of operation, there would be likely other customers for this, arguably other international space agencies that want to fly their crew. There is the possibility of the evolution of the space tourism business. Certainly, the boosters would have other uses in terms of satellite launch and national security space. And we think it could be done a bit earlier than

the Ares I and Orion.

MODERATOR: Frank, you had a follow-up?

MEDIA QUESTIONER: Yes.

Just to follow up on that, could you describe a little bit about this partnership that you mentioned? How would -- would it be a competition? Would it be a fly-off, and how much would that cost, as compared to what you foresee as the cost for Ares I?

DR. CRAWLEY: You can read the -- you can interpret the report the same, that we're suggesting in this option or alternative, a sort of new way of doing business, a new form of partnership, where NASA is the anchor customer for this service, would have to significantly incentivize its development because of the return on investment expected by any commercial investor, and would play a very important role as the -- continue to play an important role as the quality assurance and mission assurance agency for it.

We think we saw very convincing data that when launch systems have an independent government mission assurance function, as the EELVs do in the DoD launch architecture, that there's great benefit to this.

So the question is how does one strike a balance between the roles that should legitimately be reserved to the government and to NASA and the roles that the commercial industry is really best equipped to do, which is to design, to manufacture with efficiency, to be responsible for tests and delivery of the vehicle, and in there is, we think, a model that NASA and the government should carefully review.

MEDIA QUESTIONER: And the cost?

DR. CRAWLEY: The estimate that's in the report is -- by the time you come out of all the costing analysis, the Aerospace Affordability Analysis, is that $5 billion would be available for NASA's portion of the development cost of the system.

MODERATOR: Okay. Thank you.

I think well come back over here. Keith? And I'll move back.

MEDIA QUESTIONER: Keith Cowing, NASAWatch.com, for Mr. Augustine.

With regard to your committee's activities and NASA's Human Space Flight Program, is this report offering NASA a second chance to get it right? Is it a mid-course

correction? Are you focusing?

I know you weren't asked to offer recommendations, but, clearly, you're thinking in your head that this report is going to have some effect on somebody making the decisions.

CHAIRMAN AUGUSTINE: I wouldn't say it was a second chance to get it right. I think there's a good argument that maybe NASA had it right in the first place, but, as Professor Crawley has said, things have changed a lot.

The budget NASA assumed when it began the Constellation program, was substantially larger than the budget that we face in the reality today. In fact, today is about two-thirds of what it was.

And with the budget, NASA then talked about there was a -- they originally thought that they could have the Ares I by 2012, for example. Now I think they believe 2015. We believe 2017. And so the slippage that's taken place has caused a mismatch between what Ares I is needed for and what it is going to be able to do.

Having said that, I think there is argument that it was a sensible program to begin with. There is a real

question whether it's a sensible program today or not, and that's the tough issue that NASA is going to have to deal with in the White House.

MEDIA QUESTIONER: Okay. And a follow-up, just looking at this and talking to folks in the room, this looks about the same thickness as the National Commission on Space Report. It's glossy. It's pretty to look at.

This seems to happen with some periodicity every decade and a half or so. You've actually -- you're a usual suspect to these things.

[Laughter.]

MEDIA QUESTIONER: At what point do these things stick and actually get done?

CHAIRMAN AUGUSTINE: You know, I think it depends on two things. I think it depends on the quality of the work of the report, which we hope is sound and we believe it to be, and I think the second comes down to how the decisionmakers ultimately view our recommendations in larger context.

We didn't deal, of course, with how much money is available after you deal with health care and the national debt and two wars and so on. That's beyond our capability.

But I've worked on a number of these studies where I think we've had a major impact, and I worked on an awful lot of them where we had no impact, and I guess only time will tell.

[Laughter.]

MODERATOR: Thank you.

Any more questions? Mark? Please wait for the mic.

MEDIA QUESTIONER: Mark Mathews with the Orlando Sentinel.

I just want to start out with something that you said, Norm, at the end of your opening statement, talking about how the NASA Administrator should be given the authority to manage NASA. What has held the NASA Administrator back in the past from being able to do that?

CHAIRMAN AUGUSTINE: Well, there are many constraints that are placed on the NASA Administrator, including the ability of the Administrator to move money from one part of the Human Space Flight Program to another. If they discover they need additional funds, they're probably looking at a two-year delay before they get those funds, at best.

In general, they are not permitted to set aside adequate reserves at the beginning of a program. They aren't given a clear assurance -- or that's probably saying too much, but they need a better assurance of how much money is likely to be available in the future, so that they don't fall into the trap where they're now in of having a program that's designed to have more money than it currently has.

And then, very importantly, I believe in the last six bills that have come out of the Congress, NASA has been told it can't change its workforce, and I recall in industry, because I went through it at the end of the cold war, when the role of the aerospace industry changed. We had to lay off 640,000 people in that industry in about a four-year period.

It wasn't pleasant, I know, to argue for that, but you could either spend your money on fixed costs and overheard, or you can spend it doing exciting exploration. And I think NASA is going to have to face that question, but, if they are not given any latitude by the Congress, basically, or the White House -- I should say both -- they won't be able to do that.

MEDIA QUESTIONER: So one of the things, then, the NASA Administrator should be given the opportunity to lay off more workers if he sees fit, then?

CHAIRMAN AUGUSTINE: I would say to tailor the workforce to the work needed to be done. It may take more people; it may take less people. It depends on which option they pick. If they happen to like the option and can afford it where we're recommending adding the $3 billion, there would be more people needed at NASA. It seems to me that's a choice that's going to have to be made.

MEDIA QUESTIONER: And then, on the $3-billion question, right now a lot of what we're hearing from the Hill and the White House is that it's going to be very, very difficult, if not impossible, to get an additional $3 billion.

What use, then, is this report if that extra money does not come?

CHAIRMAN AUGUSTINE: Well, I think there's a number of uses that come out of it. For example, I think our comments about funding the Space Shuttle another year, I think our comments on the benefits of extending the

International Space Station five years, the importance of technology program, I think there are a lot of things in the report that will be useful, but I think it's also very useful to be told that you're on a track that you don't have enough money to stay on, and we could continue now, but I thin it would be our committee's prediction that a few years from now, there will be a group back here saying what happened.

MODERATOR: Thank you.

Next question. Have we heard from the back rows at all? Going once.

Frank? I'm sorry. Amy -- or excuse me -- Nell? All the way in the back. I'll get back to you, Frank, next.

MEDIA QUESTIONER: Thank you. Nell Greenfieldboyce, NPR.

What's the role of your committee now? I assume the White House already has this report, and you briefed them last month. I mean, do you brief them again, and is there a schedule for meetings? Have you gotten any sense of what your role is going forward, or can you finally go have your delayed summer vacation?

[Laughter.]

CHAIRMAN AUGUSTINE: Well, thank you for that question. I hope my wife was not listening.

It is a good question. We have submitted our report to both the White House and to NASA. They've been very familiar at every step of the road with what we were doing. So there's no surprises there.

And, basically, our committee, by charter, has done certainly the major part of its work. We would expect that we'll be asked questions and provide additional support to probably NASA primarily, and we're happy to do that. I'm sure I speak for everyone. I think we all have a real commitment to this program.

But what we do from here on will be rather informal. I doubt that we'll be preparing anything else that's formal, and so we would probably not meet again in any formal context.

So, from here on, it's strictly, if asked, we're available, but we don't have any particular plans. We won't be lobbying or anything like that.

MODERATOR: Thank you.

Next question, please. Right here in the front.

MEDIA QUESTIONER: Hi. I'm Karen. I'm a reporter and a graduate student with Madill News Service, and I have a question for you.

In my research so far, I have found and I've heard that people in the public and members -- people who aren't in the scientific community often question the need for funding for space exploration at all. So I'm just wondering how you're going to continue to prove to these people that scientific research and exploration deserves any sort of piece of the Federal budget at all, and how you can win them over, people who aren't in the scientific community necessarily.

CHAIRMAN AUGUSTINE: That's a great question you ask, and we obviously have thought about that a good deal.

One of the problems that we face is that too often in the space program, we've tried to decide where we want to go, what's our destination, rather than why is it we want to go, and I think that's weakened the arguments.

I guess I should say to begin with, the general public, I think, strongly support a human space flight program. If I'm not mistaken, it costs about 7 cents a day per person to support that program.

The issue, though, of why do this is a fundamental one, and it's our belief that while science has -- there are great benefits from the Human Space Flight Program for science, there are great benefits for new products, for international relations and so on, we believe that none of those things in themselves justify a human space flight program.

I think you'd have to go to a higher calling, if you will, an objective such as preparing humans to expand into space, and the inspiration that comes from that -- at my age, I remember well the impact that Neil and Buzz had when they landed in the midst of the Vietnam War on the Moon. It was a great inspiration. I talk to so many people who say, "The reason I'm an engineer today or a scientist today is because of the space program," and so I think there are intangibles.

I'll make your question even a little more difficult. You know, you say should we be spending the money on the Human Space Flight Program or on conquering cancer, and I think when the question is posed that way, it's a very tough question, but I would say that's the wrong way to pose the question.

We have a $3.9-trillion Federal budget, and I think the question is, is it worth the money we're spending on the Human Space Flight Program in that -- excuse me -- in that overall context, and I think our committee's strong feeling is that it is. On the other hand, we're anything but unbiased observers in that regard.

And, Ed, do you want to footnote that?

DR. CRAWLEY: Yeah. I think that's an excellent question, and Norm laid out these more tangible benefits of space exploration, technology, commerce, and so forth, the less tangible benefits, inspiration of the youth and allowing us to understand our place in the universe, uniquely I think one of the activities of this committee was to actually take those goals for exploration and define measures and metrics based on them that we then use to evaluate the options. So we actually were measuring our options against those things that we think are the goals of human space exploration.

And since you're a graduate student, you know, I talk to a lot of graduate students and young people, and as one of the most important, I think, political motivations for a human space flight program is the inspiration of the

public and particularly the youth, it's important to actually design a program that does that.

And one of the things we've been very conscious about in this exercise is to create options that would, in fact, engage the public, that the inclusion of the commercial providers of various services is not just about saving money or taking -- creating jobs in the commercial sector. There's actually a broad young community that thinks that commercial space is pretty cool, and that they would like to spend their careers in that.

There is the investment in technology that we put in all of the options, other than the baseline where we were trying to replicate the current program as closely as possible, which is a pretty clear signal that we believe that NASA's role as a technology developer is an important one and will be critical going forward.

The options that create new destinations, the idea of going broadly through the intersolar system as a way to interest the American public and the youth in new destinations were all crafted into the options that we created in order to address exactly those issues.

MODERATOR: Thank you.

Let's come up here to the front row, please. Go ahead. I think we can hear you.

MEDIA QUESTIONER: I just wanted to ask you about the safety --

MODERATOR: Please identify yourself and your organization.

MEDIA QUESTIONER: Stuart Powell, Houston Chronicle.

I just wanted to ask you about the safety issue. You know, this dispute about broadening the definition of a commission beyond the launch base of the entire mission, the growing international goal obviously puts more hardware and so on in the development, and it's all from overseas. Broader commercial will also expose the operation to additional new challenges on the safety front intentionally, How do you deal with the safety issue for the crew and the accountability to Congress and the White House if anything ever goes wrong?

CHAIRMAN AUGUSTINE: Yeah. The safety issue is clearly the number-one issue to be considered in human space flight.

As I said, you would obviously be aware that we

could never guarantee perfect safety, but we should do all we reasonably can to assure safety.

And, in our review, for example, we had several dozen vehicles proposed to us by various organizations, of which probably two-thirds we discarded because of concerns over safety.

As I mentioned, the primary reason or -- I guess the primary reason we rejected the direct mission to Mars was our concern over the safety of doing that at this point in time, and, clearly, the vehicles being designed under the Constellation program are designed with safety in mind.

The challenge you always face and that we faced is how you compare the safety calculations for something that hasn't yet flown with something that has flown. You take the Shuttle. We pretty well know how safe the Shuttle is. The Ares I, we have analytical calculations. To be candid, the committee has only moderate confidence in analytical calculations of safety and reliability, but it clearly is a driving factor in deciding what the program should be.

MODERATOR: Thank you.

Frank, did you have a -- and I'll come back to

Mark next.

MEDIA QUESTIONER: This is for Mr. Augustine, and it's to kind of follow up Nell's question.

Do you have any insight into what will happen next at the White House, how -- what will be done with your report? And, specifically, this -- initially, it was to be finished at the end of August, so that it could be perhaps incorporated in the Fiscal '10 budget. It doesn't look like it's going to make that, but do you know if there's a chance for that and, if not, how it's going to go at the White House?

CHAIRMAN AUGUSTINE: Frank, we provided the Summary Report that had basically everything that the Final Report has, but without all the substantiation, to the White House at the end of July and --

DR. CRAWLEY: End of August.

CHAIRMAN AUGUSTINE: Excuse me. End of August. Thank you.

And we also provided a briefing at the White House with the usual charts that engineers always have to make to the White House at the end of August.

They had the data they needed, I think, to put

the budget together. They've been deliberating there, and, in terms of where they go from here forward, I'm frankly not in a position to know.

MEDIA QUESTIONER: And if I could just follow up with Professor Crawley a little bit on the partnership in a potential commercial taxi service.

You mentioned incentivized. I wonder if you could elaborate that a little bit and also what the cost would be. Thank you.

DR. CRAWLEY: Yeah. "Incentive" is the term we used in the report to describe the component of the development cost that NASA would have to bear in an otherwise commercial endeavor. So this is not a pure commercial endeavor. It's very clear that no commercial entity could raise the risk capital to build a rocket and a capsule and recover the costs in our lifetime, but it is clear that if a substantial fraction of the development costs were carried by the government, that there is likely to be a market that would allow the operating cost to be amortized over various users.

So the term "incentive" is used in the report to describe the fraction of the development cost that NASA or

the government would bear in the development of what's really sort of a hybrid government-commercial system.

MEDIA QUESTIONER: And that would be that viability?

DR. CRAWLEY: That would be the viability.

MODERATOR: Okay.

DR. CRAWLEY: Of development cost.

MODERATOR: With Mark here, and then I'll take two more questions, and that will be our time, from AP and from -- okay. Mark?

MEDIA QUESTIONER: Norm, could you go back to the question of workforce? You compared NASA, in a way, to an aerospace company. To conduct its current missions right now and to streamline those missions, what type of reduction to the workforce may you recommend? Five percent? Ten percent?

CHAIRMAN AUGUSTINE: Mark, we're just frankly not in the position to answer that kind of a question, but I think it depends totally on what the budget turns out to be.

If the budget stays at the current level, the overall employment will probably stay somewhere near the

current level, although it may be a very different profile of employment. You may need far fewer operations people and more design and development people and so forth.

We worry a great deal about preserving the knowledge base that NASA has, and one would not want to cut to where that was a danger.

I think it boils down to what the needs are at the time, and if you had the additional $3 billion and three of the options that we propose, then there would be additions probably to -- or almost certainly to the employment, but, again, there would be some areas, and, frankly, I would assume operations at the Cape are going to suffer, in any event, because we're dependent for the next, we believe, seven years upon Russian -- there will be a seven-year gap during which basically our way to get to space will be to use -- to buy seats on the Russian launch vehicles.

The only alternative we see to that is to continue to operate the Shuttle if you don't like the gap, and we can do that to operate the Shuttle. The problem with that is it eats up money that we're trying to use for the Constellation program.

So it's kind of a mattress you push down in one place, and another place pops up.

MODERATOR: Okay. Keith? Then we'll finish up with Seth as the last question.

MEDIA QUESTIONER: Question with regard -- this is Keith Cowing, NASAWatch -- public engagement. I noticed -- pleasantly surprised to see a little bit in here on the Facebook and Twitter and so forth. These committees tend to be a bunch of people that usually like just sitting at a table, behind a name tag, people stand up at a microphone, say something or fax something in, that's it. This was different. You were Twittering, and you were all over the place.

So I wonder if you could just comment a little bit on was this different, and, as you answer, note that one of the rockets that you had to consider was a creature of the Internet. The direct option, it pretty much came out of the -- out of the ether. Was it different this time? Was the dynamic different, and is there a lesson that NASA and all the Public Affairs guys in the hallway should be listening to?

CHAIRMAN AUGUSTINE: Yeah. I would say it was

extremely different, certainly different from the study I was involved in 19 years ago.

We tried very hard, with the encouragement of NASA and the White House, to make this a public engagement, to be as open and as candid and transparent as we could be. We held, I think it was, seven public meetings. Some ran more than one day. We visited sites all over the country. We had Facebook sites. We had our own website. We Twittered and Tweeted and --

DR. CRAWLEY: Downloads of documents.

CHAIRMAN AUGUSTINE: You could download documents.

I personally -- last count, my secretary had said -- received over 1,700 e-mails on this subject since I began, and they're terrific.

And one thing they point out is that a human space flight is almost like a religion with many people. The only problem is they're all of a different religion.

[Laughter.]

CHAIRMAN AUGUSTINE: They all have their own view of what it is that we should be doing, but we try to be very open and candid. You'll recall we spent the better

part of a day and an evening rating aspects of various alternatives in public, during which I think we bored everyone to death, but it was important, and many people stuck with us until late at night to hear that.

We would like to think we set maybe a new standard for openness for this kind of an undertaking.

DR. CRAWLEY: And I might add that that wasn't an accident. I mean, there were three or four of us on the committee that really wanted to engage the public and particularly the part of the public that knows how to Tweet and Facebook and so forth, which tends to be the youth, in this process.

And we were actually tracking things, you know, what speakers were getting lots of Tweets going on, and we were reading these things in real time.

MEDIA QUESTIONER: And can you make that information available? Which was getting the most --

DR. CRAWLEY: Oh, I'm not going there.

[Laughter.]

DR. CRAWLEY: But we weren't tracking it in the sense of keeping statistics, but -- no. But, actually, Leroy and I often had his laptop open, and, you know, we

were watching things going back and forth on the Net.

So it was not only, you know, after the fact. It was actually real time, and, occasionally, I actually remember a couple of occasions where I made comments at the meeting directly in response to things that were going on online. So it really was an interactive process.

CHAIRMAN AUGUSTINE: The answer to your question of who got the most Tweets, it was Sally Ride, 10:1.

[Laughter.]

MODERATOR: Seth now with the last question, please.

MEDIA QUESTIONER: Seth Borenstein, AP.

Mr. Augustine, you mentioned using your -- what you called the more sensible, flexible path that would be faster than 15 years to go to the Moon. If you go the flexible path, how soon? What would be your first choice of options? How soon could you go to what Professor Crawley called, I guess, a new and interesting destination? How soon, and which one should be that first one?

CHAIRMAN AUGUSTINE: Since he said that, we'll let him answer.

[Laughter.]

MEDIA QUESTIONER: You said part of it, too, though.

CHAIRMAN AUGUSTINE: Okay.

DR. CRAWLEY: Well, first, let me tell you what causes the flexible path to make sense, and it's actually a very simple factor, which is that you can build some of the overall system and then start getting some value out of it.

What you build is the booster in the capsule, and then you can start going place. You can go on an orbital flight around the Moon. Then you can build a little bit more, an in-space hab, and you can go to a near-Earth object and interact with another body that we never interacted. It's energetically less intensive to go on a fly-by of Mars than it is to go to the surface of the Moon.

So, if you want a metaphor, if you can save a thousand dollars a month, do you save for a longer time and buy a camper van, or do you save for a shorter amount of time and buy a station wagon, and then, a few years later, you hook on a little trailer?

What this flexible path does is it allows us to take some of the components that you would build first anyway, the heavy booster and the capsule, and start

exploring while we're building the lunar landing system and the lunar surface system, so that when they become available, it's time to go up to the Moon.

MEDIA QUESTIONER: Seeing that circling the Moon isn't someplace new, but a near-Earth object or circling Mars would be --

DR. CRAWLEY: Right.

MEDIA QUESTIONER: -- how soon do you see -- if President Obama said, "You're right," how soon -- and the money comes.

DR. CRAWLEY: In the report, it shows that we can leave low-Earth orbit in those scenarios in the early '20s. So it would be sort of early to mid '20s, without pinning down an exact year, that we would get to a near-Earth object, which would be several years earlier than we would otherwise get to the Moon.

MODERATOR: Okay. Thank you all very much. I'd like to tell you that this press conference will be replayed on NASA Television at 4 p.m., Eastern, on the Media Channel.

I'd like to thank Secretary Augustine and all the members of the committee for the terrific work and the

terrific presentation. It's been wonderful working with you.

CHAIRMAN AUGUSTINE: Our privilege.

MODERATOR: And we wish you all the best. Thank you all.

CHAIRMAN AUGUSTINE: Thank you.

[Applause.]

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